Advantages of a true Enterprise Solid State Drive (SSD) in enterprise systems

It is now well recognized that SSD's are capable of delivering blistering IOPS performance versus traditional rotating disk drives in server and storage applications. This enormous gap in capability necessitates that enterprise applications re-examine the metrics used in the past to determine the affordability of HDD systems. On a per gigabyte bases the cost of an SSD is higher than the cost of hard disk drives which was the traditional way of measuring cost. However with the advent of SSDs that metric no longer applies. The value proposition for SSD's is now measured in dollars per IOPS. This dollar per IOPS approach can translate to significant cost savings over traditional rotating media when measuring the speed of results or access to data while typically reducing the number of drives needed to be deployed in order to hit a performance target and therefore saving significant amount of power.

An important consideration: there are differences in costs for SSD's that might raise the questions of why one SSD may cost hundreds of dollars and another cost thousands.

This paper will address the cost disparity in today's SSDs

Enterprise and Consumer class products

Similar to the HDD world, there are different SSDs that are appropriate for different usage models.

A consumer would generally never consider using an enterprise designed Fibre Channel (FC) 15K RPM HDD for a laptop or desktop computer mainly due to form, fit, power and cost considerations.

Enterprise server and storage users would likewise never consider a 5400 RPM mobile SATA drive for use in a performance oriented business critical application in the data center.

Even though a mobile SATA drive reads, writes and stores data the same way as any other 15K RPM drive.

This same reasoning can be applied to using a low cost SATA SSD in these same mission critical applications. These low cost SATA SSDs are faster than HDD's but not as capable as a true enterprise class SSD, they store data the same way as the other SAS or FC SSD's, so why not use it and save some money…?

The answers are the same as HDD considerations, data centers don't use the 5400RPM mobile drives for several critical reasons; trust, reliability, life expectancy, data retention, redundancy and performance.

Under the same considerations, consumer-grade SATA SSD's designed for consumer applications lack the critical 'designed for enterprise' deliverables that are necessary for today's data centers. Key to these designed for enterprise features include dual porting, end to end data integrity inside the drive to protect user data on the fly, rigorous specification and testing of all components, interface compatibility and technologies that work in the enterprise systems (rather than having to adapt the enterprise infrastructure to support the drive).

Tested and Approved

To better understand the trust question, one must understand that virtually all storage manufacturers have reviewed tested and ran all available SSD devices through a comprehensive test and validation process to find and qualify the

best SSD for data reliability, functionality and performance for use in their storage and server systems. These tests are implemented to prove the design in reliability, data retention and life expectancy and to meet or exceed specifications with plenty of margin to handle differing environmental and use conditions.

Performance

Enterprise environments are significantly different from consumer environments.
In today's data center, information is constantly being accessed, created and moved onto and off of the storage systems, in an enterprise computing environment the usage is 24x7x365.

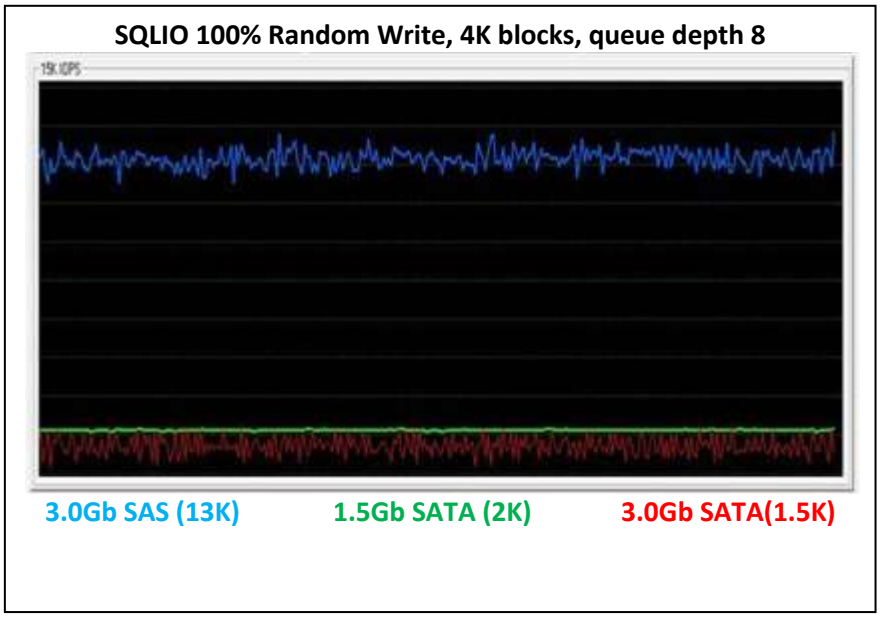
Consumer applications and systems tend to be used at very low duty cycles with occasional write or read access accompanied by long periods of power off time.

The typical consumer based SSD design may be a great performer in the environment where use is minimal, writing is rare and the system is idle much of the time.

However, these drives simply are not designed for an enterprise environment where the access is constant and write operations are consistent and the expectation is to have no data loss or limit access to that data.

A key difference in the design of an SSD vs. that of an HDD is the ability to handle and manage the NAND FLASH memory inside the drive with error handling, block management routines and wear leveling routines while writing and reading from the drive.

An enterprise SSD must manage these conditions while keeping the IO rates high and consistent in order to deliver the performance expected to keep the data center running without impact to access or performance of the systems in use. This performance must be maintained while checking all of the data and circumvent any kind of an error.



This chart demonstrates the performance difference in write IO between SATA SSD's (green and red lines) and an enterprise SSD with a SAS interface (blue line) while running an SQL database for many days non-stop. Notice that the enterprise class SSD maintains a steady state performance 5X higher than the SATA SSD drive.

Another critical difference between the consumer grade SSD and the Enterprise SSD is the level of reliability, checking, error recovery and testing that both drives undergo. Enterprise class drives are designed to a very exacting standard in order to achieve MTBF numbers greater than that of HDDs. These standards require that parts be used that have more robustness or that redundancy be used to be able to withstand failures.

It is well understood that NAND flash components will wear out commensurate to the number of writes done. An enterprise class drive is designed with more robust Error Correction and detection and with overprovisioning so that the SSD will be able to operate at its specified write performance the entire life expected in a demanding enterprise application.

Enterprise class SSDs are put through very rigorous qualification tests to ensure that the NAND flash parts used along with all the other components can meet the write endurance, reliability requirements, temperature range, as well as all critical conditions that might occur. These drives are designed and tested to contain error recovery and reporting so that in the rare event of a problem, the system can continue operation, allowing the customer access to all his data while securing its integrity.

While consumer grade SSDs have sufficient reliability and write endurance to meet the usage models they are subjected to, They fail to meet the stringent requirements Enterprise storage manufacturers set to assure rock solid system reliability and availability.

Conclusion

While consumer grade solid state drives maybe available from multiple sources and may have a very attractive price and are still called SSD's, they are not capable of deployment in a mission critical data center environment in high duty cycle workloads where data redundancy, multiple paths to the data, endurance and data protection are a must.