Solid State Drives use in Point of Sale Computers

White Paper

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Overview

Although available for some time now, solid state drivers (SSD) are finally coming into the mainstream. A solid state drive uses flash memory cells to store data and has no moving parts. Newer SSD drives use the SATA interface and 2.5 inch hard disk physical format; they are a drop-in replacement for a 2.5 inch SATA hard drive. An SSD works just like a hard disk drive (HDD) does. No software needs to be changed to use a SSD to replace a HDD. With decreasing costs, outstanding reliability and brilliant performance the SSD drives will soon become the dominant storage medium for POS computers.

Advantages

The big advantage of an SSD is twofold - reliability and speed. The MTBF for a SSD is between 1,000,000 and 4,000,000 hours, or between 114 and 456 years! Because there are no moving parts the shock rating is normally 1,500G. SSDs are also very fast and much quicker than rotating hard drives, with read and write speeds 25 to 400% faster. An SSD also uses less power than a HDD, typically one half to one quarter the power, which means less heat is generated.

Disadvantages

There are currently two disadvantages with the SSD compared to a hard drive. The biggest one is cost. Currently the cost per byte for a SSD can be two to ten times the cost for the same capacity hard drive. Fortunately this is changing quickly and SSD drives continue to come down in cost. The second disadvantage is the flash memory blocks of an SSD can only be written a limited number of times before they wear out. This may appear to be a major disadvantage but it is not. There a number of methods SSD drive use to make this a non-issue. The bottom line is that any disadvantages inherent with an SSD are more than outweighed by its advantages when used for POS applications.

Performance

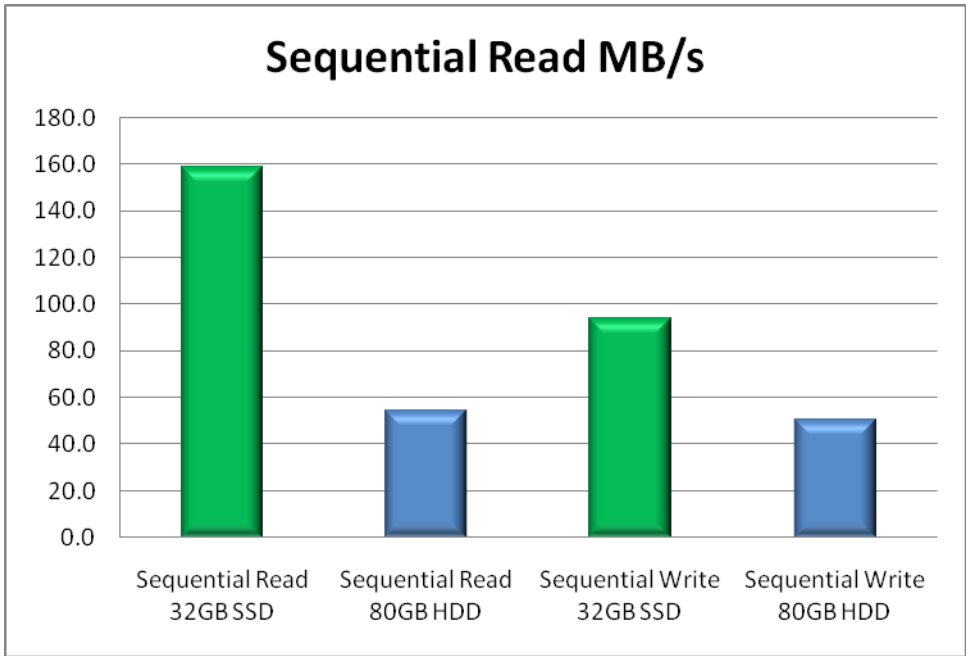
SSD drives typically have much better performance then HDD drives and do particularly well with random reads of small blocks. As an example: the J2 615 1.6 GHz Atom based POS system boots XP Pro in about 55seconds with a HDD, but boots the same XP Pro image in 35 seconds when booting off the standard 8GB SSD.

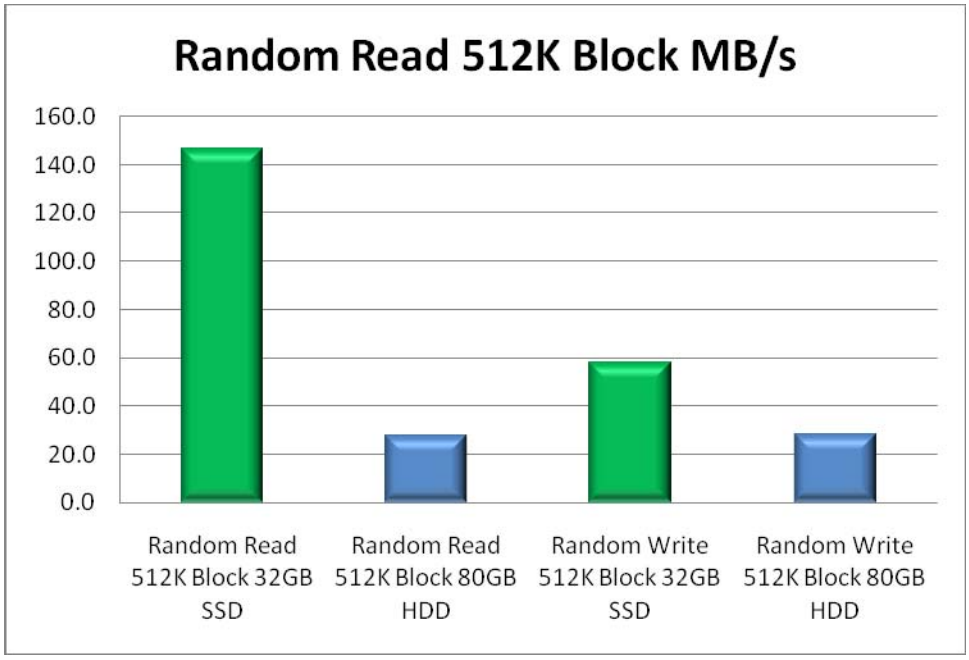
Because all read accesses in a SSD take the same amount of time, the read performance is the same for sequential reads as it is for random reads. In a HDD random reads are much slower because the drive needs to move the read head to the correct location on the disk

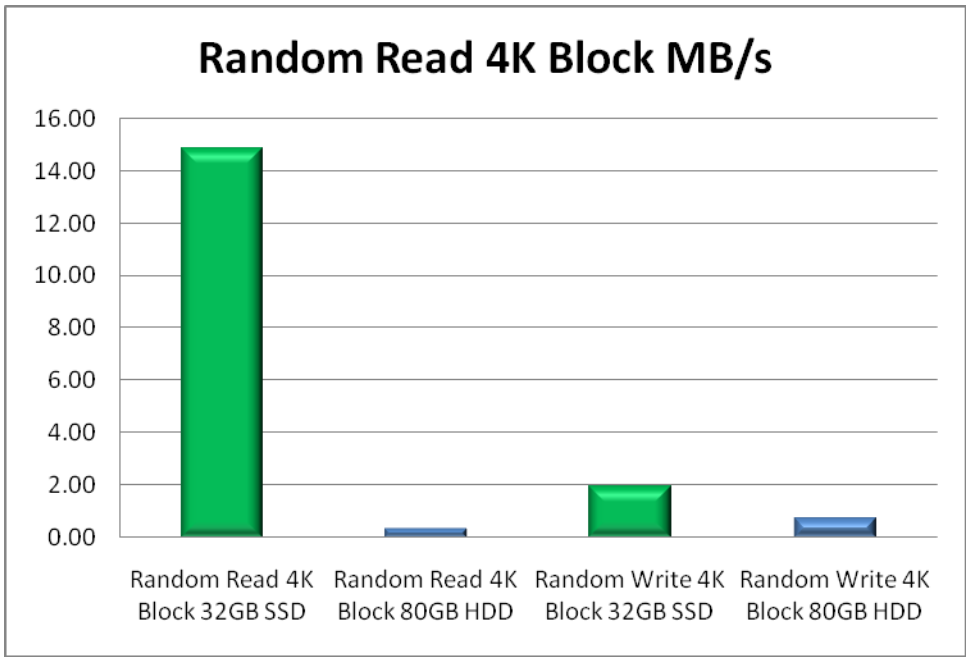
platter to read the desired data. The mechanical latency adds a significant performance penalty to random reads that the SSD does not have.

Write performance of SSDs have been improved significantly over the past few years. Write performance is now greater than any HHD, which was not the case a few years ago.

Below are typical benchmarks comparing a 32GB SSD and an 80GB SATA HDD.







Reliability

An SSD, being a solid state device, has nothing that can wear out in the normal sense of the word with the exception of the flash cell. With a HDD the bearings in the spindle motor have a limited life time, as do the read heads and as does other moving parts of an HDD. These parts are also much more sensitive to G shock damage than an SSD dive is.

Wear Leveling

SSD flash memory blocks have a limit as to the number of erase/write cycles they can perform. The number of erases/write cycles to a MLC NAND block is about 10,000 and about 100,000 to a SLC NAND. SSDs typically have a very sophisticated wear leveling scheme to insure that the writes to the SSD are spread out, insuring that the SSD will not wear out. Intel stated that their SSD can handle 100GB of data written to the drive per day and be guaranteed to last 5 years. This amount of data being written to a SSD or HDD is much, much higher than has been seen before in a POS application. An SSD would typically have a much longer usable live span than the typical product life of 7~12 years.

SSD Capacity

Currently the cost of an SSD can be quite high for a large capacity drive. The good news is that most POS applications do not need a great deal of storage capacity. In J2's

research into the capacity required by most customers, it was found that an 8GB SSD fits most all requirements. J2 also determined that a number of POS software vendors hardware requirements list stated that they require a 40GB hard drive. This was because at the time the software vendors published their requirement lists the smallest new HDD available at that time was a 40GB drive, they did not envision running their software on an SSD. The fact is that most POS software packages can easily run on an 8GB SSD with room to spare.

Of course the advantage of lower capacity is lower cost. J2 currently offers SSD drives for J2 systems in 8GB, 16 GB and 32GB sizes. Higher capacities are available if needed. J2's new product, the J2 615 computer comes standard with an 8GB SSD and has a price point similar to the HDD version.

Compact Flash

Although SSDs are similar to Compact Flash cards in many ways, there are some major differences. Not all CF cards have wear leveling, which means that if too many writes are done to the card they will wear out. In addition, the CF card interface uses the older PATA (IDE) interface and cannot read or write as fast as a SSD and so are typically a lot slower than a hard disk drive or an SSD. CF card writes are typically very slow which makes them unsuitable for a POS application unless used with an OS, like XP Embedded with the EWF or Windows CE.

Conclusion

With reduced costs and better performance the time has come for the SSD to be used in POS computers. With HDDs being one of the highest failure items in a POS computer, eliminating them can have enormous benefits for both customers and suppliers alike.