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The Latest News from More Power Computers

Hard Drive Versus Solid State Drive

The following is based on an article at Tom's Hardware. To see the complete article including graphs and test data go to http://www.tomshardware.com/reviews/ssd-performance-power,2279.html.

Individuals and businesses want faster data drives. The performance qualities of solid state drives (SSDs) have been disputed. But what are the real differences and are those trade-offs worth swapping drives? Essentially, hard drives are best at reading or writing data sequentially—the more they have to reposition their heads to tackle random operations, the more they slow down in terms of both throughput and I/O operations per second. The performance evaluation of hard drives has been rather simple: you want to know the throughput performance in megabytes per second, and access time in milliseconds, for both desktop and notebook drives. Sometimes you need to add I/O performance analysis for servers and workstation products before making a decision.

SSDs are different. They have extremely quick access times, as they just have to pick the right position within the memory array instead of moving physical components. But that also makes SSDs more complex as the physical location and strategy for storing data isn't as simple as it is on hard drives. The combination of smart controllers and multiple flash channels results in erratic use of the available resources. This means that a sequential stream of data is never actually written sequentially. The fact that files can be anywhere between a few bytes and many gigabytes, and that data is typically written, read, erased, and written again adds a layer of complexity that can have a substantial impact on SSD performance. This can become more pronounced once you utilize the entire SSD capacity, leaving fewer options for the flash controller to optimize performance. An over-crowded SSD will suffer on performance. To combat this, Intel has new firmware that has shown in tests to improve performance of SSDs.

Testing SSDs:

Intel's X25-E has no substantial performance drop. The SLC flash-based drive is capable of maintaining its performance level even if you keep changing the type of workload. Very impressive, indeed. Web server performance doesn't suffer as much as it is based 100% on reading small random blocks, which flash SSDs can handle very well. In testing SSDs, Intel's X25-E professional SSD managed to maintain more than 200 MB/s throughput regardless of what type of workload was tested. Samsung's 256 GB MLC flash PB22-J SSD typically delivers more than 200 MB/s sequential read throughput, which it cannot maintain when you stress it with heavy I/O operation between sequential tests. Performance dropped with every cycle that included sequential throughput followed by intensive I/O performance testing, but the write throughput quickly caught up again once we stopped throwing the I/O operations at the drive. Samsung's PB22-J SSD performance is far from the levels reached by the Intel products, but the good news is that it is still much faster than any hard drive could ever be, and that I/O performance is consistent across our testing. There were no significant performance drops.

Performance Issues:

Intel's X25-M has been the fastest consumer drive and it typically still is, but only if you update the firmware with the latest available version. While the X25-M showed severe performance reduction in sequential writes after heavy I/O, it managed to handle the changing workloads much better with the latest firmware. Samsung's PB22-J flash SSD also showed performance drops following the change of workload, but the drops were much smaller across the board.

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Hard Drive Versus Solid State Drive (continued)

Solutions:
We believe that firmware updates for flash-based SSDs could become more popular, and at least as important as software updates for your motherboard. There still is room for optimization, and all serious SSD vendors will take advantage of it. Hence, it makes sense to install the latest firmware version, not only to avoid severe performance drops, but also to make sure your SSD performance is maximized.
The other solution is to make sure that you don't throw lots of changing workloads at your SSD, as this does result in a noticeable performance impact. Such workloads would be intensive P2P downloads and activities that lead to fragmentation. While fragmentation on a file level, as you may be familiar with it, isn't an issue for SSDs, block level fragmentation is. In such a case, the SSD has to store data across multiple flash cells; this requires frequent read, erase, and write processes, which is what takes the most time on SSDs. This happens inside the SSD and cannot be influenced by the SATA controller or the operating system. At the same time, you should also avoid running conventional defragmentation tools on a flash SSD—they only appear to tidy up file storage, while actually contributing to block level fragmentation.
Finally, we want to remind you that a SSD, which doesn't have to answer to drastically changing workloads, will not show performance drops as significant as in seen in this series of tests. Temporary files and similar random information won't become an issue unless they become a serious workload for the SSD. Fast SSDs, like those used for this article, are definitely faster than any conventional hard drive.

A final word of caution: Be safe out there. Back up your data. Remember that SSDs are more complex as the physical location and strategy for storing data isn't as simple as it is on hard drives. Data recovery from a bad hard drive is one thing. Data recovery from a bad solid state drive is highly unlikely.

The Old Flash-Drive Pick Up Trick, Eh?

See a penny, pick it up, and all day long you'll have good luck, . . or at least a penny. However, see a flash-drive and pick it up and all day long you may be fighting a rootkit or other malicious software.
It's human nature for a person to pick it up and try to see what's on the drive so it can be returned to the owner or used rather than thrown away. But it is a long-time hacker trick to drop a flash-drive in a parking lot, especially outside a company, bank, etc. Curiosity does the rest and when an employee or home user plugs the drive into their computer the drive installs a hidden rootkit that enables the hacker to have total access to financial records and more. The hacker can then hold hostage an entire company or mess up services they provide, or make an individual's life miserable.