

Storage I/O Performance Comparison between SSD and HDD hosting

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Background

To test the performance gain between HDD and SSD server

Test Platform

Intel S2600CP2 platform
2 x Intel Xeon CPU E5-2620 v2 @2.10GHz
16GB DDR3 ECC memory
OS: CentOS 7.1 x64
Kernel: 3.10.0-229.14.1.el7.x86_64

SSD RAID array: 4 x Kingston E50 480GB SSD SE50S3480G (RAID-10, mdadm with internal bitmap enabled, i.e. array size is nearly 960GB, mount as /home)

HDD RAID array: 2 x Western Digital 2TB SATA HDD WD2000FYYZ (RAID-1, mdadm with internal bitmap enabled, i.e. array size is nearly 2TB, mount as /home1)

In order to have sufficient enough server storage (at least 1TB storage is required), at the time of testing, in our opinion, 480GB SSD is the most suitable model to build a near 1TB storage in terms of cost, stock availability, and RAID configuration.

We run the tests with the same server hardware (except storage), same OS, and same Linux kernel.

Testing Tools

We used *filebench* utility to test the array. *Filebench* is shipped with RHEL7 (and also CentOS 7), and comes with a number of personality test template.

We modified the templates - *filemicro_seqread* , *filemicro_seqwrite* , *fileserver* , *webserver* – to suit our test, we changed the test data file size (from default 1GB to 32GB and 64GB), and the test data path.

For *filebench* details, please refer to <http://filebench.sourceforge.net/>

Test Result

We conduct a series of *filebench* tests, including -

- sequential read
- sequential write
- random access read/write (simulate a busy **file server**, ratio: 1 read vs 1 write)
- random access read/write (simulate a busy static **web server**, ratio: 10 read vs 1 write)

Legend

SSD 64G = run filebench test on SSD array with 64GB test data

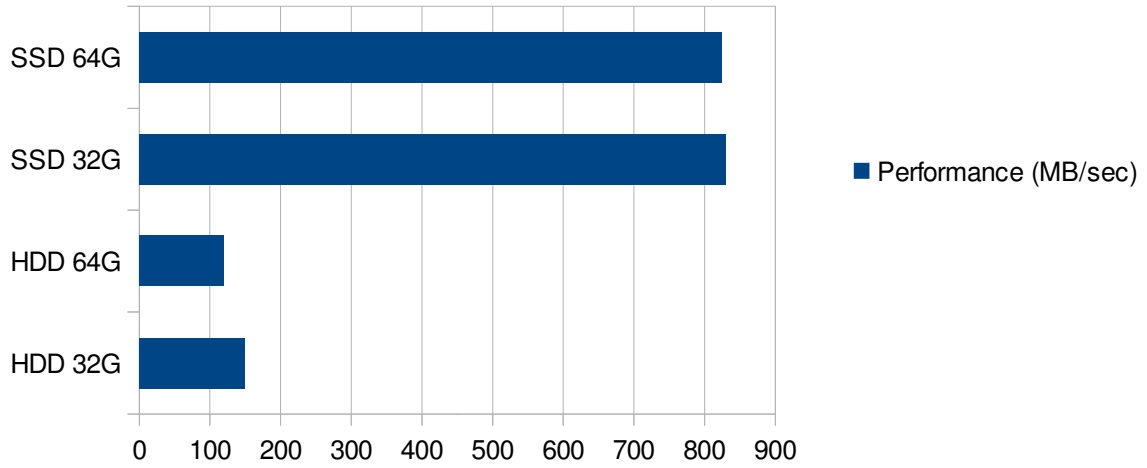
SSD 32G = run filebench test on SSD array with 32GB test data

HDD 64G = run filebench test on HDD array with 64GB test data

HDD 32G = run filebench test on HDD array with 32GB test data

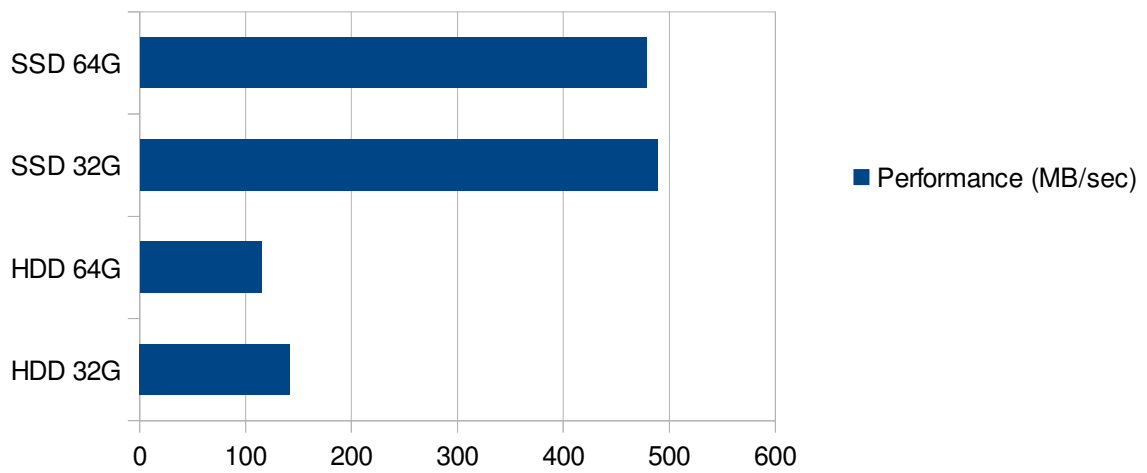
HDD vs SSD server Sequential Read Comparison

longer means better



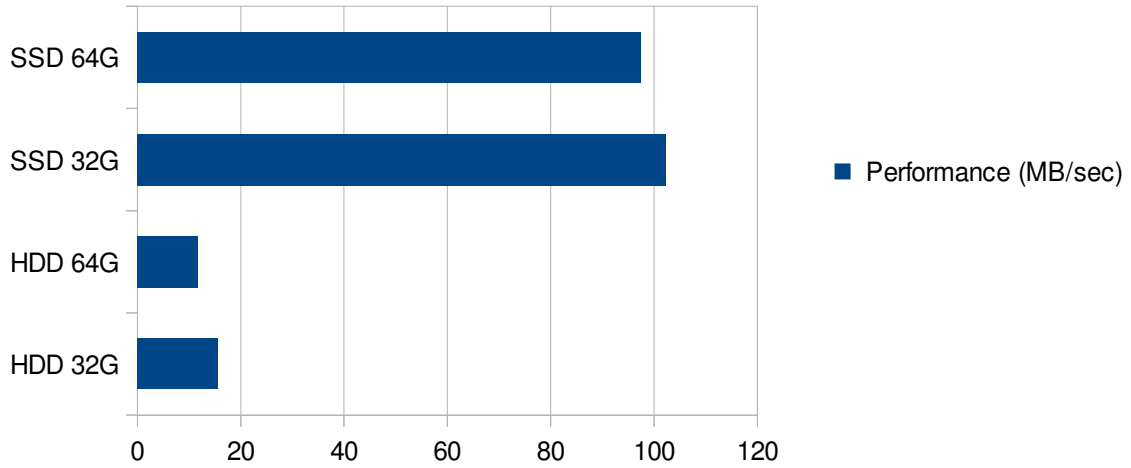
HDD vs SSD server Sequential Write Comparison

longer means better



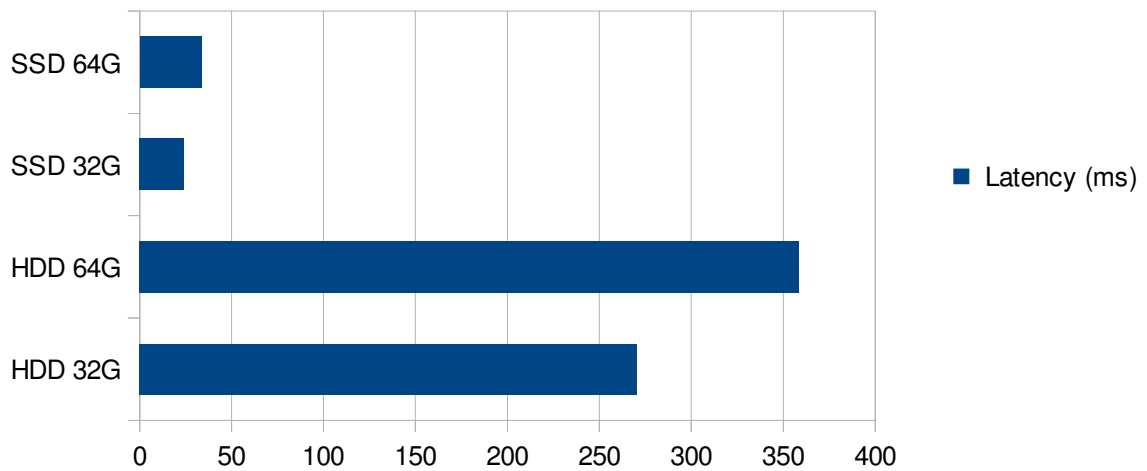
HDD vs SSD (as a File server) random Read/Write Performance Comparison

longer means better



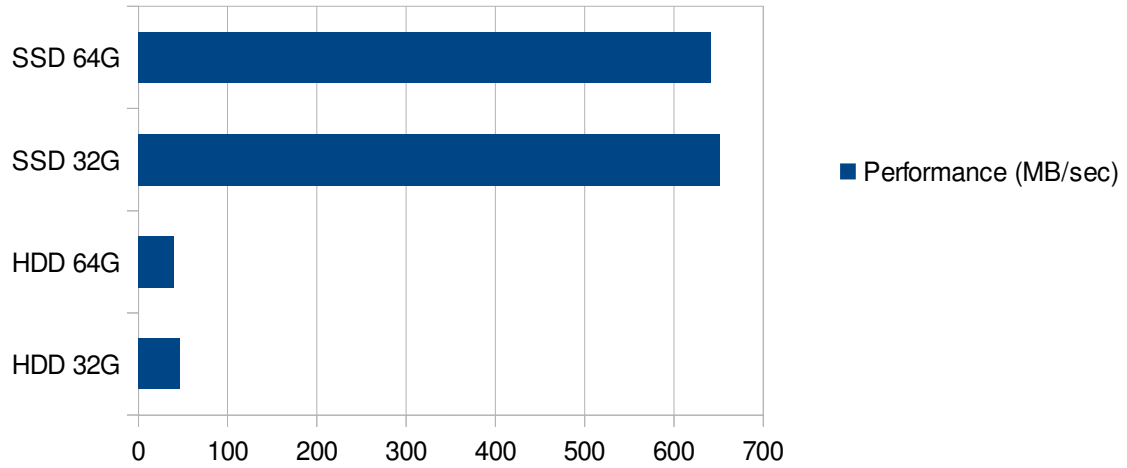
HDD vs SSD (as a File server) random Read/Write Latency Comparison

shorter means better



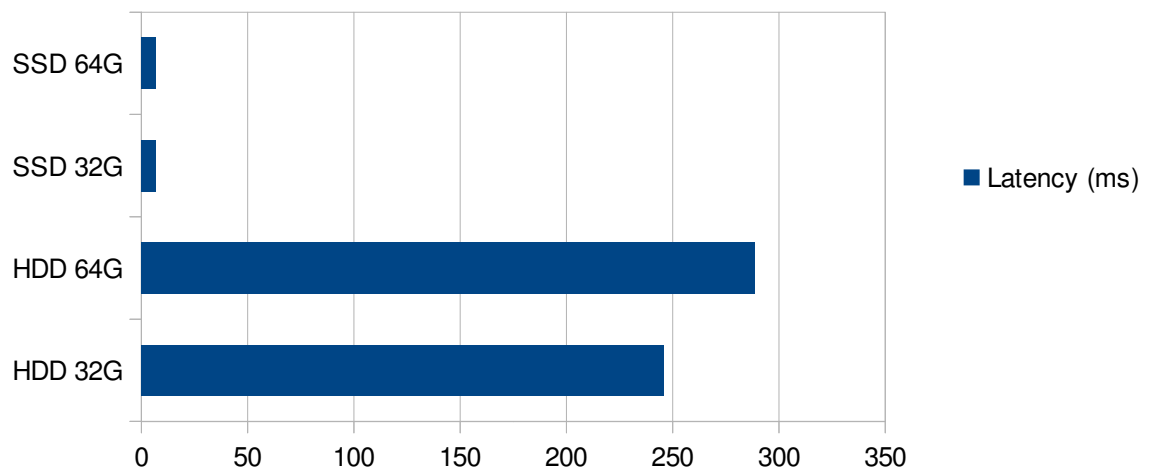
HDD vs SSD (as a Web server) random Read/Write Performance Comparison

longer means better



HDD vs SSD (as a Web server) random Read/Write Latency Comparison

shorter means better



Notes

- This test simply compares the SSD (RAID-10) vs HDD (RAID-1) I/O performance in server environment
- RAID-10, by its nature, may boost the read performance (up to 4X theoretically)
- RAID-10, by its nature, may boost the write performance (up to 2X theoretically)
- RAID-1 (mirroring), by its nature, may have a little performance impact on write.
- The testing server contains 16GB memory. A large portion (around 15GB) by default may be used for system cache. The cache may favor 32GB test data set more than 64GB test data set.
- Users on SSD storage platform can gain can improve the website responsiveness. However, **the website responsiveness also depends other factors** (including, but not limited to, client-to-server bandwidth and latency, server processing performance, PHP script complexity, database performance, firewalling, client device web page rendering, web page components from other websites, etc).

Conclusion

- SSD raid array is better performed in both read/write performance and responsiveness

- End -