Intel® RAID RS25 Series Performance

including Intel® RAID Controllers RS25DB080 & RS25NB008

PERFORMANCE SUMMARY

Measured IOPS surpass 200,000 IOPS

When used with Intel RAID Fastpath IO* software, IOPS exceed 465,000

Up to 3X the IOPS of existing industry leading Intel 6Gb/s controllers

4X-7.5X the IOPS of next closest competitor

Up to 67% improvement in RAID 5 and RAID 6 sequential writes over existing industry-leading Intel 6Gb/s controller

Unmatched RAID 5 and RAID 6 streaming bandwidth performance

Highest IOPS performance in SSD environment

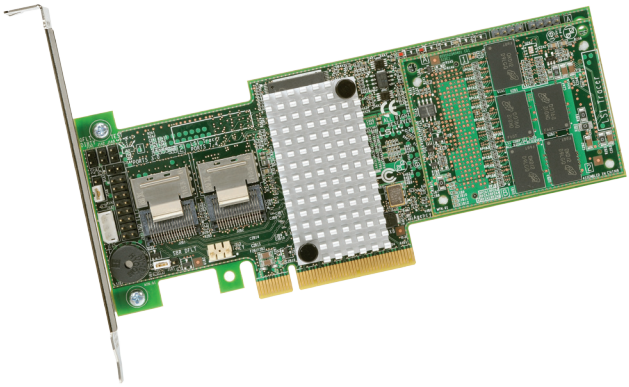
25-35% improvement in 3Gb/s SATA

* Other names and brands may be claimed as property of others

Executive Summary

Intel® RAID RS25 Series controller cards, powered by the LSISAS2208 dual-core 6Gb/c SAS RAID-on-Chip (ROC), deliver the industry's highest server RAID IOPS and bandwidth, extending the performance leadership offered by the existing family of Intel 6Gb/s SATA+SAS Intel RAID controllers. This second-generation 6Gb/s SAS Intel RAID series includes an 8-port internal controller (RS25DB080) and 8-port external controller (RS25NB008) to address high-performance storage requirements for both inside and outside the server. The low profile MD2 form factor controllers feature the LSISAS2208 SAS ROC IC with two 800MHz PowerPC® processor cores and 1GB DDRIII cache memory. The cards provide support for up to 240 SATA and SAS hard drives or solid state drives (SSDs), and support hardware RAID levels 0, 1, 5, 6, 10 and 60.

Intel uses the latest technology and features on the second-generation RS25 Series designed to deliver significant performance improvements over the existing industry Intel 6Gb/s RAID controllers. Additionally, the RS25DB080 & RS25NB008 controllers outperform the competition with unmatched RAID IOPS, bandwidth and SSD support. This brief outlines these performance accomplishments with Intel internal benchmark results in a variety of configurations and environments.



Intel RAID Controller RS25DB080 with 8 internal 6Gbps SATA + SAS ports

Highest Server RAID Performance – Over 465,000 IOPS

Intel® RAID RS25 Series controllers drive performance levels up beyond 465,000 I/Os per second (IOPS) to meet the high I/O transaction demands of datacenters, database and cloud applications. Transaction-oriented environments, which have many I/Os operations per second and are dominated by random I/O access patterns, will enjoy impressive performance gains with the Intel RAID Controllers RS25DB080 & RS25NB008. These applications include email servers, web servers, databases, data warehousing and OLTP (online transaction processing).

Intel internal benchmark testing shows that measured IOPS for these second-generation 6Gb/s SATA+SAS RAID controllers from Intel surpass 200,000, and exceed 465,000 IOPS when used in conjunction with Fastpath IO software in SSD environments (Figure 1). When tested side-by-side with the Intel® RAID RS2 Series controllers, the RS25DB080 & RS25NB008 controllers boost IOPS performance up to 3 times (3X) that of these existing industry-leading 6Gb/s RAID controllers based on the LSISAS2108 ROC. Furthermore, the RS25 Series provides between four and seven-and-a-half times (4X-7.5X) the IOPS of the next closest competitor (Figure 2).

Figure 1: Internal Intel testing comparing Random Read IOPS performance of 1st-generation and 2nd-generation 6Gb/s Intel RAID SAS controllers using 8 solid-state drives (SSDs).

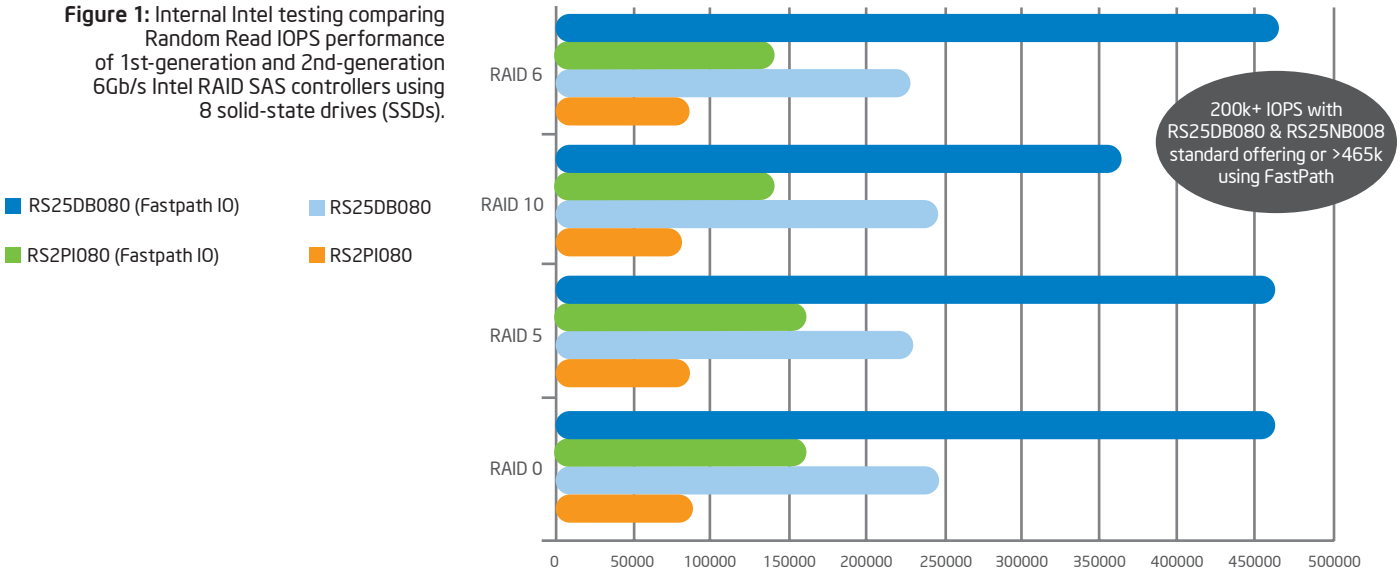
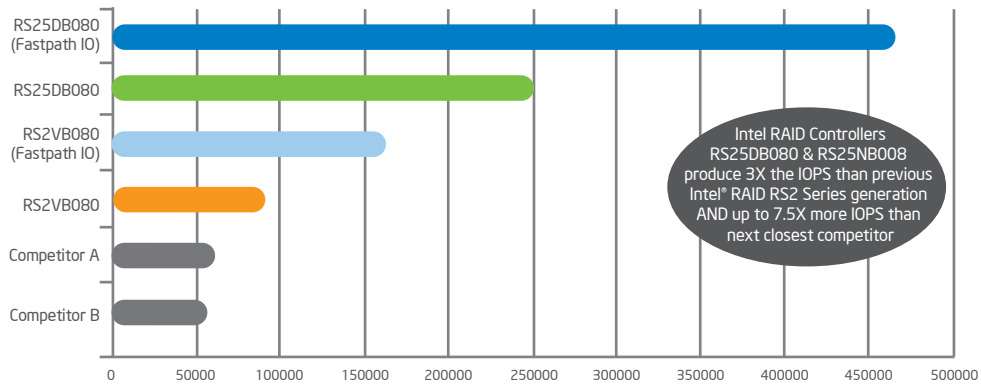


Figure 2: Internal Intel testing illustrating competitive single-block random read IOPS performance using 8 SSDs in a RAID 0 array



Industry-leading Bandwidth for Digital Media, Video, Imaging

In addition to high IOPS performance, the Intel RAID Controllers RS25DB080 & RS25NB008 is equally adept at supporting bandwidth-intensive applications. These Intel RAID SAS controllers, based on the LSISAS2208 ROC, are designed to provide the sustained data transfer rate (SDTF) horsepower and high sequential bandwidth to meet the processing requirements of digital media, video, imaging and high-performance computing environments. High bandwidth applications like these are characterized by large sequentially stored data sets and are measured in megabytes per second (MB/s).

Intel performed a series of internal benchmark tests to confirm the performance of the Intel RAID RS25DB080/RS25NB008 RAID controllers under streaming workloads typical of high-bandwidth applications. As shown in Figure 3, the RS25NB008 controller demonstrated up to a 67% improvement over the Intel® RAID RS2 Series, with RAID 5 sequential writes over 2500MB/s versus 1500MB/s by the previous generation.

Figure 3: Internal Intel testing comparing StreamingWrite MB/s performance of 1st-generation and 2ndgeneration 6Gb/s Intel RAID SAS controllers using 24 6Gb/s SAS HDDs

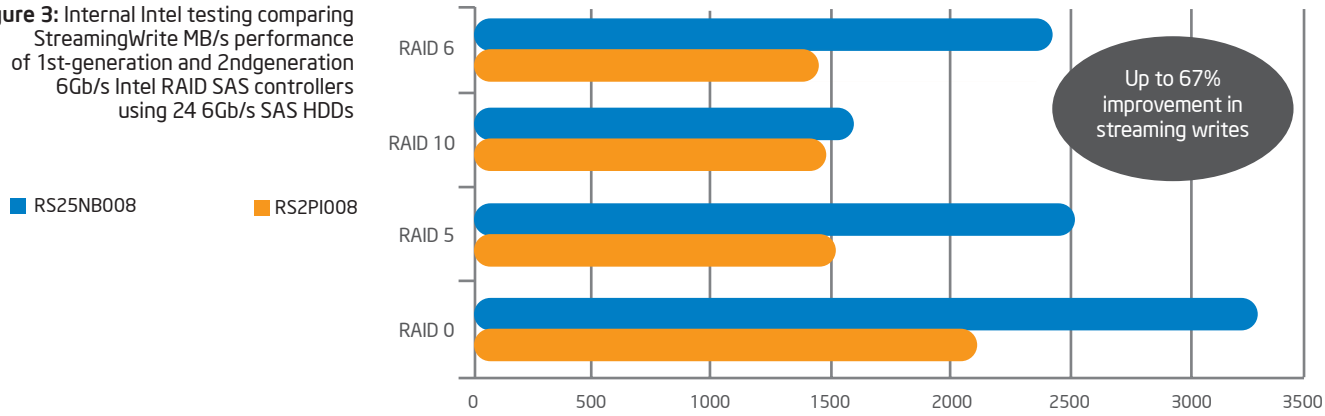
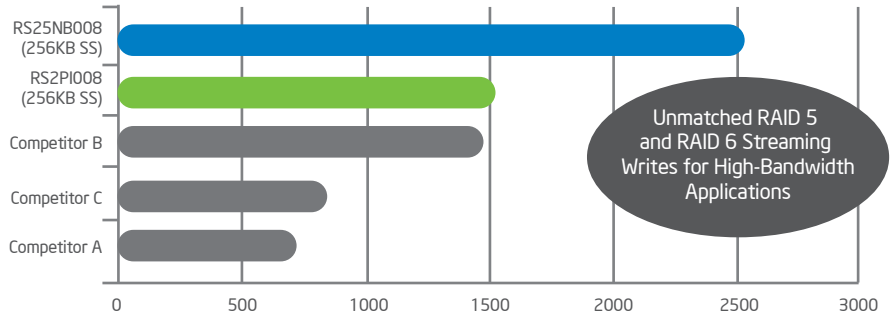


Figure 4: Internal Intel testing illustrating competitive large streaming writes MB/s performance using 24 6Gb/s SAS HDDs in a RAID 5 array



Exploit Performance Potential of Solid-State Drives

As customers look to increase overall performance of their storage infrastructure, SSDs will continue to make inroads into the enterprise server market. Solid state storage accelerates random I/O processing to increase productivity for transaction-intensive applications. Many data centers are implementing SSD tiered storage for applications with the highest IOPS performance requirements. These applications include OLTP servers, email servers, and cloud computing. However, in order to exploit the full potential of the SSDs, the RAID controller in the server must have sufficient performance and throughput to be able to scale with the storage.

Intel RAID controllers provide the most comprehensive offering of SSD software and support features in the industry. The RS25 Series is able to complement SSD adoption and exploit their potential with unmatched IOPS performance, SSD Guard™ technology protection and Intel RAID SSD Cache and Fastpath IO software options. Figure 5 shows that the Intel® RAID RS25 Series controllers outperform the competition in real-world SSD environments by up to 250%. Figure 6 expands on the performance improvements seen in multiple real-world applications using SSDs as compared to the previous generation RS2 Series. These benchmarks are shown as a percentage improvement from one generation to the next, with up to 164% improvement in RAID 5 arrays.

Figure 5: Internal Intel testing illustrating competitive real-world workload performance using eight SSDs.

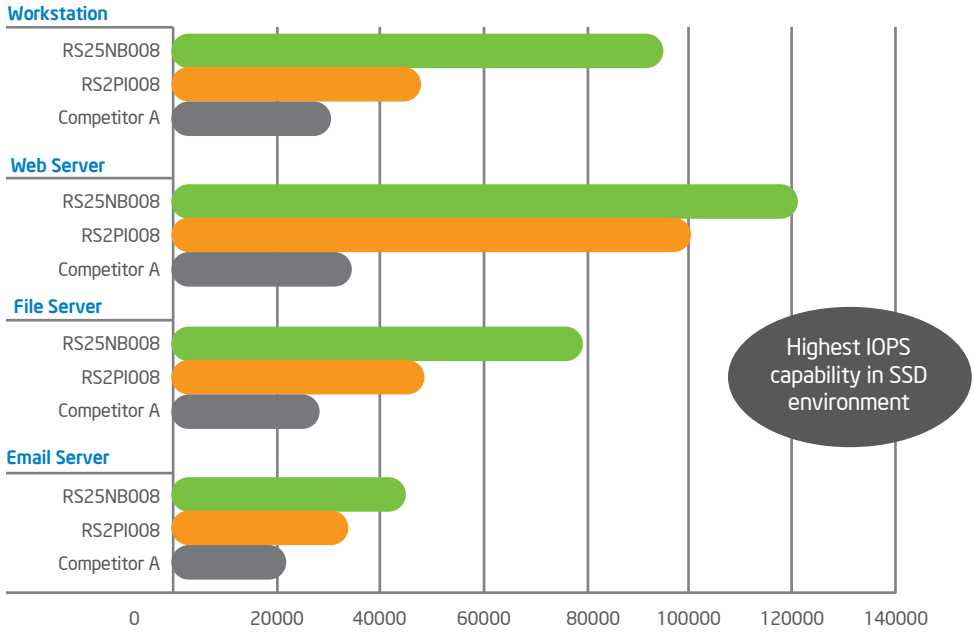
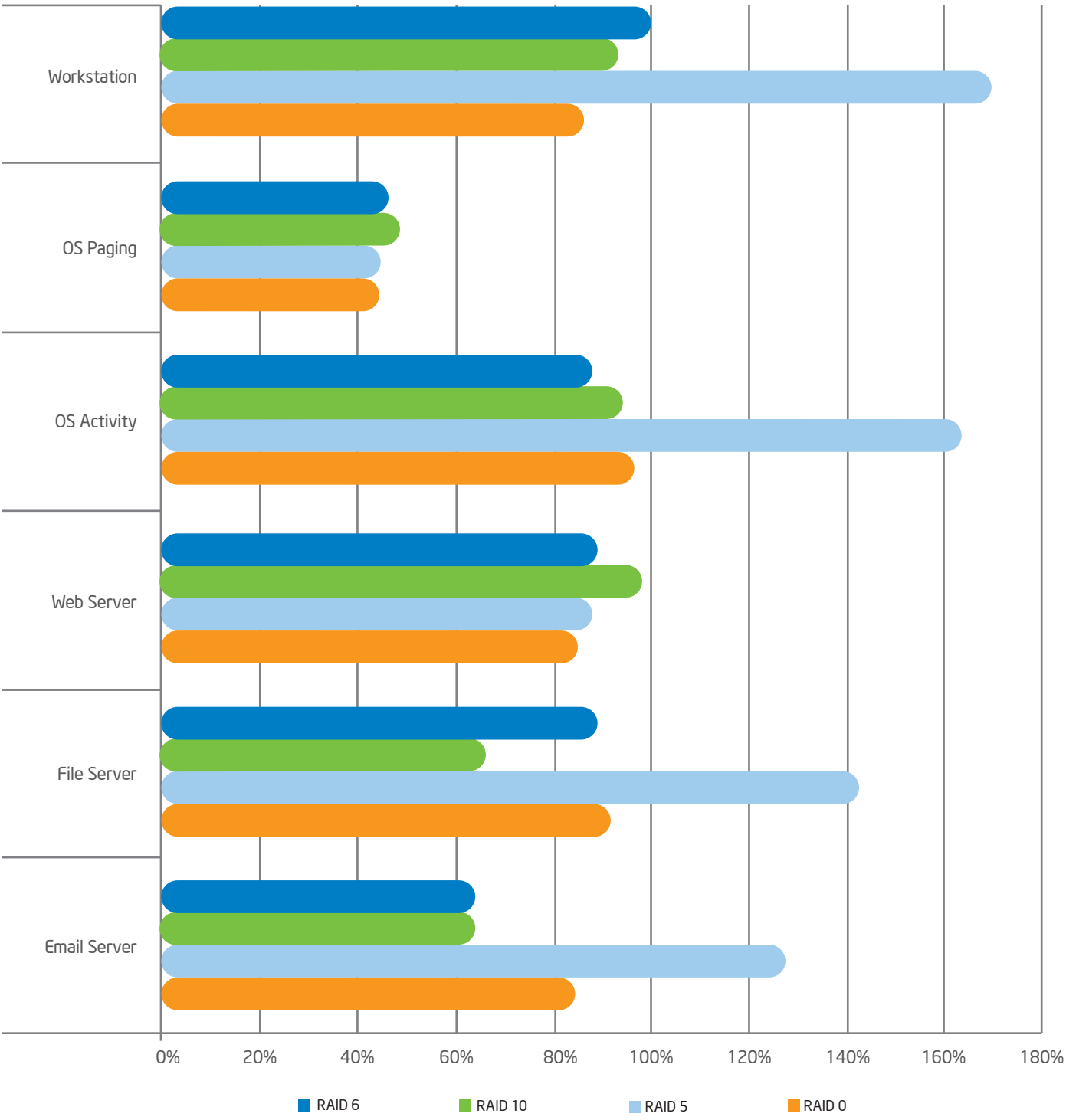


Figure 6: Internal Intel testing showing real-world IOPS performance of Intel® RAID RS25 Series as percentage improvement over 1st-generation Intel® RAID RS2 Series using 8 SSDs.



Improved SAS and SATA performance

In addition to the unmatched SSD RAID performance, the Intel RAID Controllers RS25DB080 & RS25NB008 also demonstrates performance improvements for applications employing SAS and SATA hard drives. During Intel internal testing, the Intel RAID Controllers RS25DB080 & RS25NB008 produced up to 67% better streaming write performance and up to 42% better random write performance using 6G SAS hard drives (Figure 7 and Figure 8). For environments using SATA drives, these 2nd generation 6Gb/s controllers show a 25-35% improvement in 3G SATA streaming performance (Figure 9).

Figure 7: Internal Intel testing comparing sequential write MB/s performance of 1st-generation and 2nd-generation 6Gb/s Intel RAID SAS controllers using 24 6Gb/s SAS HDDs

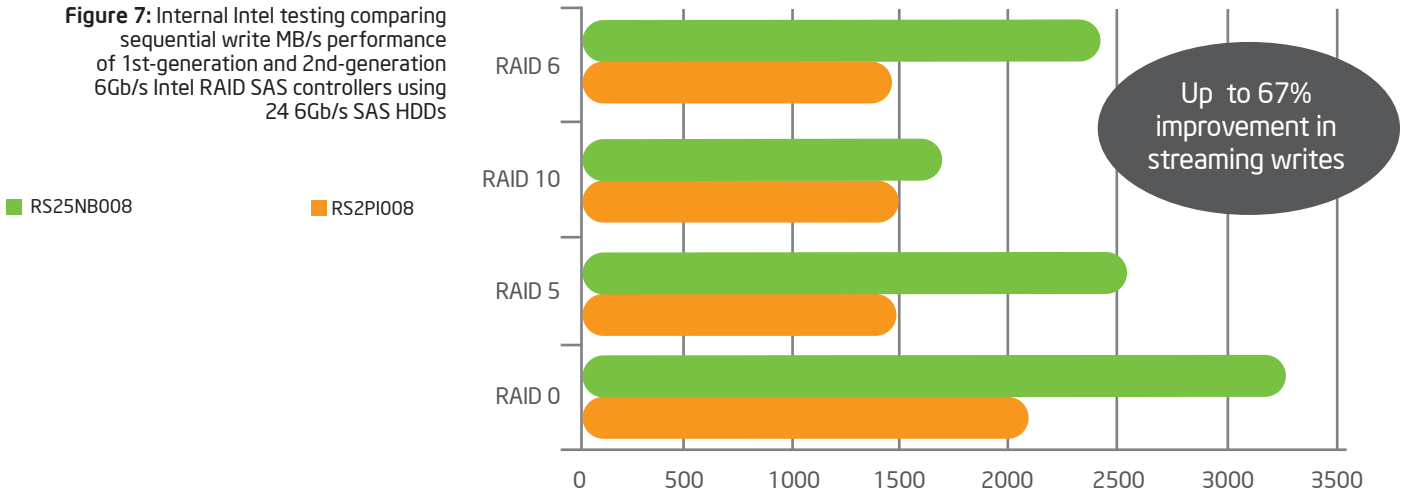


Figure 8: Internal Intel testing comparing random write IOPS performanceof 1st-generation and 2nd-generation 6Gb/s Intel RAID SAScontrollers using 24 6Gb/s SAS HDDs

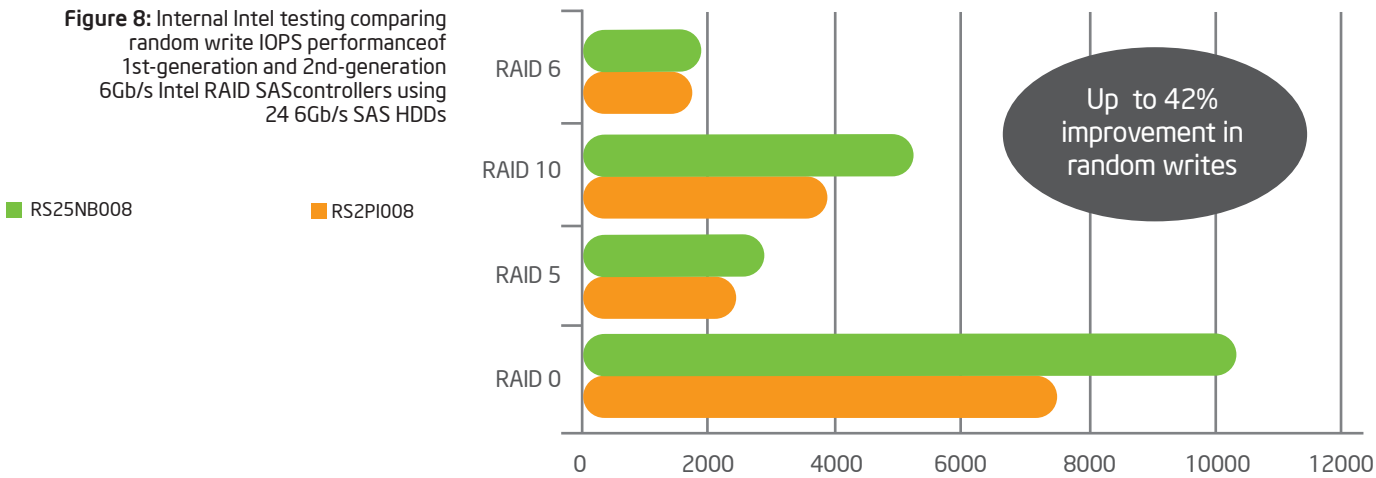
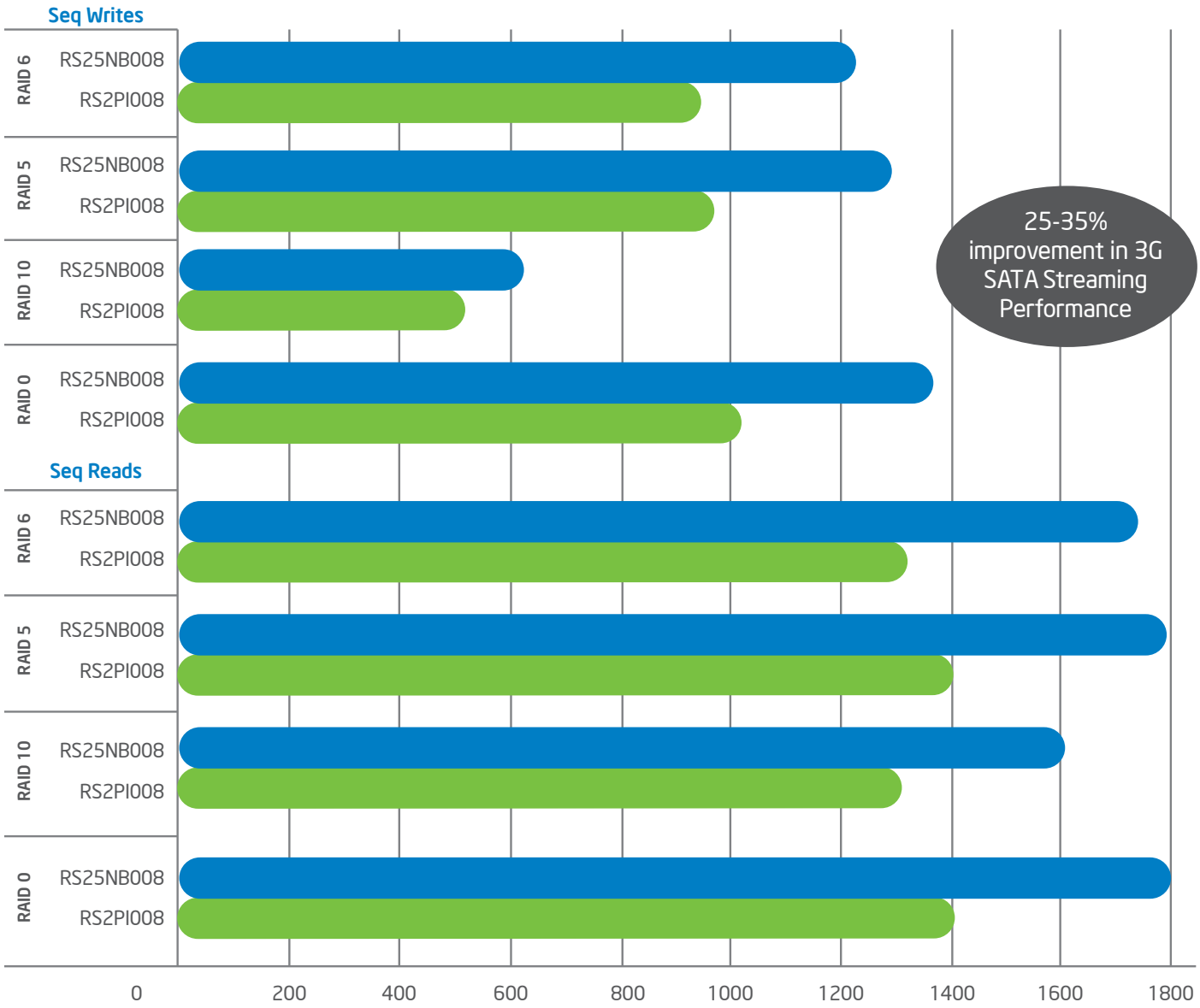


Figure 9: Internal Intel testing comparing RAID 0 sequential MB/s performance of 1st-generation and 2nd-generation 6Gb/s Intel RAID SAS controllers using 24 3Gb/s SATA HDDs



Summary

The Intel® RAID RS25 Series is equally adept at supporting the high I/O applications, such as databases and cloud, and the bandwidth-intensive applications, such as digital media, video and imaging. Building on the strength of the existing industry-leading 6Gb/s SAS Intel RAID offering, Intel delivers the highest server RAID performance with the second-generation RS25 Series. This unmatched performance (in both IOPS and bandwidth), combined with some of the most advanced SSD support and software in the industry make the Intel RAID Controllers RS25DB080 & RS25NB008 a key storage building block for channel partners building high-performance storage solutions for a wide variety of applications.

Intel RAID RS25 Series Order Information

INTEL RAID CONTROLLER	ORDERING PART NUMBER(S)	INTERNAL PORTS	EXTERNAL PORTS	PROCESSOR	CACHE MEMORY	HOST INTERFACE
Intel® RAID Controller RS25DB080 8	RS25DB080	8	0	LSI2208 ROC	1GB DDR3	PCIe 2.0 x8
Intel® RAID Controller RS25NB008	RS25NB008	0	8	LSI2208 ROC	1GB DDR3	PCIe 2.0 x8

Call to Action for more information on the Intel® RAID RS25 Series, visit **www.intel.com/go/raid**

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL® PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER, AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. UNLESS OTHERWISE AGREED IN WRITING BY INTEL, THE INTEL PRODUCTS ARE NOT DESIGNED NOR INTENDED FOR ANY APPLICATION IN WHICH THE FAILURE OF THE INTEL PRODUCT COULD CREATE A SITUATION WHERE PERSONAL INJURY OR DEATH MAY OCCUR.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined." Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information.

Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit http://www.intel.com/performance/resources/limits.htm or call (U.S.) 1-800-628-8686 or 1-916-356-3104.

The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request. Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order. Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or by visiting Intel's Web site at www.intel.com.

Copyright © 2011 Intel Corporation. All rights reserved. Intel, the Intel logo, and Xeon are trademarks of Intel Corporation in the U.S. and other countries.

*Other names and brands may be claimed as the property of others.

Printed in USA 07/11/LSI/SJ Please Recycle 325866-001US