



Address the "I/O Blender" of Virtual Server Environments and Virtual Desktop Infrastructure

RAID matters. Rely on Intel® RAID.



RAID with SSD cache and cache management software helps efficient use of virtual server storage

The I/O Challenge of Virtual Servers and Virtual Desktop Infrastructure

Adoption of server virtualization has been growing in popularity, with nearly 70 percent of U.S. companies that have either implemented or are currently implementing the technology¹. Similarly, Virtual Desktop Infrastructure (VDI) is growing in popularity.

While server virtualization and VDI have numerous advantages – reduced TCO and server count, greater business continuity and efficiency, and more – they also face performance challenges. Since virtual solutions involve multiple workloads communicating with the same physical hard drives simultaneously, sequential I/O requests are “blended” together to effectively become random I/O requests. This increases the disk head movement required for each Read or Write, which creates more latency. Plus, it often prevents virtual storage environments from taking advantage of features like pre-fetching, requiring greater performance from the storage system to meet IOPs goals.

Popular Ways to Lessen the I/O Blender

The I/O blender effect is commonplace in nearly all virtual environments, and some organizations attempt to resolve this issue by tactically using high speed caching devices and solid-state drives (SSDs) in conjuncture with their existing storage arrays. This combination delivers high performance storage resources directly to where the application resides in the hypervisor. While this can alleviate I/O inefficiencies, it increases human resource requirements as it places additional responsibilities on storage and application administrators. In this environment, administrators frequently need to analyze data I/O trends and make decisions about what database tables or application files need to be loaded into cache.

To alleviate these extra administrative requirements, virtual server and storage administrators typically stretch their budgets further by investing in cache management software. This software can have high startup costs, but once optimized, it automates data placement into cache, which helps ensure that performance will remain consistent even when I/O data patterns change. The worst case is that many organizations cannot afford this complex and budget-stretching alternative, so they don't address the I/O issue and their solutions do not perform to expectations.

The Intel® RAID SSD Cache Controller RCS25ZB040 Alternative

The Intel® RAID SSD Cache Controller RCS25ZB040 provides a cost-effective and simple solution that addresses the I/O blender effect in virtual servers and VDI environments. Powered by LSI* Nytro MegaRAID technology, the Intel RCS25ZB040 accelerates performance with near “plug and play” intelligent caching technology, which offers low latency and high I/O performance that is streamlined. The approach is similar to using high-speed caching devices. In a virtual server or VDI environment, Write I/Os pass through the cache and are sequenced for optimal transition to hard disk-based arrays. Read I/Os of frequently accessed information are served directly from the SSD cache for much higher performance than would be possible from hard-drives only.

In addition, the Intel RCS25ZB040 allows the server CPU to focus on the application, rather than flash management. Overall, this makes a much better IOPs per dollar investment.



- High-speed flash performance with RAID data protection
- Advanced capabilities that are simple to use
- Optimized flash use for both Reads and Writes
- Flash memory can be partitioned for OS installation and RAID cache

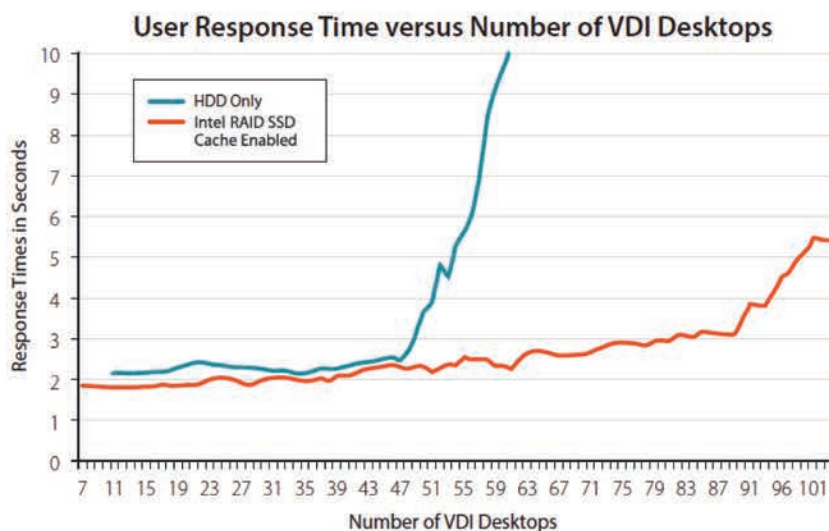
Example of VDI Performance and Cost Improvement

The Intel RCS25ZB040 can nearly double the number of desktops a server can support, while still providing short response times.

To demonstrate this, the power and capability of the Intel RCS25ZB040 in a virtualized environment, a Login Virtual Session Indexer* (Login VSI) was used to generate a load of up to 100 VDI sessions using VMware View and response times were measured with a standard RAID add-in card and then again with the Intel RCS25ZB040 installed. Login VSI is a vendor-independent industry standard benchmarking tool that measures the performance and scalability of centralized desktop environments like VDI. For the solution with a standard RAID add-in card, response times exceeded 5 seconds after 54 desktop sessions were simulated. By repeating the test with Intel RCS25ZB040, this same 5 second time constraint was not reached until reaching 95 desktop sessions.

Decrease the Cost per VDI Desktop Session

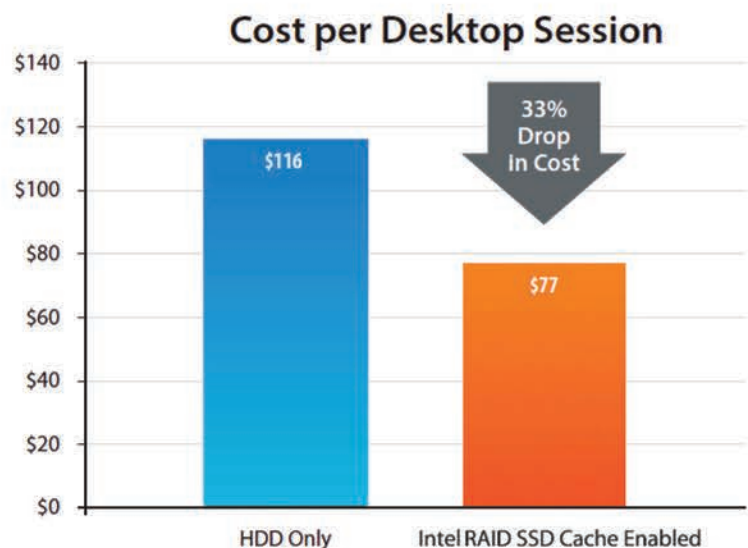
Using the performance results described here, cost analysis shows that the Intel RCS25ZB040 results in a 34 percent lower cost per virtual desktop. See Table 1 for the cost breakdown for both configurations. Systems with the SSD Cache enabled were able to achieve a cost per virtual desktop of \$77, compared to \$116 for each virtual desktop in systems without the controller².



The preceding graph provides additional insight into the measured results. Desktop sessions above 54 resulted in the user's response time exceeding five seconds when only using HDDs (blue line). The response time for the system with Intel® RAID SSD Cache enabled did not exceed five seconds until after 95 sessions (red line).

Table 1 - Cost breakdown of tested configurations

Maximum Desktops	HDD Only		Intel RAID SSD Cache Enabled	
	Total	Per Desktop	Total	Per Desktop
System	\$1661	\$30	\$1661	\$18
RAM	\$550	\$10	\$550	\$6
CPU	\$2130	\$38	\$2130	\$22
HDD	\$1501	\$26	\$1501	\$16
RAID Card	\$672	\$12	\$0	\$0
Intel RCS25ZB040	\$0	\$0	\$1460	\$15
Total	\$6514	\$116	\$7302	\$77



Intel® RAID SSD Cache Controller RCS25ZB040

Alleviate the I/O Blender Effect and Significantly Improve Performance

As more and more storage environments become virtualized, an easy and cost-effective way to reduce the latency caused by the I/O blender effect is through the use of the Intel RAID SSD Cache Controller RCS25ZB040. It allows for I/O traffic to be better sequenced with many Read I/Os being serviced directly from cache. The Intel RCS25ZB040 replaces standard RAID add-in card and is configurable in the same, short amount of time as a standard RAID card.

For quick reference, the key features and benefits of the Intel® RCS25ZB040 are listed below. Detailed information including a Hardware Guide and in-depth Technical Specifications are available at the Intel web site listed near the bottom of this page. To make Intel RAID SSD Cache Controller RCS25ZB040 part of your server environment, please contact an Intel® Channel Partner Program participant.

- **High-speed flash performance with RAID data protection.** Up to 1TB of flash significantly enhances the performance of many mainstream applications and a powerful LSI* SAS2208 ROC manages high-speed transactions and data protection.
- **Advanced capabilities that are simple to use.** Built-in caching algorithms manage data transfer to and from the flash pool without the need for special code, intimate application data structure knowledge, or time spent understanding configuration complexities.
- **Optimized flash use for both Reads and Writes.** Many competing flash caching technologies are limited to Read use and do not allow for Write capability. Writes can be mirrored to help protect against data loss prior to the data being written to the designated RAID array.
- **Flash memory can be partitioned for OS installation and RAID cache.** The embedded flash can be partitioned such that a portion of it is usable by the Operating System; while the remainder is utilized as cache to accelerate performance.



Intel RCS25ZB040 Overview:

RAID Levels and Spans	RAID Levels 0, 1, 5, 10, 50, 60
Data Protection Feature Highlights	Featuring both 256 GB and 1TB models. Each has LSI SAS2208 ROC that manages high speed transactions and MegaRAID* data protection. Plus, it features single controller multipathing (failover), enclosure management, background consistency checking and S.M.A.R.T. Support.
Operating System	Extensive support includes Microsoft* Windows* Vista/2008/Server 2003/2000/XP, Linux*, Solaris*(x86), Netware*, FreeBSD*, VMware* and more.* Visit intel.com for the most complete list of supported operating systems

Order Codes		
RAID Card with 256GB SSD Cache: RCS25ZB040	RAID Card with 1TB SSD Cache: RCS25ZB040LX	RAID Expander (for >4 hard drives): RES2SV240

For more information on the Intel® RAID Cache Controller RCS25ZB040 and other Intel® RAID products, visit: www.intel.com/go/RAID

1 - Study on virtualization by O+K Research and Kaspersky Labs

2 - Cost calculations are based on hardware costs only. Neither licensing cost benefits nor other non-hardware TCO benefits are accounted for.

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