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Measuring Performance that Matters to End-Users

Adaptec Unified Serial™ RAID 31605 vs. 3ware 9650SE

Contents

There are two ways to measure the performance of a controller: in a lab environment where the highest numbers are achieved under ideal conditions, or in a lab environment that reflects the actual workload the controller will need to handle.

While "ideal" numbers are good for press releases and headlines, they don't provide the information that helps customers know how a controller will actually perform in their environment. The disconnect between the vendor goal of achieving bragging rights with the highest possible numbers and the customer goal of achieving the best performance in a particular environment often leads to the customer being unhappily surprised by performance after installation.

Adaptec is committed to real-world workload testing, where the results allow customers to get a realistic measurement of how controllers will perform in their business conditions.

How Real-World Testing Works

Workload traces of storage systems deployed as various applications servers show that the lion's share of transactions are small transfer sizes. This is due to the fact that most current operating systems have virtual memory subsystems composed of pages that are either 4KB or 8KB in size. When servers and workstations are servicing multiple clients or users, the workload becomes essentially random in all but the most specific application environments.

> Adaptec is committed to real-world workload testing, where the results allow customers to get a realistic measurement of how controllers will perform in their business conditions.

The table below shows the workload characteristics that are the foundation of Adaptec real-world testing.

Measurement	IO Characteristic	Typical Applications
Online Transaction Processing	Small transfer sizes (2KB-16KB), random in nature with two reads for every write. Large number of concurrent request	Databases (SAP, Oracle, SQL), Email, Decision Support.
File Server	Requests fall between 4-64KB in size primarily random as multiple users are being serviced with a fair amount of concurrency	File Servers, Print Servers,
Web Server	Generally random IO which varies widely in size and is applied with a high number of concurrent accesses.	Web Services, Search Engines, RSS Feeds, Blogs, etc.
Workstation	Primarily small to medium requests with a 4:1 read to write ratio, with 80% of the requests being sequential with 20% random IO interspersed.	Business Productivity, CAD/CAM, Scientific and Engineering Applications

Table 1.

Real-World Testing: 16-Drive RAID 5 Workloads

In capacity-sensitive environments, RAID 5 is often deployed. RAID 5 makes efficient use of the available disk space while still providing excellent performance and good data availability even with the loss of a single drive. The following chart shows the performance of the Adaptec RAID 31605 and 3ware 9650SE to be competitive for servicing application workloads.
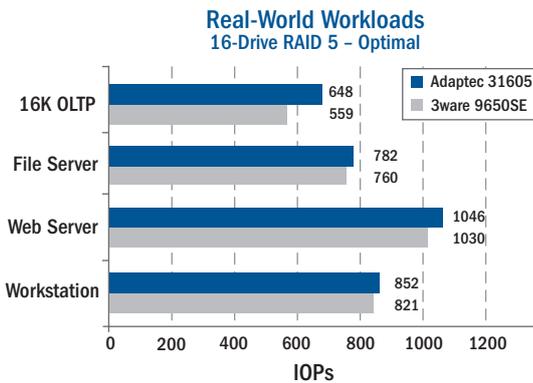
Real-World Workloads
16-Drive RAID 5 – Optimal

	Adaptec 31605	3ware 9650SE
16K OLTP	648	559
File Server	782	760
Web Server	1046	1030
Workstation	852	821

IOPs

Figure 1.

Real-World Workloads
16-Drive RAID 6 – Optimal

	Adaptec 31605	3ware 9650SE
16K OLTP	468	432
File Server	672	560
Web Server	1061	1030
Workstation	658	654

IOPs

Figure 2.

Figure 1 above shows the Adaptec 31605 against the 3ware 9650SE-16ML configured as a 16-drive RAID 5. In all four workloads – online transaction processing, file server, web server and workstation – Adaptec has the performance edge over 3ware.

> Adaptec has the performance edge over 3ware with RAID 5.

Real-World Testing: 16-Drive RAID 6 Workloads and Array Rebuild

If data availability is key to your business, RAID 6 offers 10,000 times the mean time to data loss (MTTDL) of an equivalently configured RAID 5. Users who want to keep their data safe choose RAID 6 because it allows for the data store to service IO even if the array sustains the simultaneous loss of up to two drives. The most probable situation, however, is that a single drive has failed and that array will be running in a sub-optimal state. In this state, the Adaptec RAID 31605 still provides high-performance service of user requests while simultaneously restoring the array to a fully protected state by doing a rebuild in the background.

The following chart shows the Adaptec 31605 Unified Serial RAID Controller measured against the 3ware 9650SE in a 16-drive RAID 6 configuration.
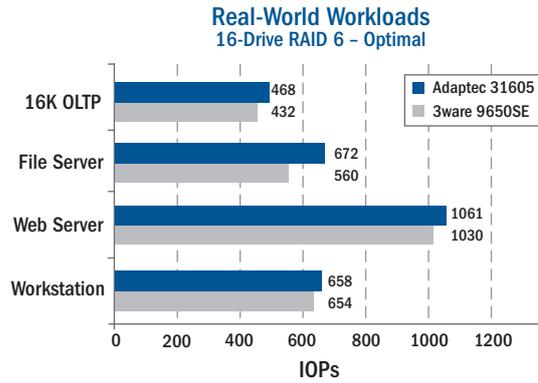
Figure 2 above shows the Adaptec 31605 against the 3ware 9650SE-16ML configured as a 16-drive RAID 6. In all four workloads – online transaction processing, file server, web server and workstation – Adaptec has the performance edge over 3ware.

> Adaptec has the performance edge over 3ware with RAID 6.

Not only does the Adaptec Unified RAID controller perform well under real-world workloads, it will also return the array to an optimal state three times as fast as the 3ware 9650SE.
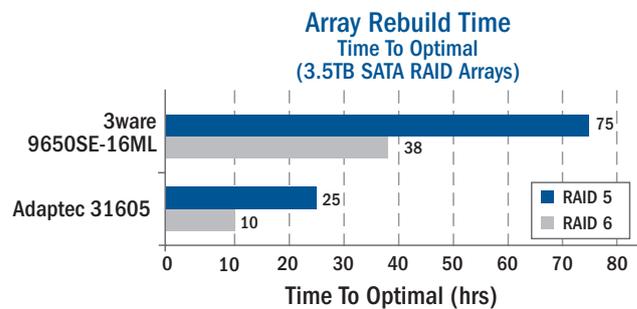
Array Rebuild Time
Time To Optimal
(3.5TB SATA RAID Arrays)

	RAID 5	RAID 6
3ware 9650SE-16ML	75	38
Adaptec 31605	25	10

Time To Optimal (hrs)

Figure 3.

This chart shows the time it takes to reconstruct an array suffering from a single drive loss and still servicing user file server requests. The testing used a 3.5TB array composed of 16 250GB SATA disks configured as RAID 5 and RAID 6. The applied workload was a file server workload with 32 outstanding requests measured using IOmeter. 3ware took nearly three days to repair a RAID 6 array, and over a day to repair a RAID 5 array when under a file server workload. Adaptec was three times as fast as 3ware. The longer the array is in a sub-optimal state, the more likely the array is to experience a second drive failure, increasing exposure to total data loss.

> The Adaptec 31605 will return the array to an optimal state **three times as fast** as the 3ware 9650SE.

The Adaptec RAID 31605

Adaptec RAID has been specifically tuned to enhance the performance of servers for the most common storage environments deployed today. As we have seen in this paper, this tuning enables Adaptec Unified Serial RAID controllers to accelerate the performance that matters most to end-users.

The Adaptec RAID 31605 also integrates Unified Serial technology that allows you to leverage low-cost, high-capacity Serial ATA (SATA) drives immediately. Unified Serial technology also provides the option to migrate to Serial Attached SCSI (SAS) later, simply by swapping out the drives.

> Adaptec Unified Serial Architecture allows the use of both SATA and SAS drives in a single storage solution for optimised use of capacity and performance.

If capacity or performance needs go beyond 16 drives, it's easy to expand the Adaptec RAID 31605. The infrastructure allows up to 128 SATA and/or SAS targets while the 3ware 9650SE can attach only a maximum of 16 drives.

Even higher performance and reliability can be achieved by using SAS drives instead of nearline or enterprise SATA disks. While the cost per GB is higher than SATA, SAS drives can provide nearly three times the transaction performance.

Testing Configuration

The following table details the configuration used in the testing.

System Test Disclosure			
Operating System	Microsoft Windows 2003 Server 64-Bit Edition (Service Pack 2)		
Motherboard	Intel S5000XVN		
Processor	Intel Xeon 5160 (3.0 GHz)		
Memory Configuration	2GB 667MHz 72-Bit ECC Registered FBDIMM		
Hard Drives	Seagate ST3250624NS (250GB 7200 RPM Nearline Storage) Firmware 3.AEH		
Array Configurations	16-Drive RAID 6 Arrays, 64KB Stripe in Write-Back Mode		
Test Tool	IOmeter Build 2004.07.30		
Controllers	**Adaptec 31605**		**3ware 9650SE-16ML**
Firmware	Build 10518		FE 9X 3.08.02.005
BIOS	Build 10518		BE 9X 3.08.00.002
Driver	Storport 5.2.0.10518		3.00.02.090

Table 2

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