Subsystem Performance Testing Report for

EonStor® DS S16F-G1840-4

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1. Performance Configuration

Below is a description of the benchmarking testing environment and includes specifications for the server hardware, disk drive, subsystem, management tools of the subsystem and the software-testing tool. The industry standard test application IOMeter was used to measure the performance of the unit. This system comes with the standard Infortrend management software SANWatch®. Telnet and RS-232 connections can be used to manage the subsystem as well.

1.1 Testing Configuration

RAID	Controller	DSS16F-G1840-4
	FW	3.85A.10 (FA385A10_122_IFT_ESDSG6S3G.BIN)
	RAM	2GB DDR II SDRAM
	Drives	RAID: Hitachi SAS 450GB (Model: HITACHI HUS156045VLS600; Capacity: 450GB; Speed: 3G; 15000 RPM) JBOD: Hitachi SAS 450GB (Model: HITACHI HUS156045VLS600; Capacity: 450GB; Speed: 3G; 15000 RPM)
	Channels	Host Channel - Channel 0, 1, 2 ,3
		Drive Channel - Channel 4
	Virtual Volumes (LD RAID5 / 6) (Dual Hosts)	LV0 - Host channel 0; ID 112; LUN 0; 16 drives/channel; 1 partition
		LV1 - Host channel 1; ID 112; LUN 0; 16 drives/channel; 1 partition
	All Cache Virtual Volumes (LD RAID5 / 6) (Four Hosts)	LV0 - Host channel 0; ID 112; LUN 0; 8 drives/channel; 1 partition
		LV1 - Host channel 1; ID 112; LUN 0; 8 drives/channel; 1 partition
		LV2 - Host channel 2; ID 112; LUN 0; 8 drives/channel; 1 partition
		LV3 - Host channel 3; ID 112; LUN 0; 8 drives/channel; 1 partition
	Setting	Optimization for – Sequential, (Raid 5 / 6 Default stripe size 128K)
		Periodic Drive Check Time – Disable

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		Periodic SAF-TE and SES Device Check Time – Disable
		Verification on Normal Drive Writes – Disable
		Verification on LD Rebuild Writes – Disable
		Max Drive Response Timeout – Disable
		Drive Delayed Write – Enable
		SDRAM ECC – Enable
		BBU – ON
Data Service	Snapshot Copy on Write	V.V Size : 100GB Virtual Volume 1 : Host channel 0; ID 112; LUN 0 Virtual Volume 2 : Host channel 1; ID 112; LUN 0
	Split mirror	V.V Size: 100GB (Source) Virtual Volume 1 : Host channel 0; ID 112; LUN 0 (Target) Virtual Volume 2
Software	SANWatch	SANWatch_1.3.k.04
Server*2 (Host)	M/B	SUPERMICRO X7DBE Single
	CPU	Intel Quad-Core Xeon 2.0GHz
	RAM	Kingston 2GB DDRII 667 DIMM * 8
	PCI	PCI-X 64-bit/133MHz *3
	System Drive	IDE Seagate 120G (ST3120026A)
	OS.	Microsoft Windows Server 2003 Enterprise Edition R2 (With Service Pack 2)
HBA	OS Register	MaximumSGList : FF (Hexadecimal) NumberOfRequests: FF (Hexadecimal)
	QLogic	QLE2562 , BIOS VER: 2.02 ; Driver VER: 9.17.18
Benchmark	IOmeter	2004.07.30
	I/O Tool Setting	Outstanding I/O - 16 for MB/s; (Random - 256 for IO/s , Sequential - 64 for IO/s)
		Ramp Up Time: 40 sec.
		Run Time: 30 sec.
		One LD Corresponds to One Worker.
		All Cache : Maximum Disk Size 10240
		Align I/Os on

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2. Performance Test Results

The Performance test results are listed below.

 **NOTE:**

1. In the following sections, “write-back” is abbreviated as **WB** and “write-through” is abbreviated as **WT**.
2. End-to-End four-channel IOPS Read having a lower performance than dual-channel configuration is a known issue, and will be resolved in the coming release of firmware.

2.1 End-to-End RAID 5 Performance

2.11 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)	WT (MB/sec)
Host Channels	**I/O Size**			
Dual Channel	128K Bytes	1074.65	797.41	273.93
	256K Bytes	1081.19	711.28	396.39
	512K Bytes	1083.42	794.73	577.86
	1M Bytes	1050.18	722.10	614.22

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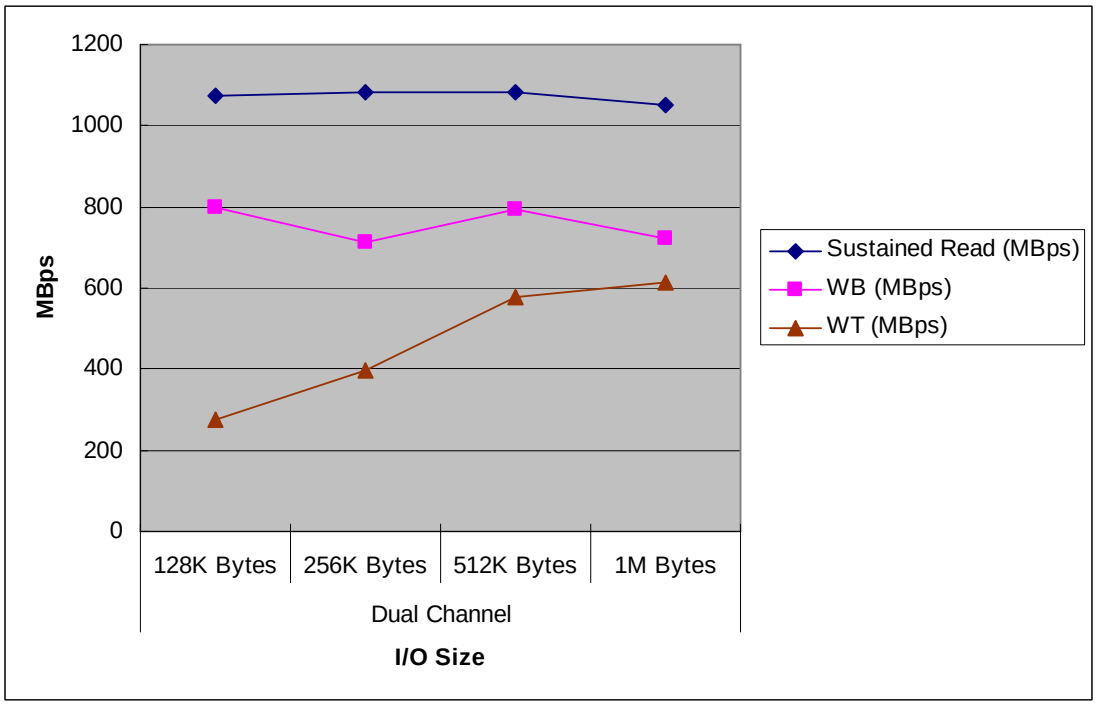

Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Dual Channel	512 Bytes	71381.33	52028.24
	4K Bytes	58773.50	42100.48

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2.12 Random I/O

>> Dual Channel

Data Transfer Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Dual Channel	512 Bytes	9769.39	4117.22
	4K Bytes	9773.06	4125.33

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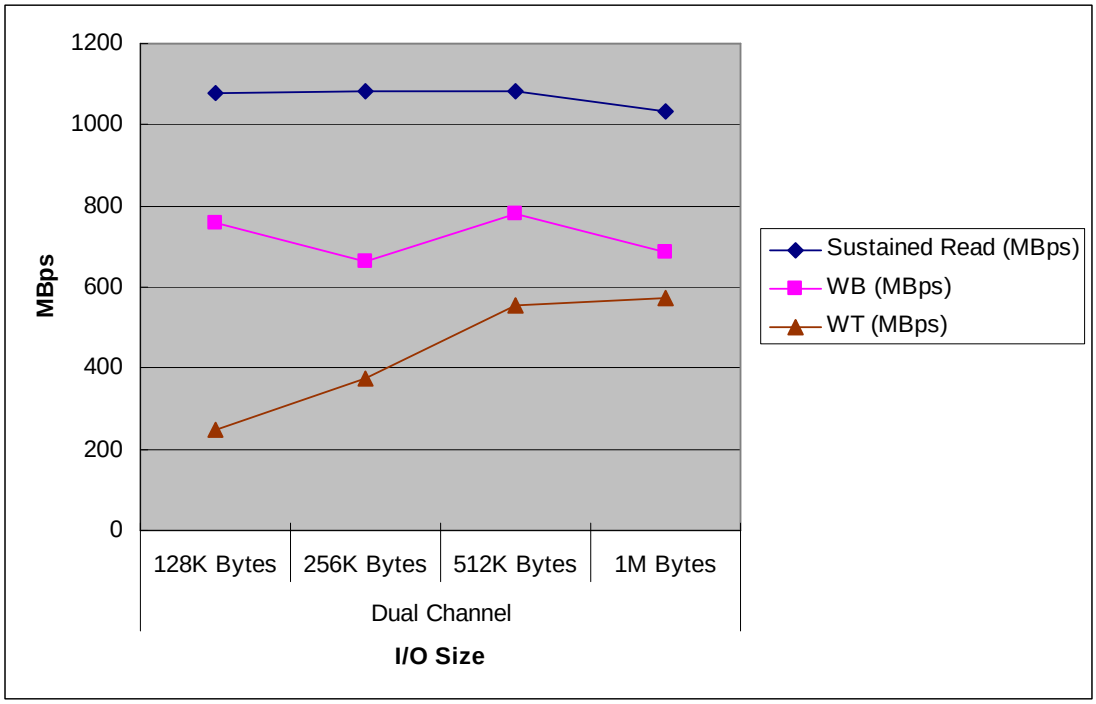
2.2 End-to-End RAID 6 Performance

2.21 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)	WT (MB/sec)
Host Channels	I/O Size			
Dual Channel	128K Bytes	1078.57	759.28	249.82
	256K Bytes	1082.08	665.02	376.25
	512K Bytes	1083.09	778.83	554.29
	1M Bytes	1033.80	687.15	574.05



Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Dual Channel	512 Bytes	71338.64	51409.66
	4K Bytes	58711.80	41292.00

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2.22 Random I/O

>> Dual Channel

Data Transfer Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Dual Channel	512 Bytes	9691.40	2843.94
	4K Bytes	9724.64	2856.72

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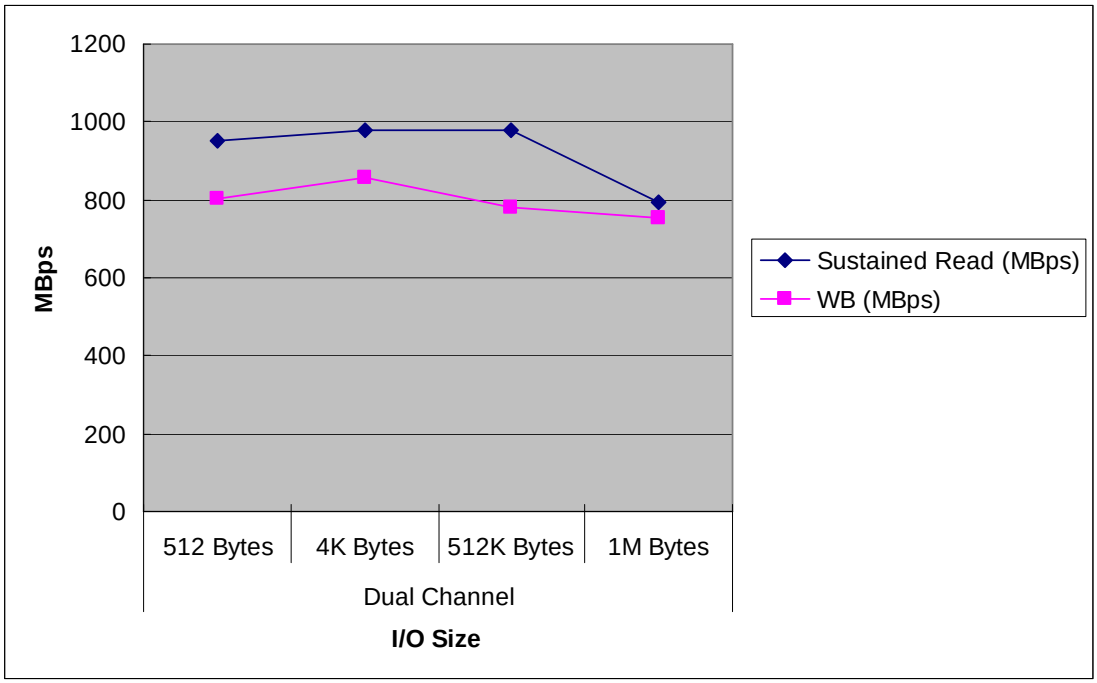
2.3 Degraded RAID 5 Performance

2.31 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	953.30	803.91
	256K Bytes	977.76	856.33
	512K Bytes	980.12	782.00
	1M Bytes	792.53	753.27



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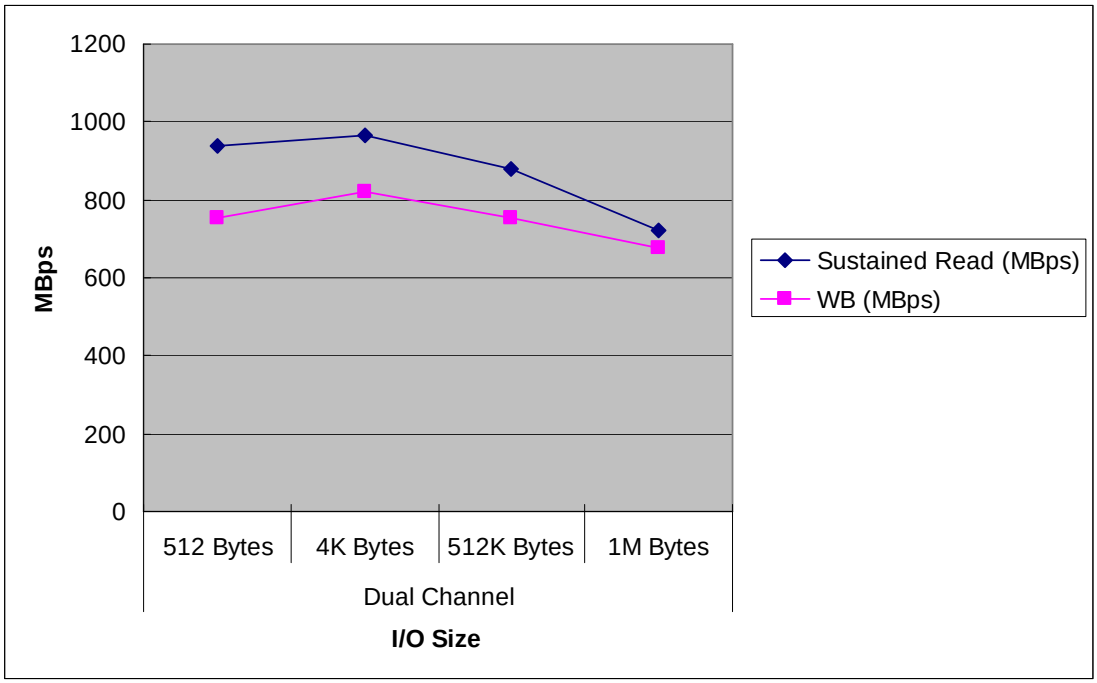
2.4 Degraded RAID 6 Performance

2.41 Sequential I/O – 1 Drive Failed

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	936.87	752.56
	256K Bytes	966.88	819.50
	512K Bytes	881.58	754.63
	1M Bytes	723.53	677.63



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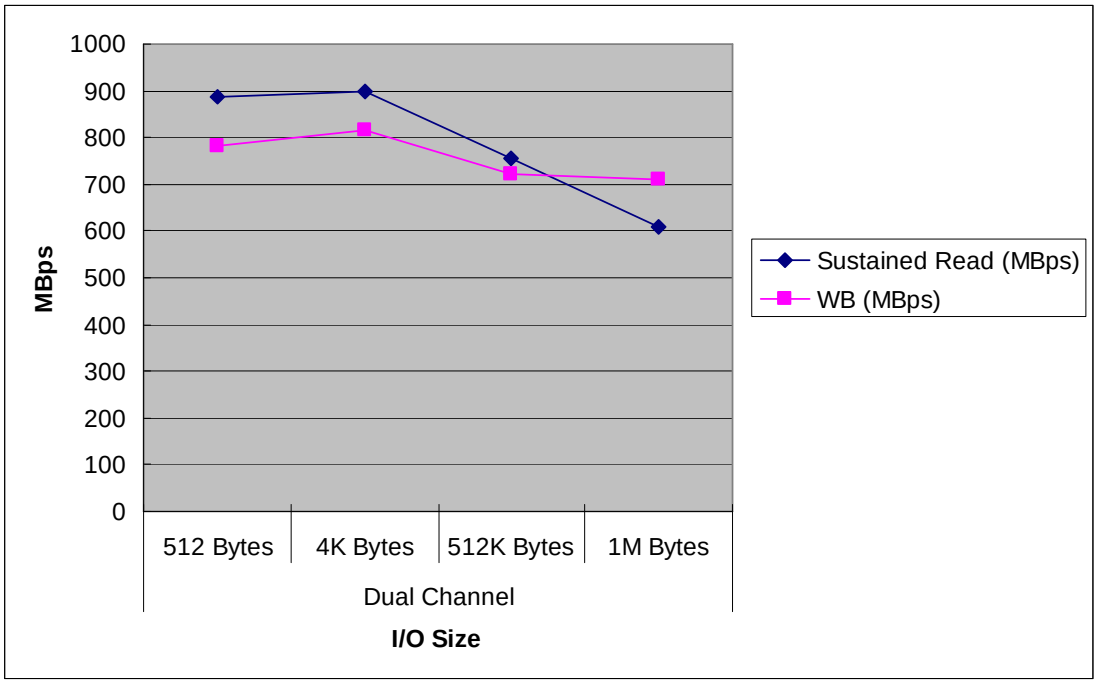
2.42 Sequential I/O – 2 Drives Failed

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	886.78	783.52
	256K Bytes	897.80	816.74
	512K Bytes	755.53	721.46
	1M Bytes	608.85	709.42



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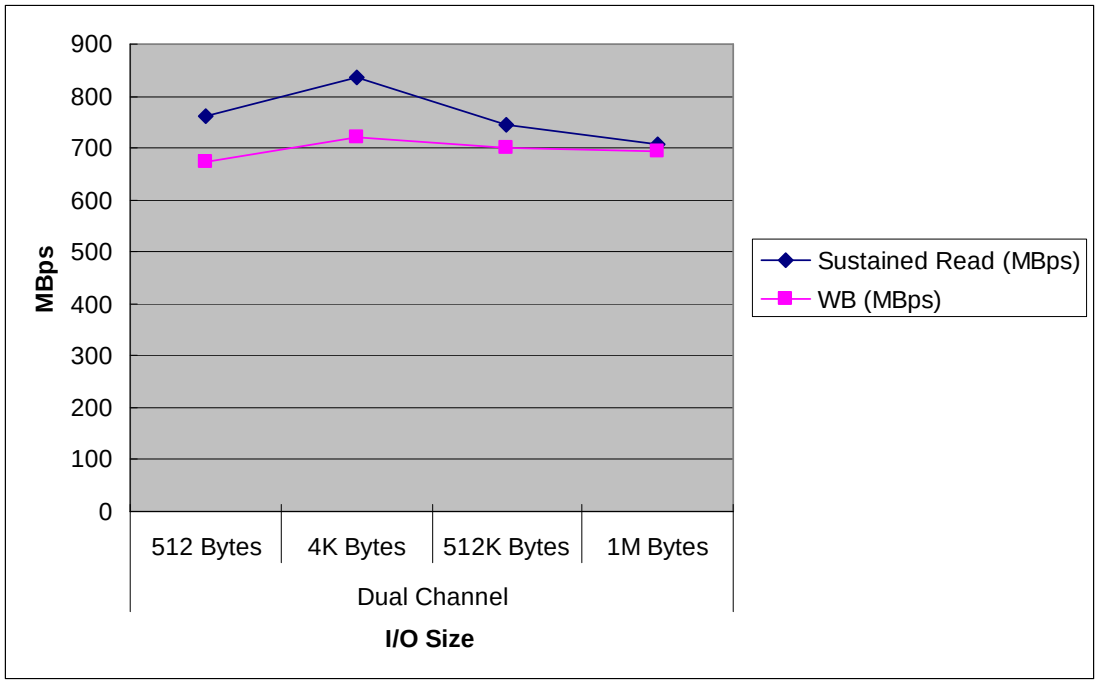
2.5 Rebuilding RAID 5 Performance

2.51 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	762.87	674.30
	256K Bytes	834.63	722.16
	512K Bytes	743.28	700.13
	1M Bytes	708.36	692.27



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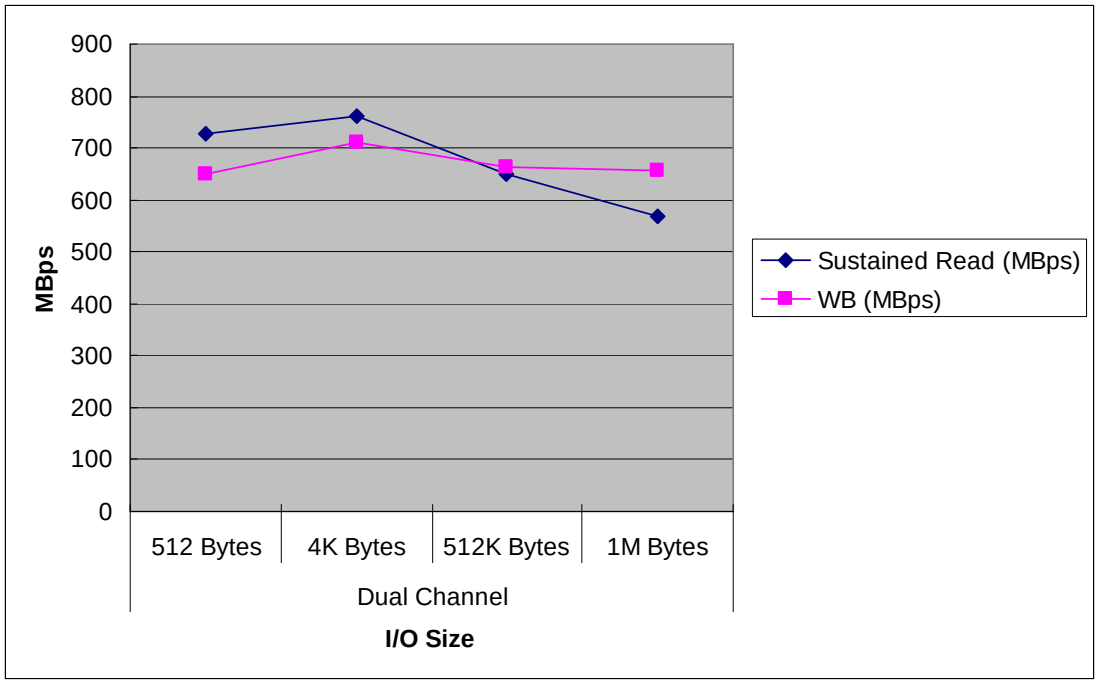
2.6 Rebuilding RAID 6 Performance

2.61 Sequential I/O – 2 Drives Rebuilding

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	727.13	648.89
	256K Bytes	762.82	711.54
	512K Bytes	650.29	664.38
	1M Bytes	567.34	656.72



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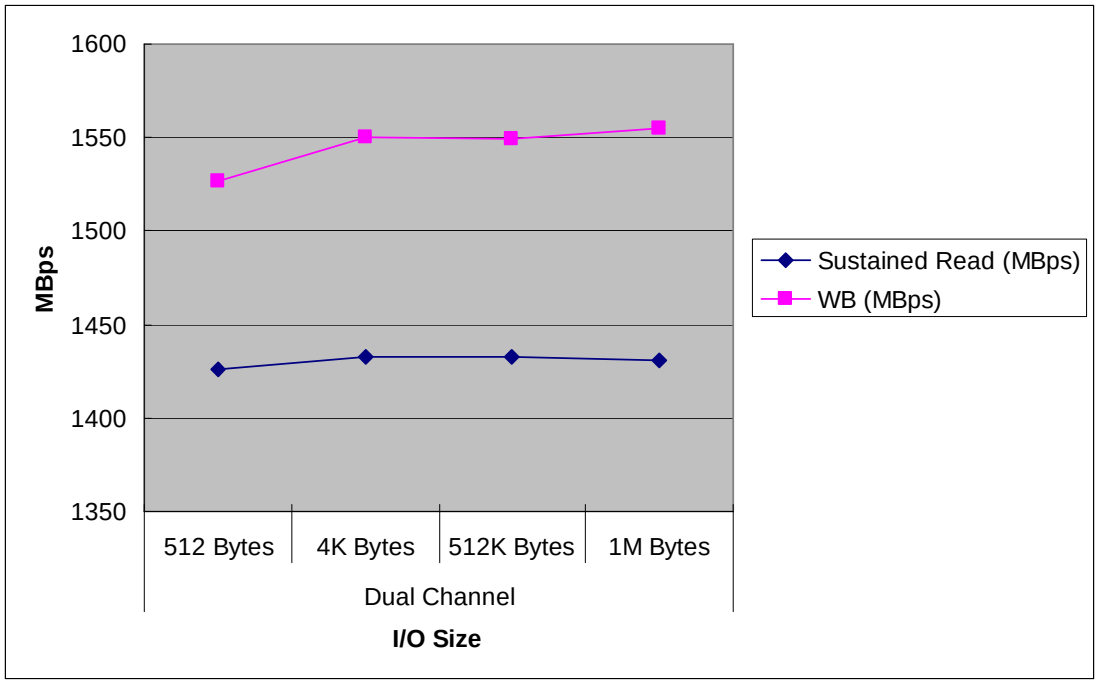
2.7 All Cache Hit RAID 5 Performance

2.71 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1426.58	1526.60
	256K Bytes	1432.25	1550.49
	512K Bytes	1432.45	1549.48
	1M Bytes	1431.16	1555.26



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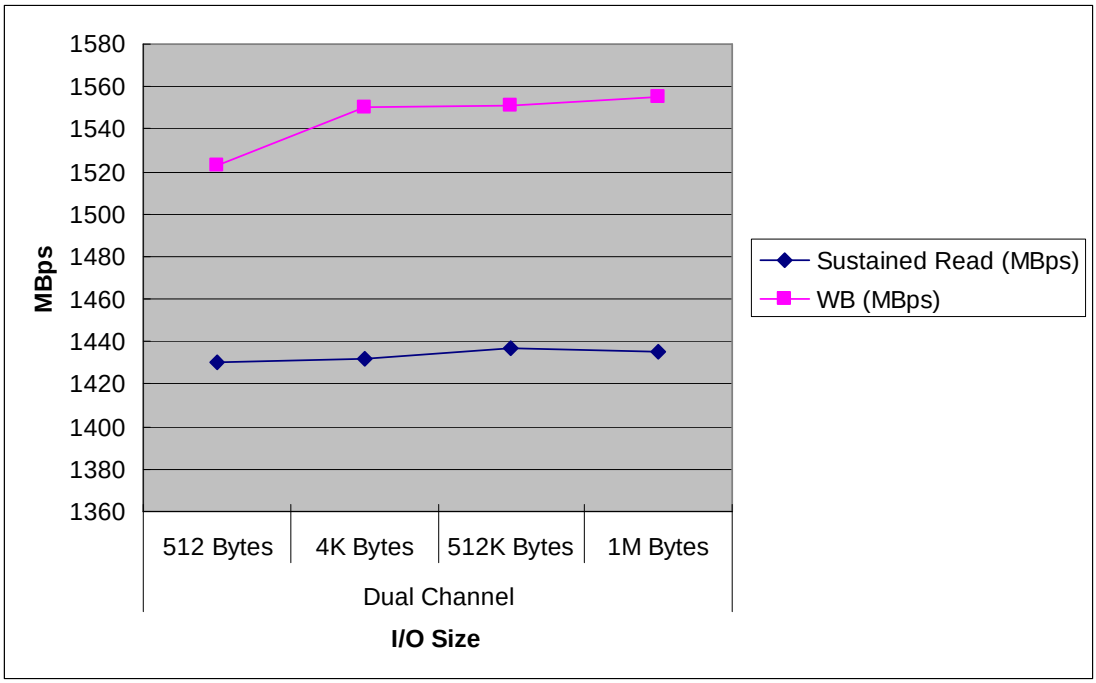
2.8 All Cache Hit RAID 6 Performance

2.81 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1430.43	1523.04
	256K Bytes	1432.12	1550.50
	512K Bytes	1437.07	1550.82
	1M Bytes	1435.05	1555.24



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3. Performance Test Results with Data Service enable

3.1 Snapshot Copy-on-Write End-to-End RAID 5 Performance

3.11 Sequential I/O

>> Dual Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Dual Channel	1M Bytes	1018.49	1018.49	1758.57	1758.57

3.12 Random I/O

>> Dual Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Dual Channel	8k Bytes	2199.73	17.19	231.08	1.81

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Dual Channel	8K Bytes	521.74	4.08

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3.2 Split Mirror End-to-End RAID 5 Performance (Source to 1 Target)

3.21 Sequential I/O

>> One Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
One Channel	1M Bytes	776.12	776.12	315.06	315.06

3.22 Random I/O

>> One Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
One Channel	8k Bytes	4544.89	35.51	1611.95	12.59

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	2867.71	22.40

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3.3 Split Mirror End-to-End RAID 5 Performance (Source to 2 Targets)

3.31 Sequential I/O

>> One Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
One Channel	1M Bytes	773.33	773.33	195.06	195.06

3.32 Random I/O

>> One Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
One Channel	8k Bytes	4599.64	35.93	838.03	6.55

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	1897.35	14.82

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3.4 Volume Copy / Virtual Volume Size 100GB / Data Size 10GB

Subsystem	1 Raid
Parameters	1 Source to 1 Target
Finish Time	6 MIin

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