Subsystem Performance Testing Report for

EonStor® DS S16F-R2840-4

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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	DS S16F-R2840-4
	FW	3.85B.08 (FA385B08_222_IFT_ESDSG6S6G.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, 5
		RCC Channel – Channel 6
	Logical Drives (RAID5/6) (Dual Hosts)	LD0 - Host channel 0; AID 112; LUN 0; 16 drives/channel; 1 partition
		LD1 - Host channel 1; BID 113; LUN 0; 16 drives/channel; 1 partition
	Logical Drives (RAID5/6) (Four Hosts)	LD0 - Host channel 0; AID 112; LUN 0; 8 drives/channel; 1 partition
		LD1 - Host channel 0; BID 113; LUN 0; 8 drives/channel; 1 partition
		LD2 - Host channel 1; AID 112; LUN 0; 8 drives/channel; 1 partition

		LD3 - Host channel 1; BID 113; LUN 0; 8 drives/channel; 1 partition
	Logical Drives (RAID5/6) All Cache Hit (Eight Hosts)	LD0 - Host channel 0; AID 112; LUN 0; Host channel 1; AID 112; LUN 0; 8 drives/channel; 1 partition
		LD1 - Host channel 0; BID 113; LUN 0; Host channel 1; BID 113; LUN 0; 8 drives/channel; 1 partition
		LD2 - Host channel 2; AID 112; LUN 0; Host channel 3; AID 112; LUN 0; 8 drives/channel; 1 partition
		LD3 - Host channel 2; BID 113; LUN 0; Host channel 3; BID 113; LUN 0; 8 drives/channel; 1 partition
	Setting	Optimization for – Sequential, (Raid 5 / 6 Default stripe size 128K)
		Periodic Drive Check Time – Disable
		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 – Disable
		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_2.1.a.01.SW_DBFlushAgent_2.0.a.44-20091223_CM_2.0.a.50-20091229
HBA	OS Register	MaximumSGList : FF (Hexadecimal)
		NumberOfRequests: FF (Hexadecimal)
	QLogic	QLE2562 (Driver VER: 9.1.7.18) ,Bios : v2.02
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 R2 (With Service Pack 2)
Bench mark	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

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.

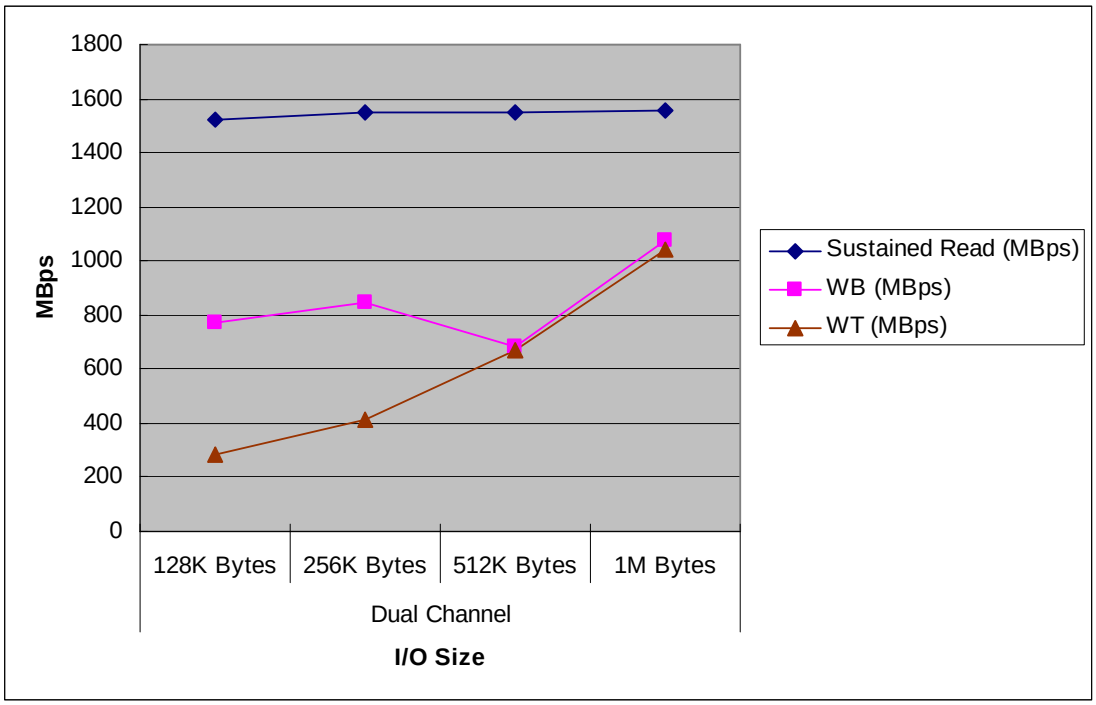
2.1 End-to-End RAID 5 Performance

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	1524.70	769.59	283.88
	256K Bytes	1546.44	842.94	414.59
	512K Bytes	1551.71	681.86	669.88
	1M Bytes	1557.53	1078.53	1041.61



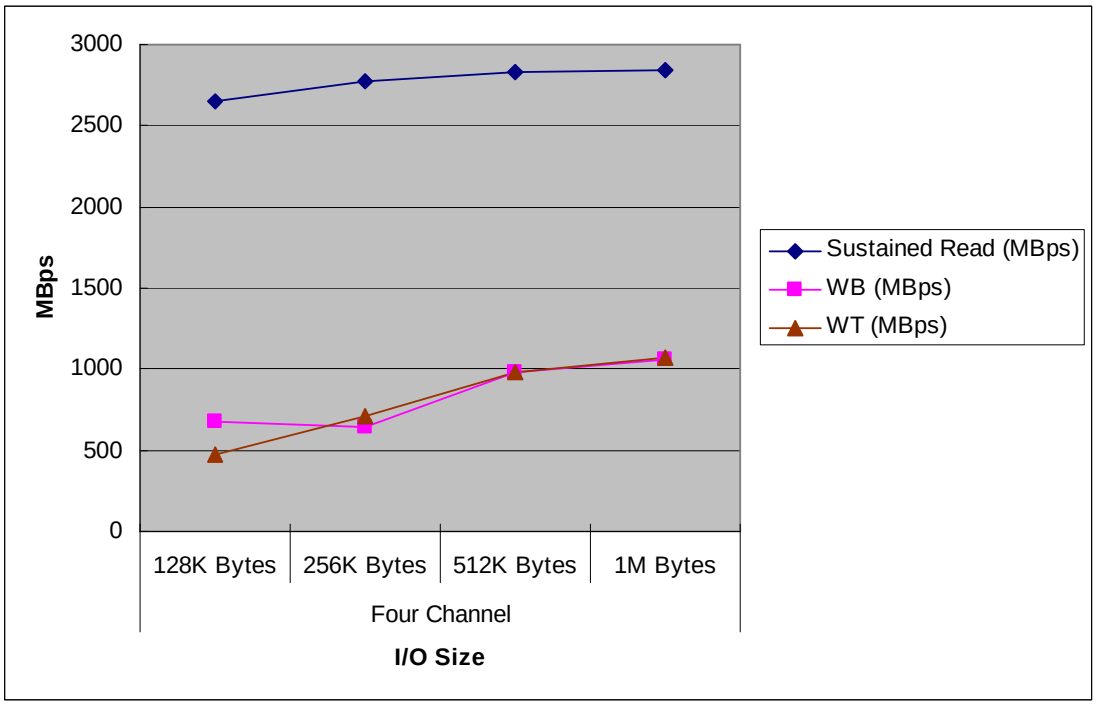
Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Dual Channel	512 Bytes	148363.65	46887.54
	4K Bytes	132487.02	37009.38

>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)	WT (MB/sec)
Host Channels	**I/O Size**			
Four Channel	128K Bytes	2648.59	677.03	472.12
	256K Bytes	2775.64	643.34	714.71
	512K Bytes	2830.72	985.61	978.15
	1M Bytes	2847.46	1062.78	1074.16



Data Access Rate (IOPS)

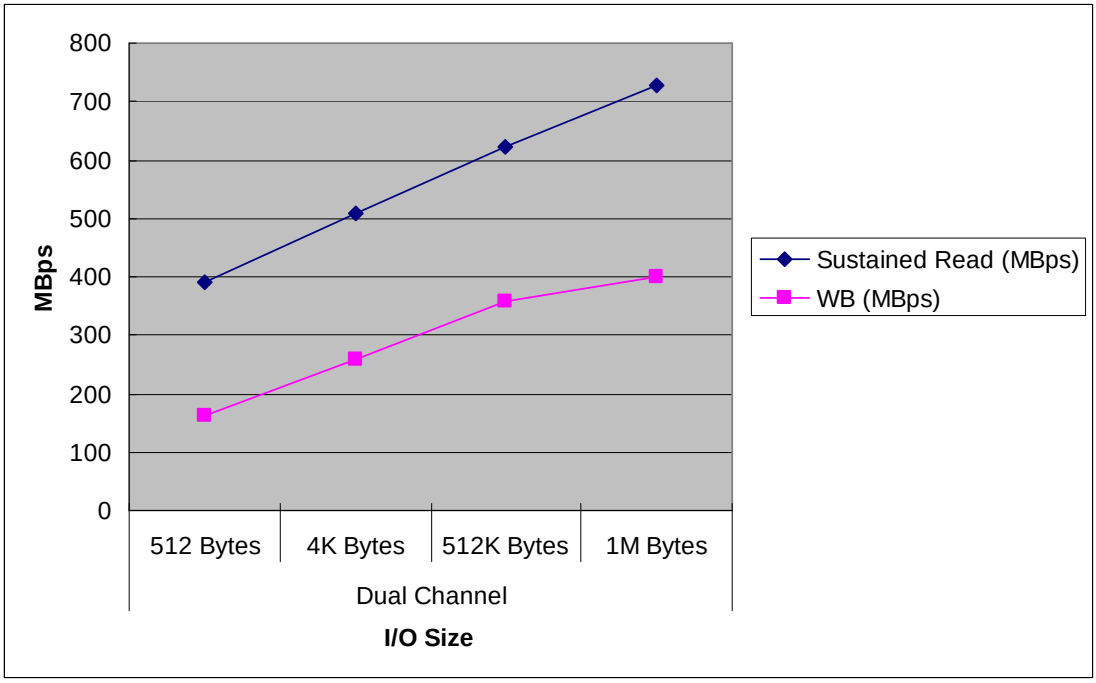
I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Four Channel	512 Bytes	139575.59	54188.53
	4K Bytes	121011.16	40139.02

2.12 Random I/O

>> Dual Channel

Data Transfer Rate (MBps)

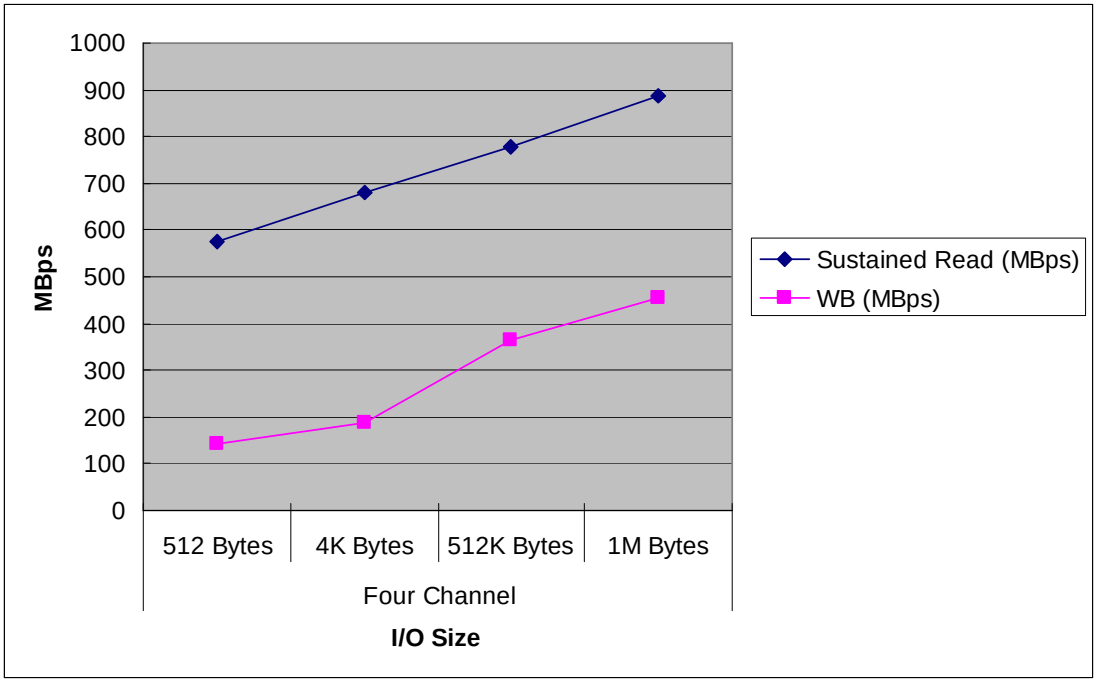
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	391.41	161.26
	256K Bytes	508.73	259.90
	512K Bytes	623.68	358.59
	1M Bytes	728.00	400.01



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	576.70	142.28
	256K Bytes	681.20	189.68
	512K Bytes	777.02	363.31
	1M Bytes	887.25	453.28



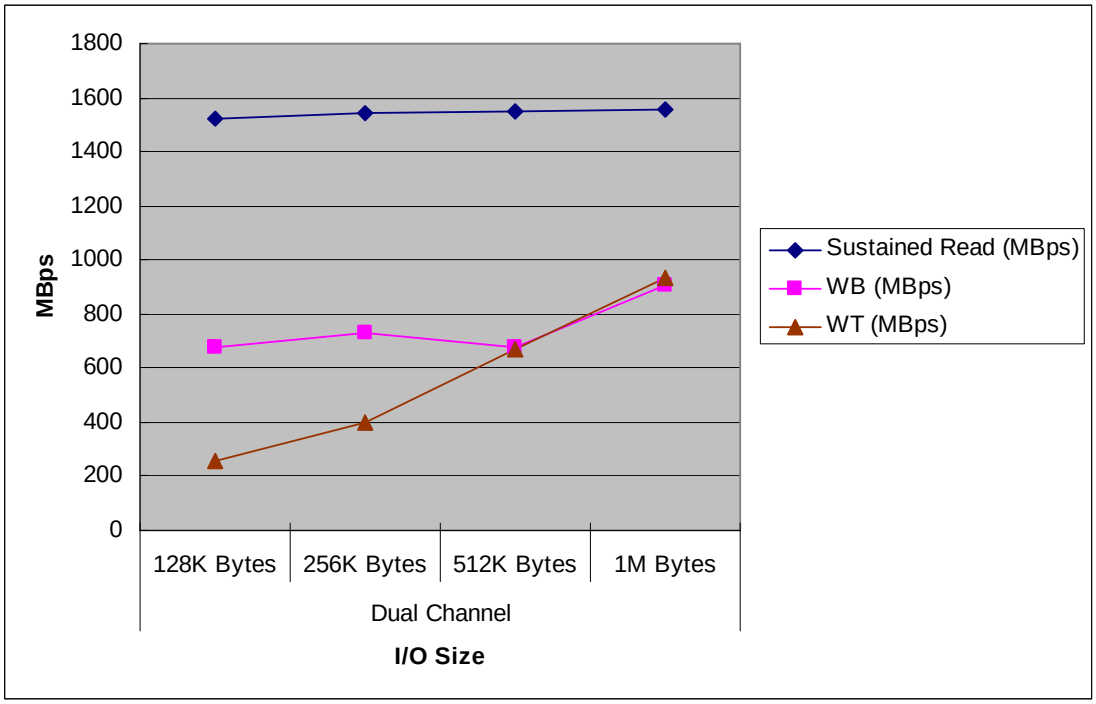
2.2 End-to-End RAID 6 Performance

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	1524.61	675.40	258.15
	256K Bytes	1546.12	727.64	398.72
	512K Bytes	1551.56	674.81	672.69
	1M Bytes	1557.49	909.72	934.13



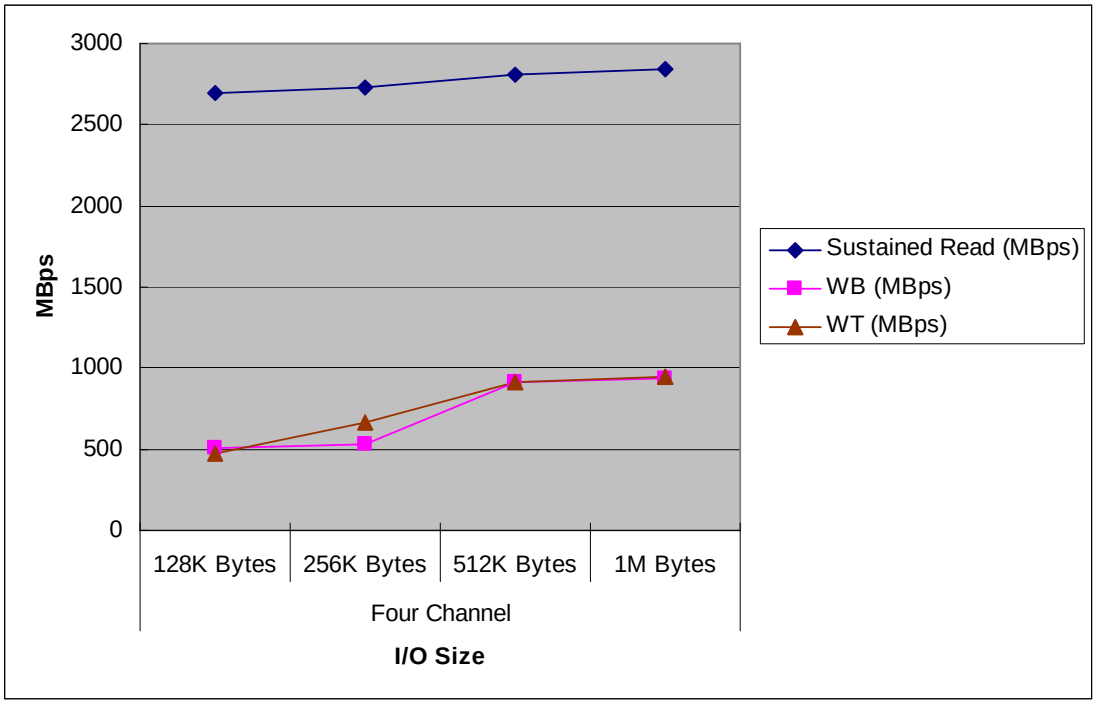
Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Dual Channel	512 Bytes	148281.04	46741.11
	4K Bytes	129059.45	36118.38

>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)	WT (MB/sec)
Host Channels	**I/O Size**			
Four Channel	128K Bytes	2696.79	510.62	476.77
	256K Bytes	2726.86	529.21	663.67
	512K Bytes	2812.80	917.71	912.44
	1M Bytes	2840.84	939.94	942.44



Data Access Rate (IOPS)

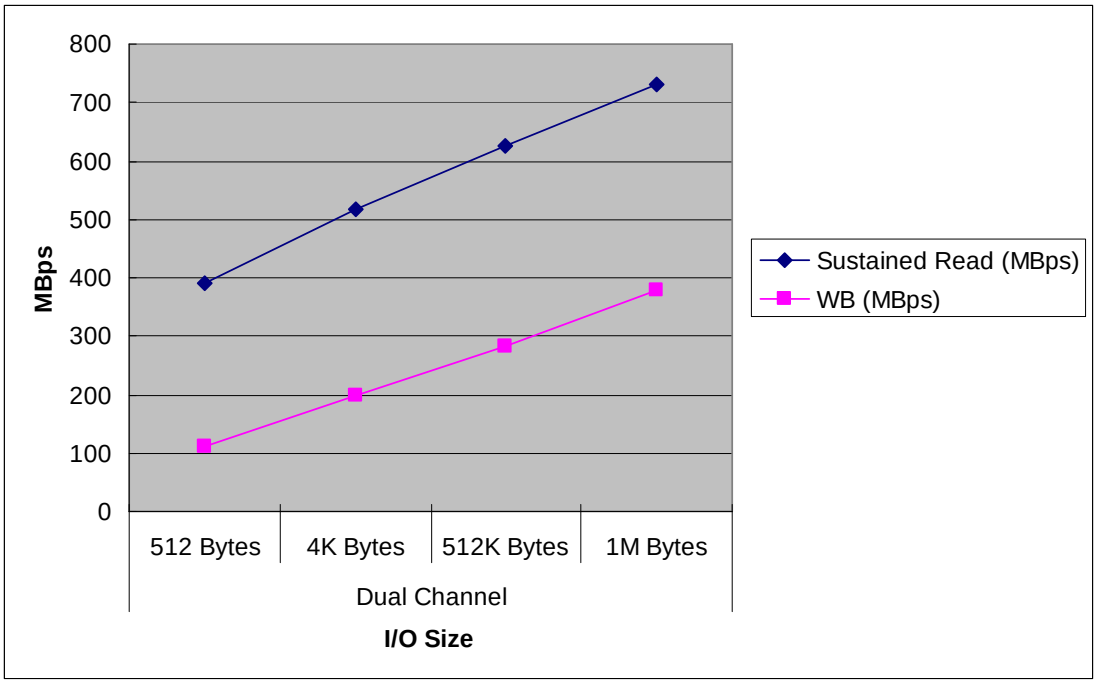
I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Four Channel	512 Bytes	136621.83	53866.18
	4K Bytes	116467.38	35810.26

2.22 Random I/O

>> Dual Channel

Data Transfer Rate (MBps)

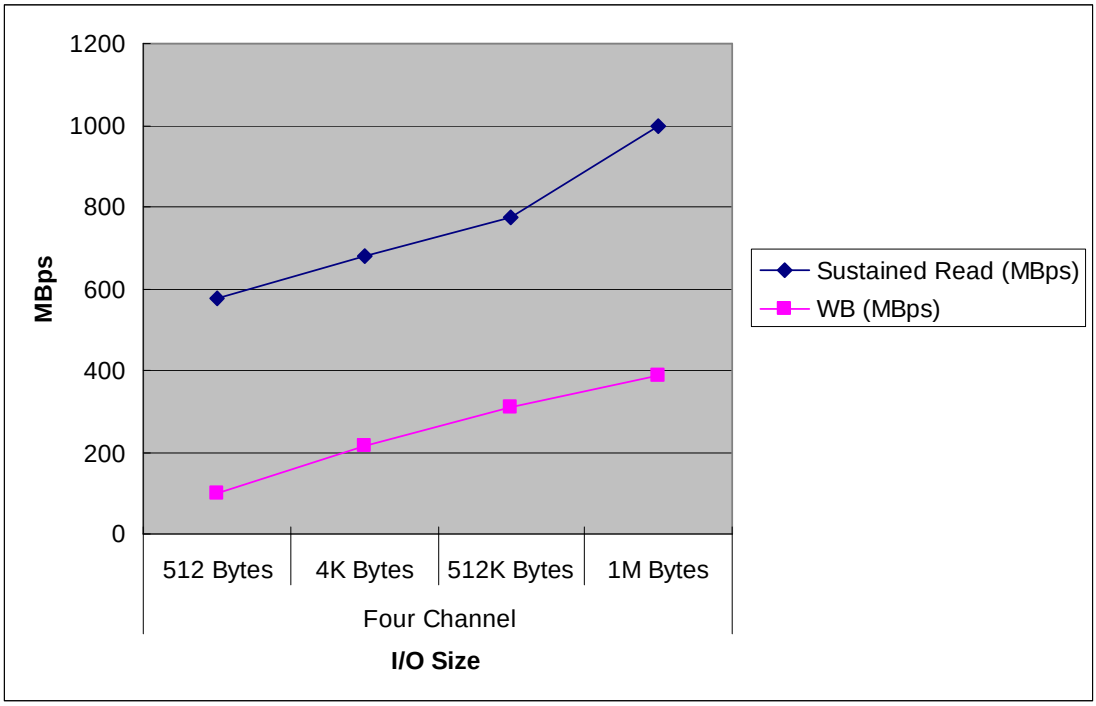
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	392.48	112.65
	256K Bytes	517.63	198.63
	512K Bytes	625.56	283.97
	1M Bytes	731.60	380.24



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	575.80	99.01
	256K Bytes	680.05	215.30
	512K Bytes	774.18	308.02
	1M Bytes	996.33	385.86



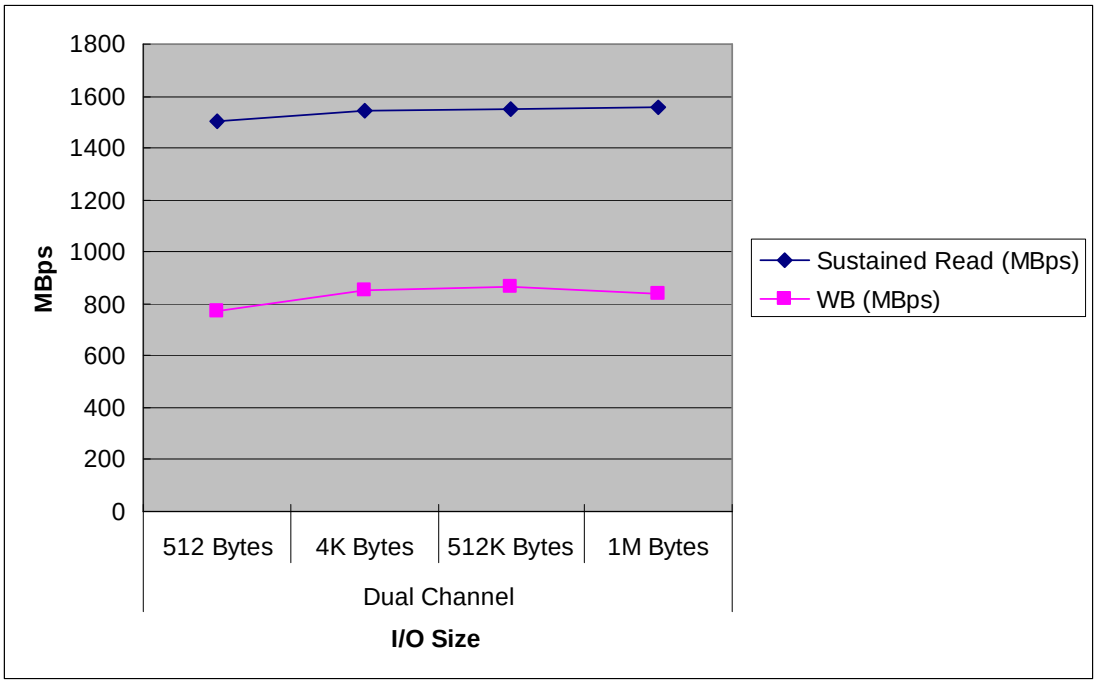
2.3 Degraded RAID 5 Performance

2.31 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

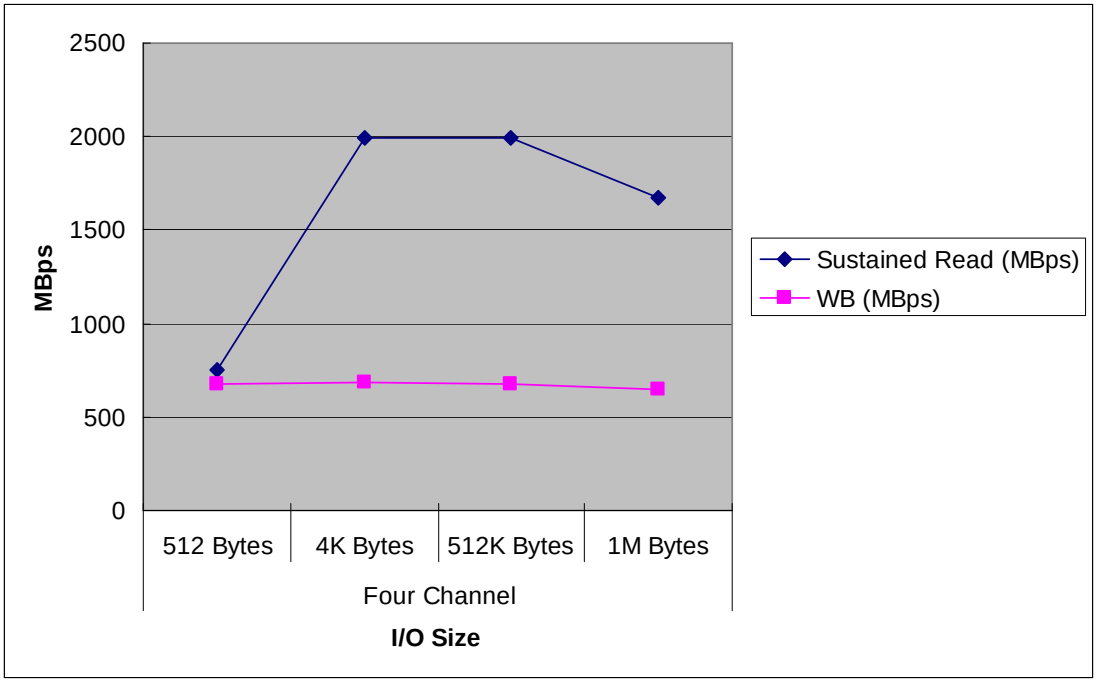
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1502.48	772.11
	256K Bytes	1542.58	855.28
	512K Bytes	1551.83	869.17
	1M Bytes	1557.57	837.41



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	754.21	674.14
	256K Bytes	1994.42	685.40
	512K Bytes	1992.59	679.69
	1M Bytes	1675.00	646.55



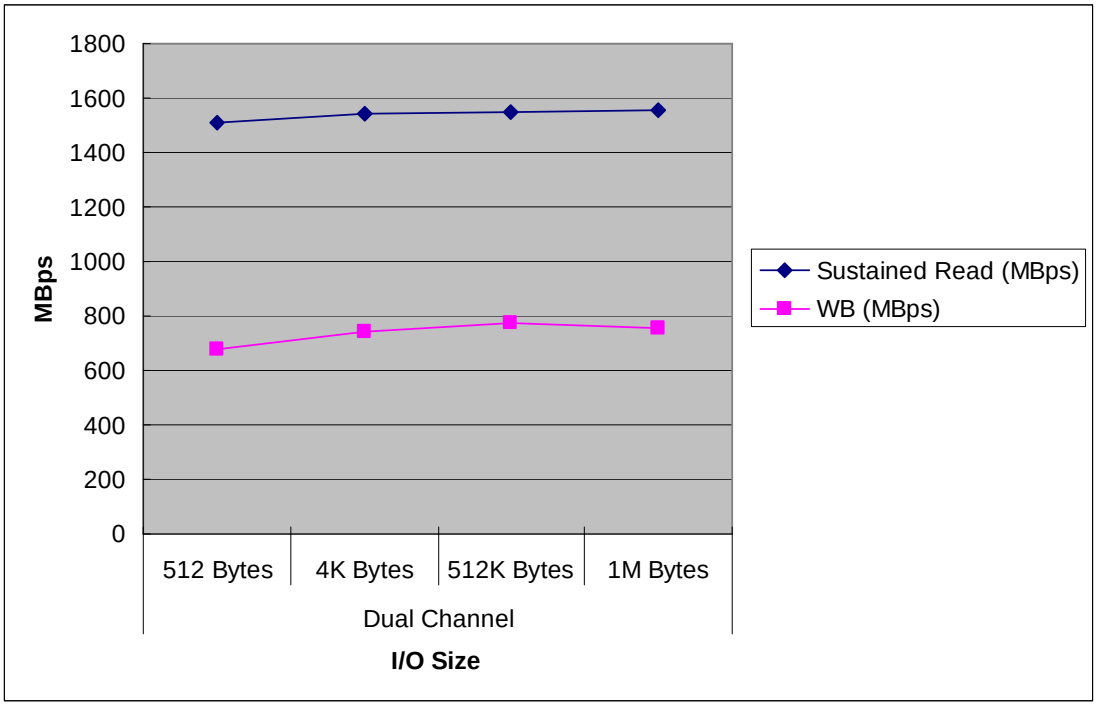
2.4 Degraded RAID 6 Performance

2.41 Sequential I/O – 1 Drive Failed

>> Dual Channel

Data Transfer Rate (MBps)

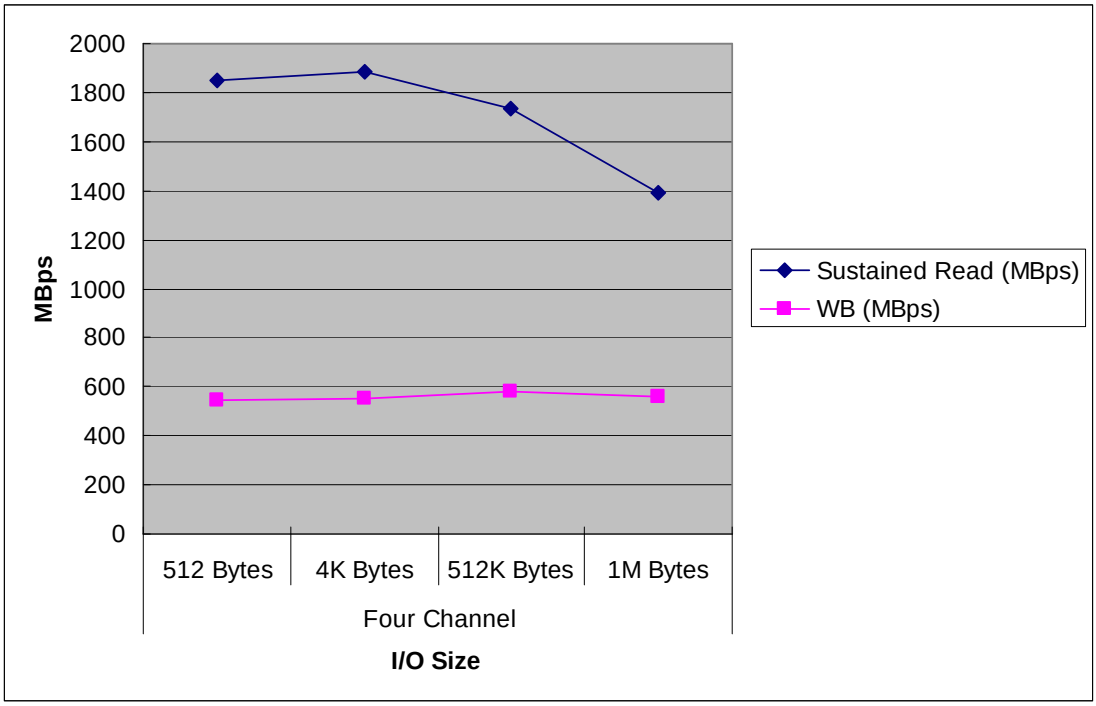
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1507.06	679.20
	256K Bytes	1543.10	742.66
	512K Bytes	1551.34	771.76
	1M Bytes	1557.61	756.13



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1847.54	545.01
	256K Bytes	1886.06	549.96
	512K Bytes	1735.44	577.57
	1M Bytes	1389.45	557.97

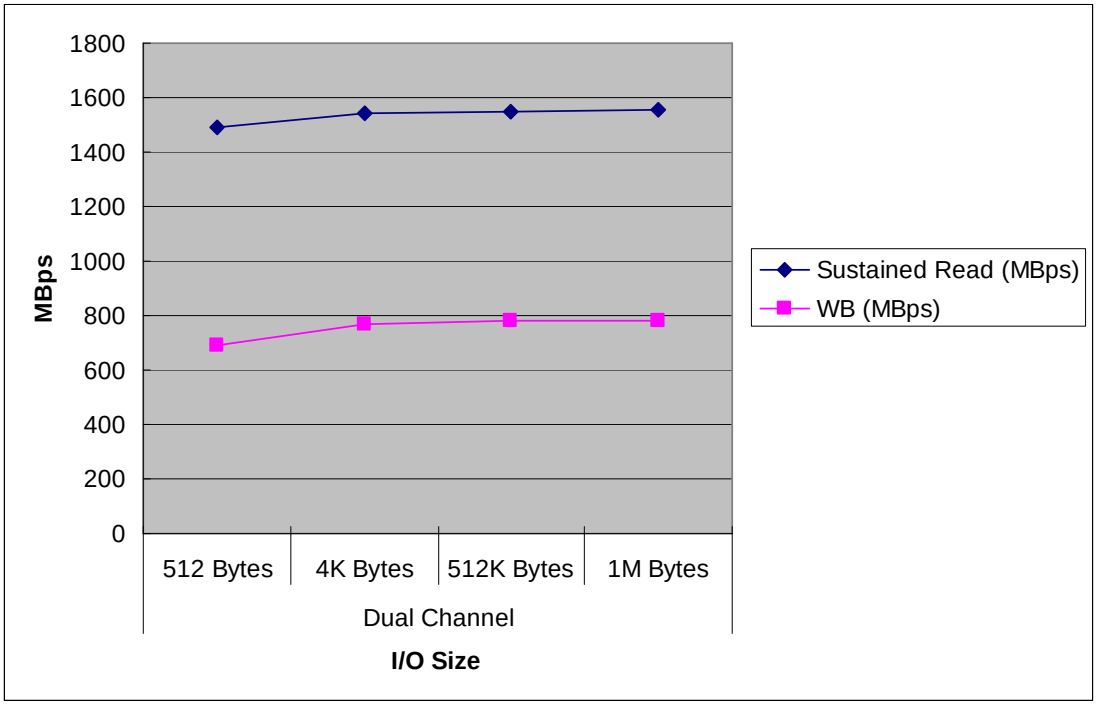


2.42 Sequential I/O – 2 Drives Failed

>> Dual Channel

Data Transfer Rate (MBps)

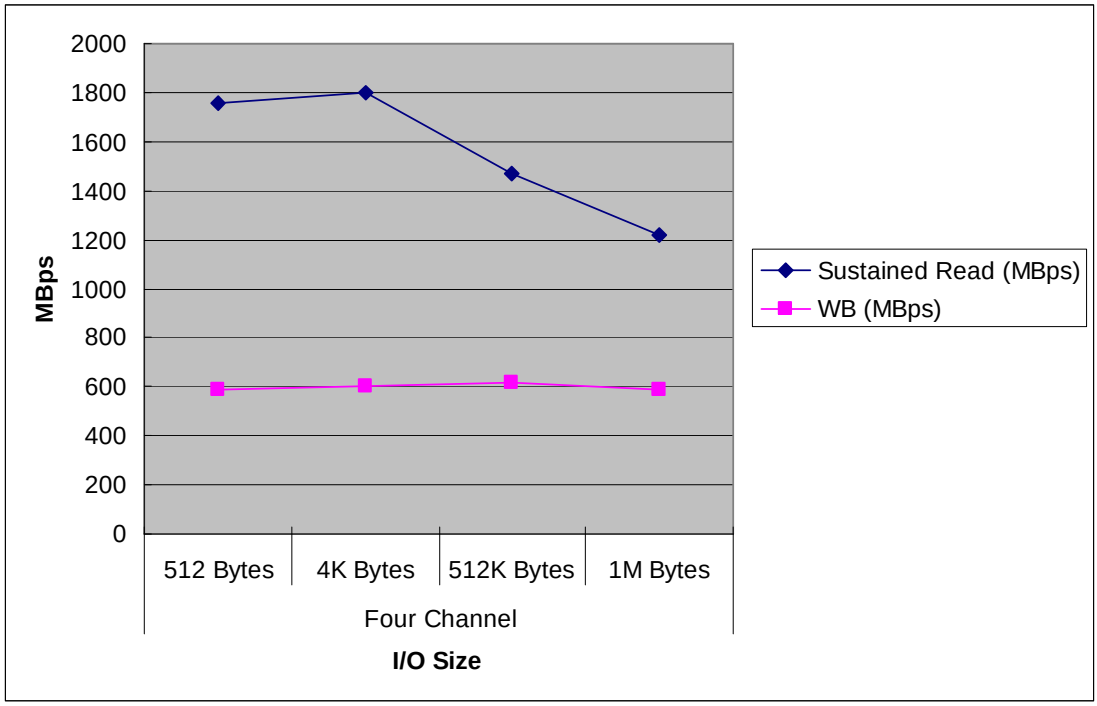
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	1490.65	691.98
	256K Bytes	1540.18	766.31
	512K Bytes	1549.00	782.36
	1M Bytes	1557.58	777.52



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	1759.30	590.25
	256K Bytes	1801.55	600.53
	512K Bytes	1470.93	614.96
	1M Bytes	1217.85	590.85



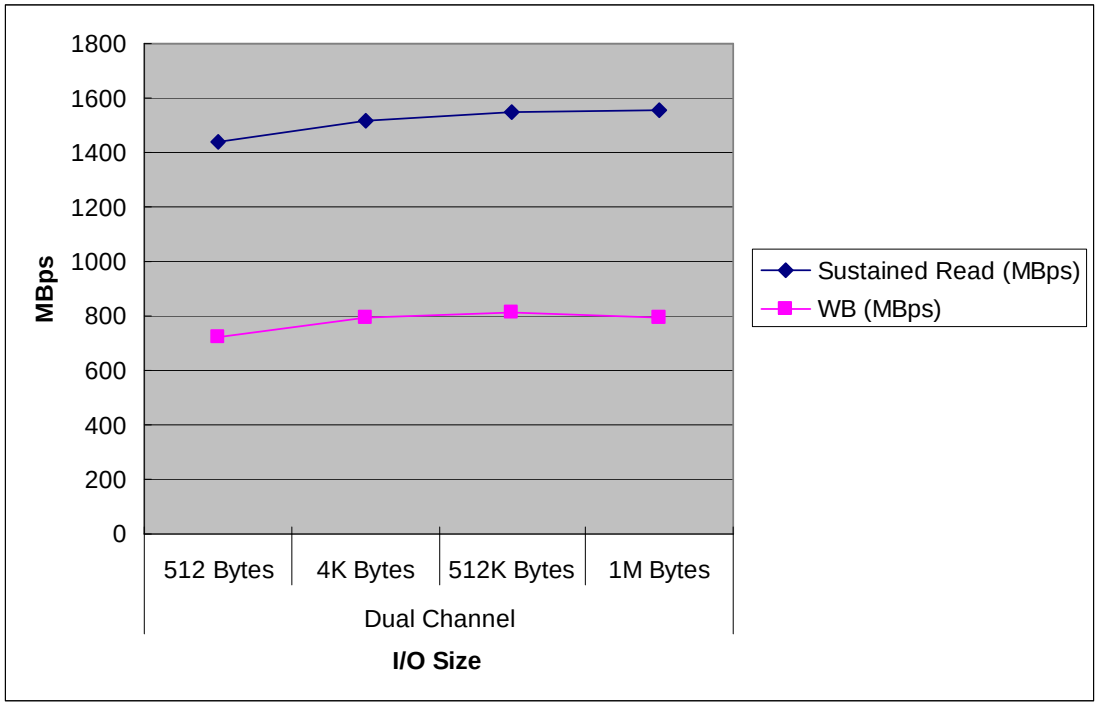
2.5 Rebuilding RAID 5 Performance

2.51 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

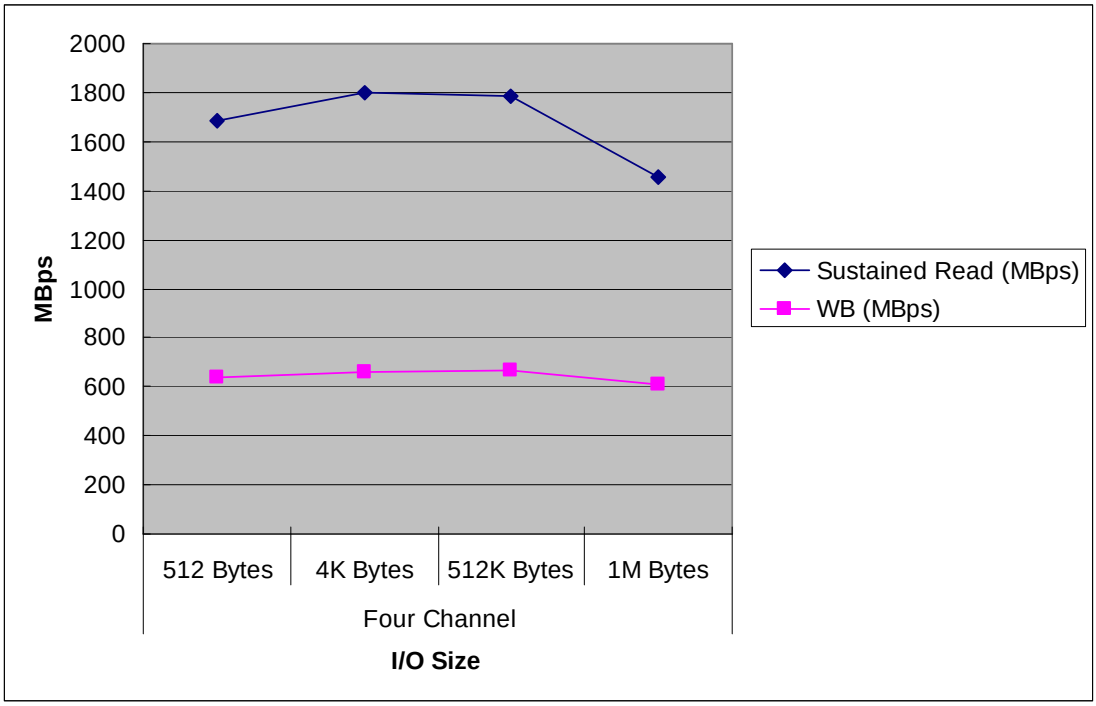
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1438.81	723.44
	256K Bytes	1516.33	793.38
	512K Bytes	1548.32	813.08
	1M Bytes	1557.20	791.41



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1684.65	638.79
	256K Bytes	1799.78	656.99
	512K Bytes	1785.72	664.18
	1M Bytes	1456.11	612.34



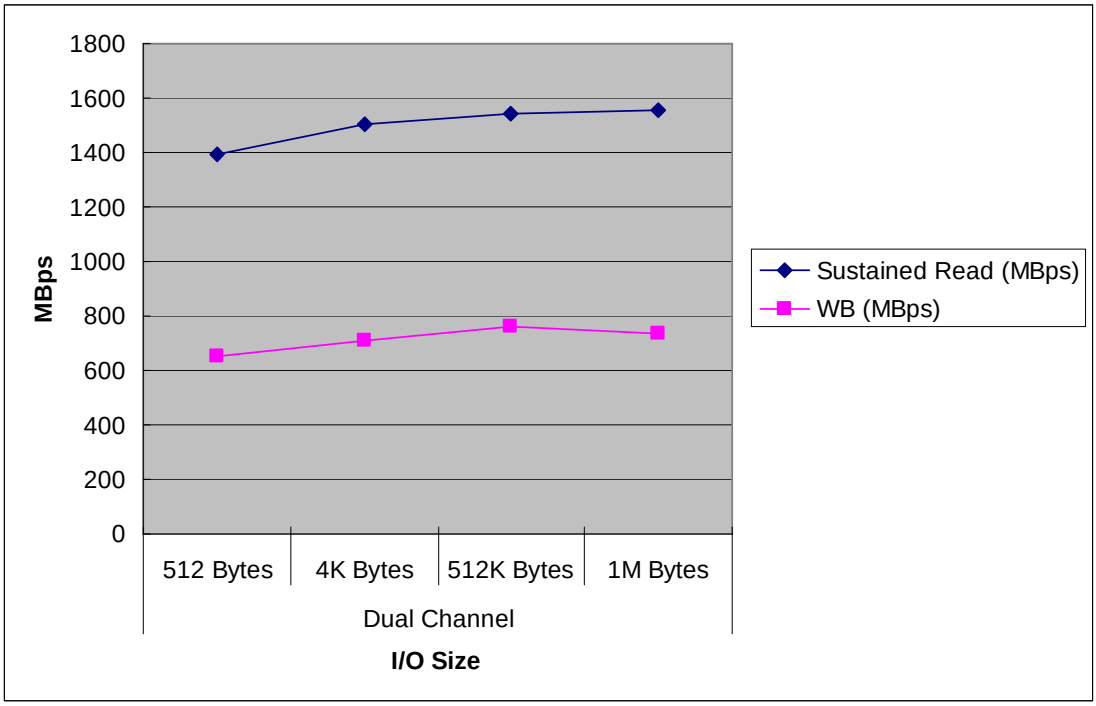
2.6 Rebuilding RAID 6 Performance

2.61 Sequential I/O – 2 Drives Rebuilding

>> Dual Channel

Data Transfer Rate (MBps)

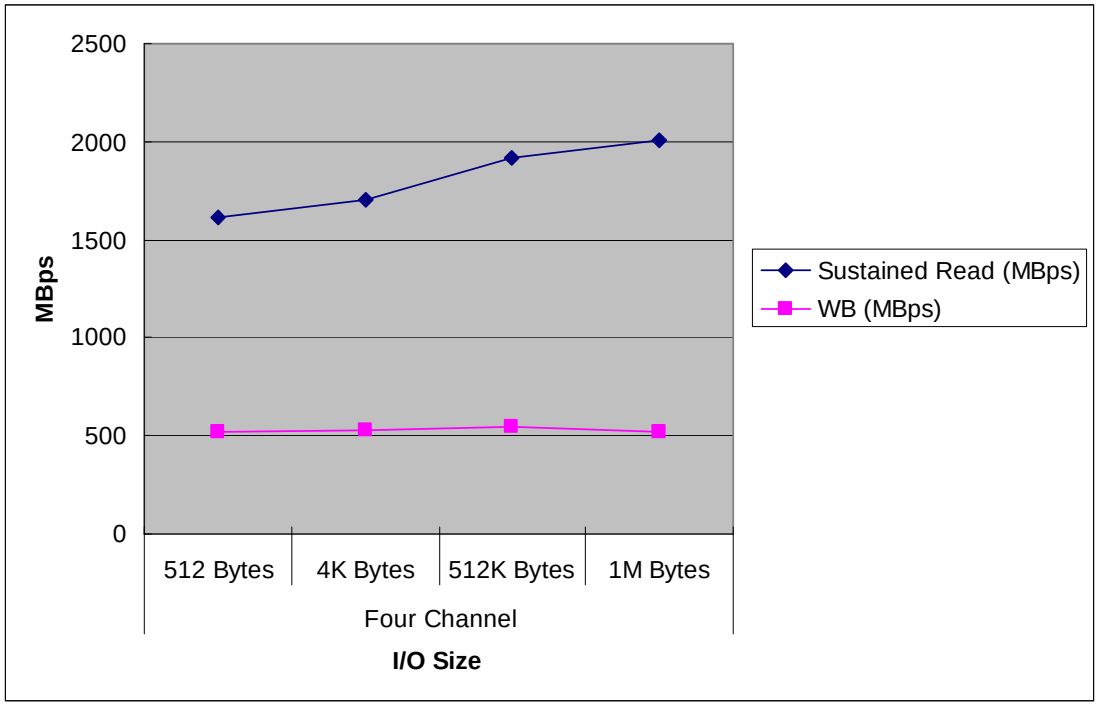
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	1391.82	650.48
	256K Bytes	1505.29	708.93
	512K Bytes	1545.15	758.38
	1M Bytes	1554.56	734.22



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	1610.78	520.61
	256K Bytes	1706.65	532.83
	512K Bytes	1915.45	542.95
	1M Bytes	2005.59	520.56



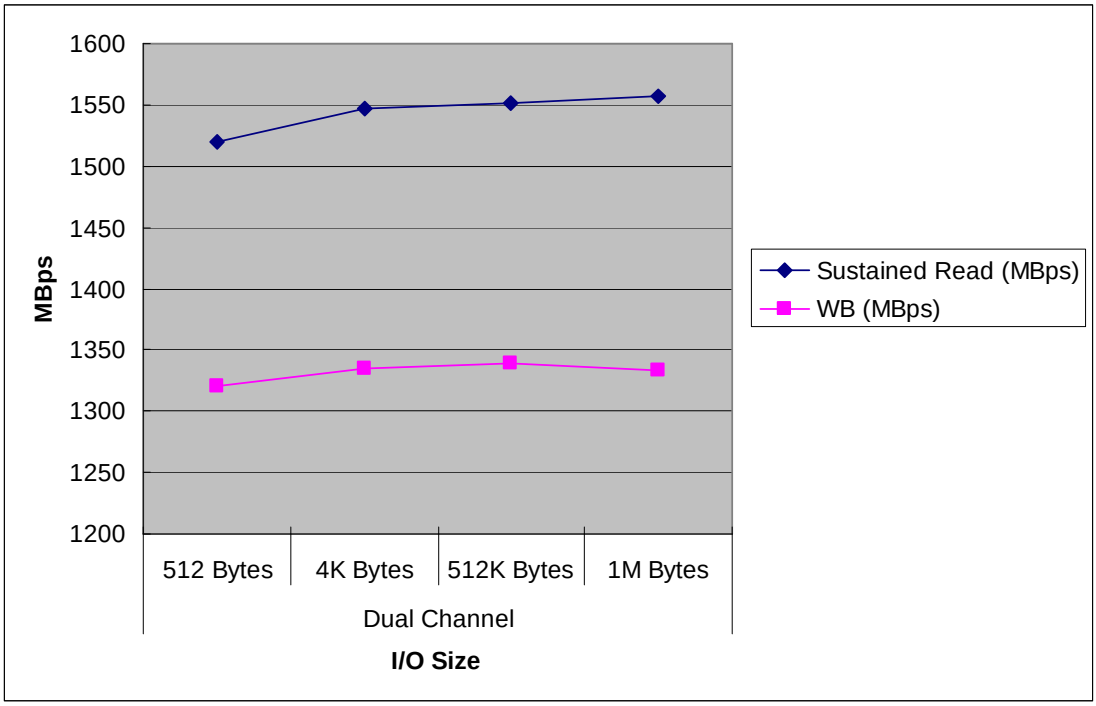
2.7 All Cache Hit RAID 5 Performance

2.71 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

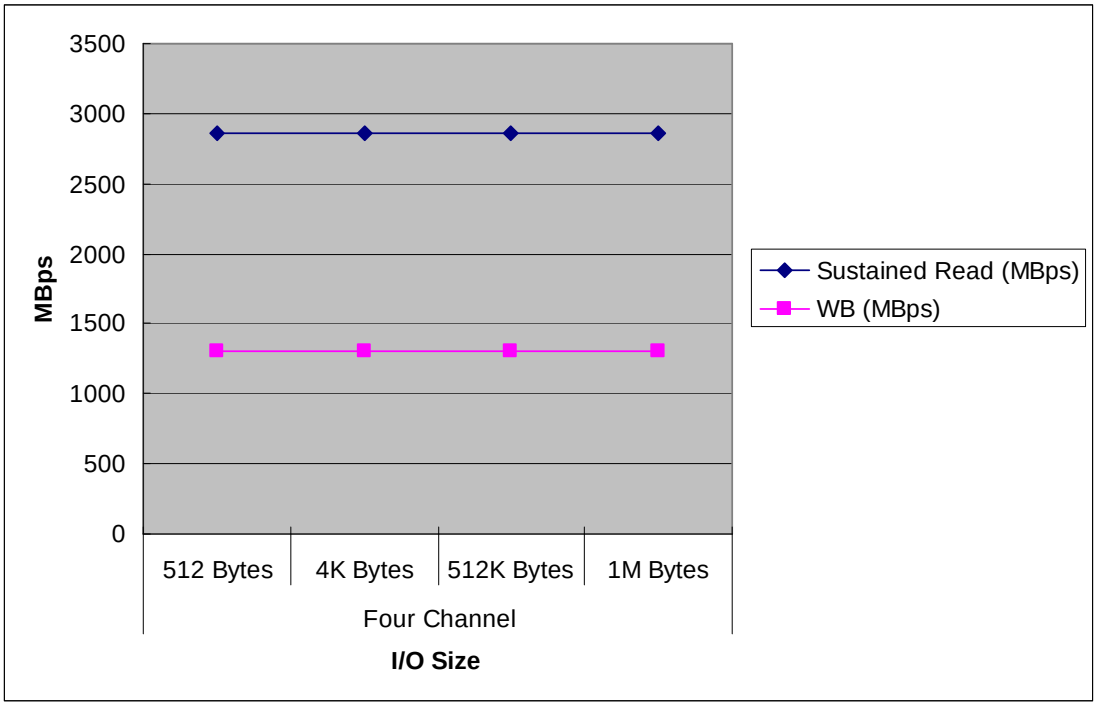
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	1519.53	1320.39
	256K Bytes	1547.19	1335.30
	512K Bytes	1551.45	1339.63
	1M Bytes	1557.53	1332.66



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	2856.76	1308.86
	256K Bytes	2861.08	1310.46
	512K Bytes	2865.22	1309.42
	1M Bytes	2859.76	1299.57



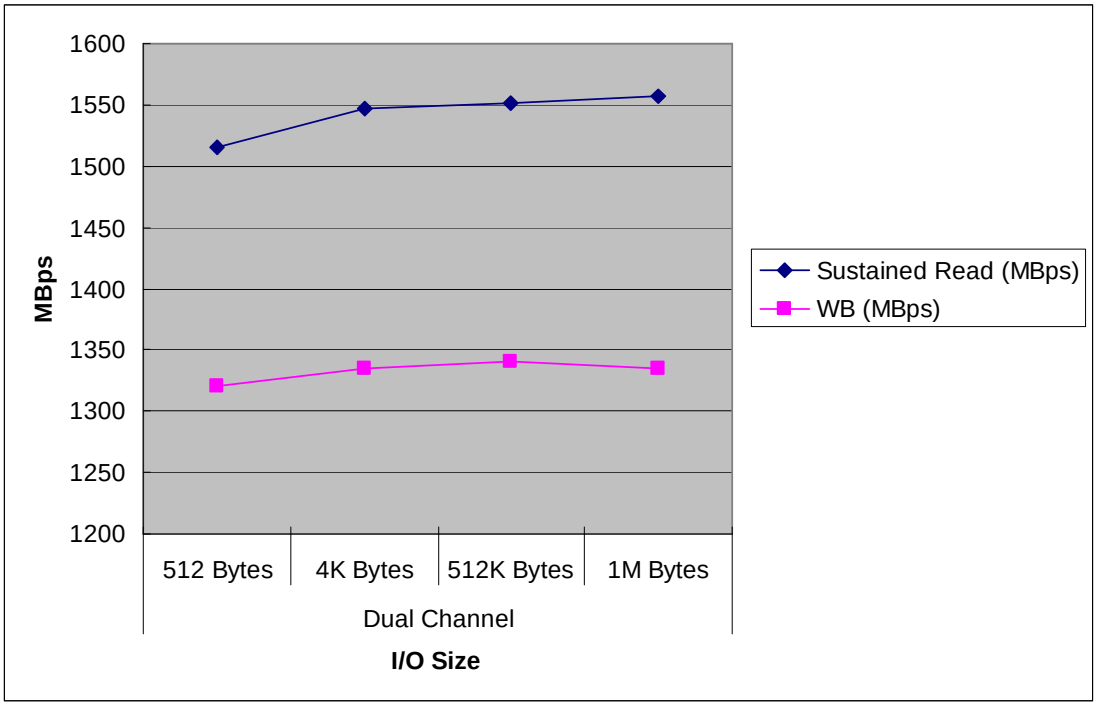
2.8 All Cache Hit RAID 6 Performance

2.81 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

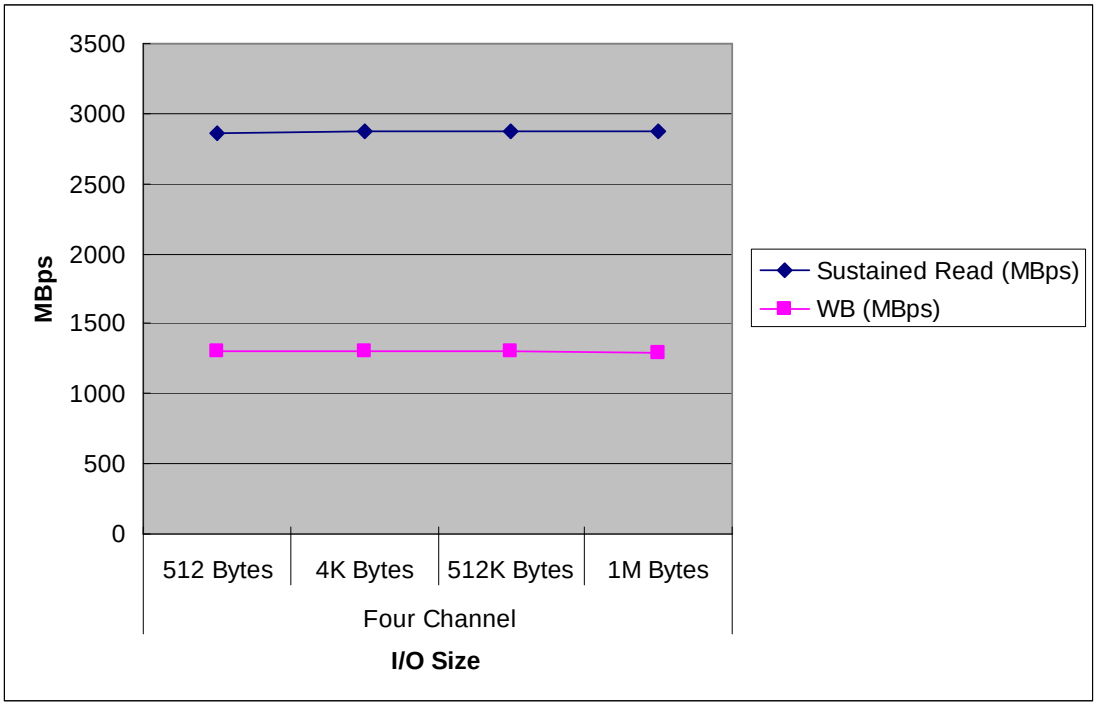
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	1516.06	1320.91
	256K Bytes	1546.63	1335.31
	512K Bytes	1551.52	1339.84
	1M Bytes	1557.55	1334.18



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	2861.96	1308.27
	256K Bytes	2869.17	1310.36
	512K Bytes	2873.23	1309.58
	1M Bytes	2872.02	1297.47



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 (MBps)

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Dual Channel	1M Bytes	744.20	744.20	347.18	347.18

3.12 Random I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Dual Channel	8k Bytes	2058.30	16.08	749.06	5.85

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Dual Channel	8K Bytes	1141.65	8.92

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

3.21 Sequential I/O

>> One Channel

Data Transfer Rate (MBps)

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
One Channel	1M Bytes	778.06	778.06	244.30	244.30

3.22 Random I/O

>> One Channel

Data Transfer Rate (MBps)

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
One Channel	8k Bytes	4720.06	38.88	1527.57	11.93

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	2741.59	21.42

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

3.31 Sequential I/O

>> One Channel

Data Transfer Rate (MBps)

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
One Channel	1M Bytes	777.40	777.40	157.63	157.63

3.32 Random I/O

>> One Channel

Data Transfer Rate (MBps)

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
One Channel	8k Bytes	4617.69	36.08	1037.88	8.11

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	2111.52	16.50

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

Subsystem	**1 Raid**
Parameters	1 Source to 1 Target
Finish Time	10 Min