Subsystem Performance Testing Report for

EonStor® DS S16F-R1840-4

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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	ESDS S16F-R1840-4
	FW	3.85B.04 (FA385B04_221_IFT_ESDSG6S6G)
	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	LD0 - Host channel 0; AID 112; LUN 0; Host channel 1; AID 112; LUN 0; 8 drives/channel; 1 partition

	(RAID5/6) All Cache Hit (Eight Hosts)	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)
	IOmeter	2004.07.30

Benchmark	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.

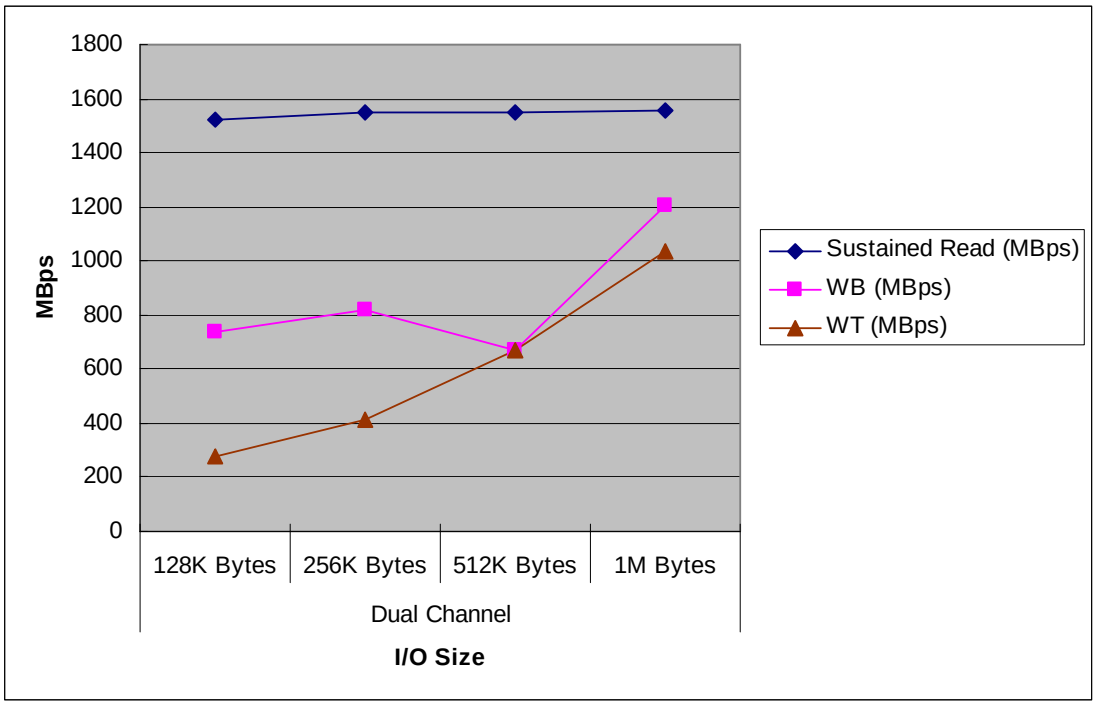
2.1 End-to-End RAID 5 Performance

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	1524.14	735.22	279.48
	256K Bytes	1547.81	816.04	410.74
	512K Bytes	1552.33	673.21	671.01
	1M Bytes	1558.09	1204.95	1034.14



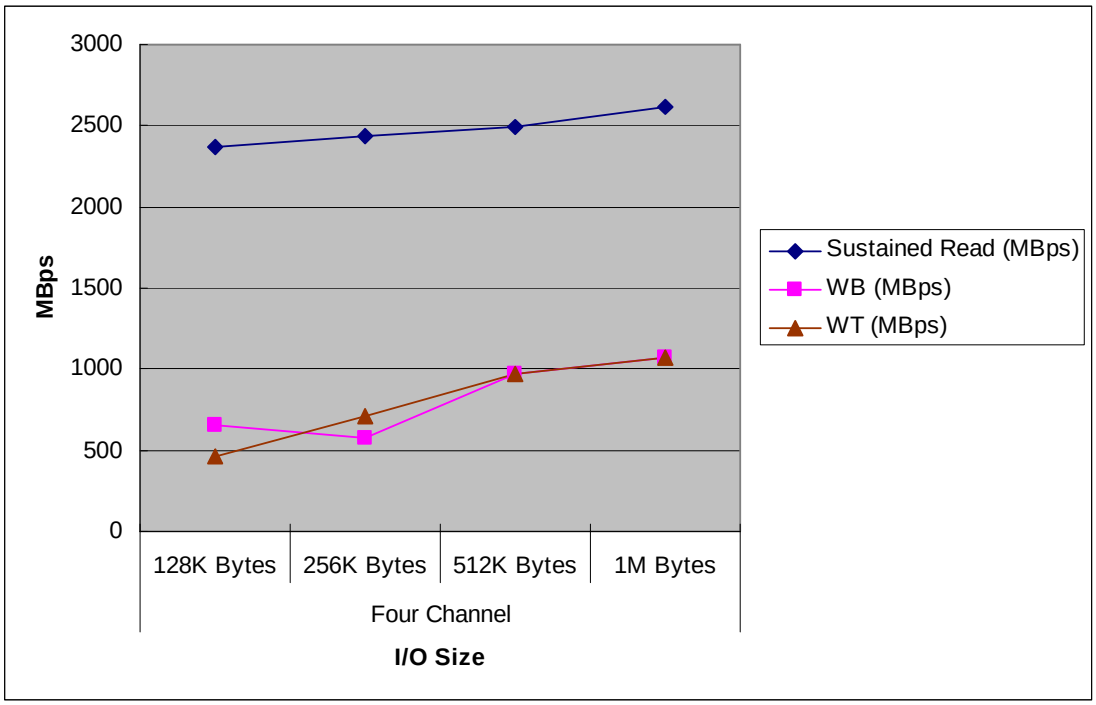
Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Dual Channel	512 Bytes	142801.59	47571.94
	4K Bytes	121890.93	37096.12

>> 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	2365.86	654.04	467.02
	256K Bytes	2431.77	570.74	707.14
	512K Bytes	2491.38	973.66	966.61
	1M Bytes	2620.73	1072.99	1072.35



Data Access Rate (IOPS)

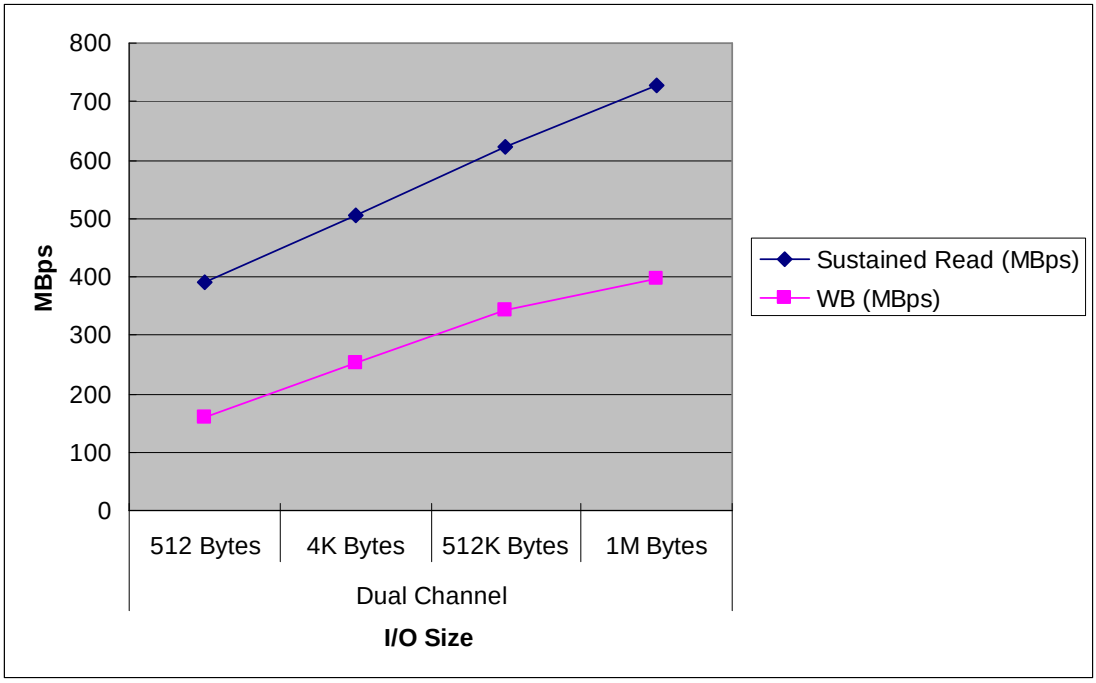
I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Four Channel	512 Bytes	124248.27	55562.17
	4K Bytes	107150.32	41512.79

2.12 Random I/O

>> Dual Channel

Data Transfer Rate (MBps)

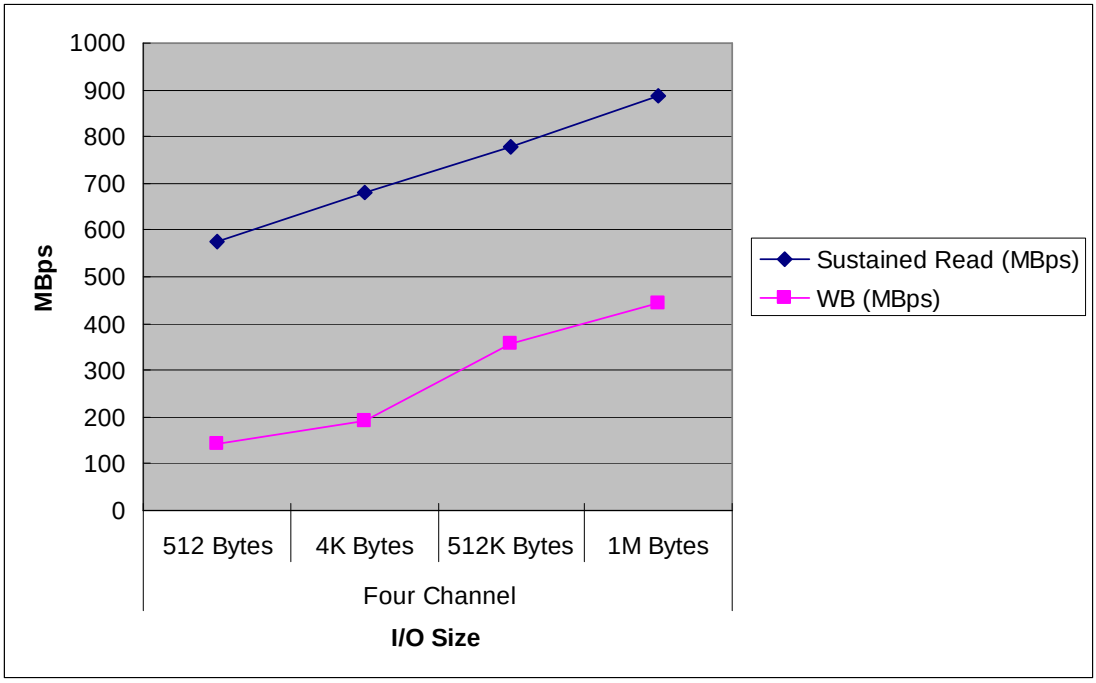
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	390.90	157.95
	256K Bytes	505.54	253.85
	512K Bytes	623.19	344.13
	1M Bytes	728.57	397.32



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	575.13	141.58
	256K Bytes	680.91	192.11
	512K Bytes	777.93	355.93
	1M Bytes	887.23	442.36



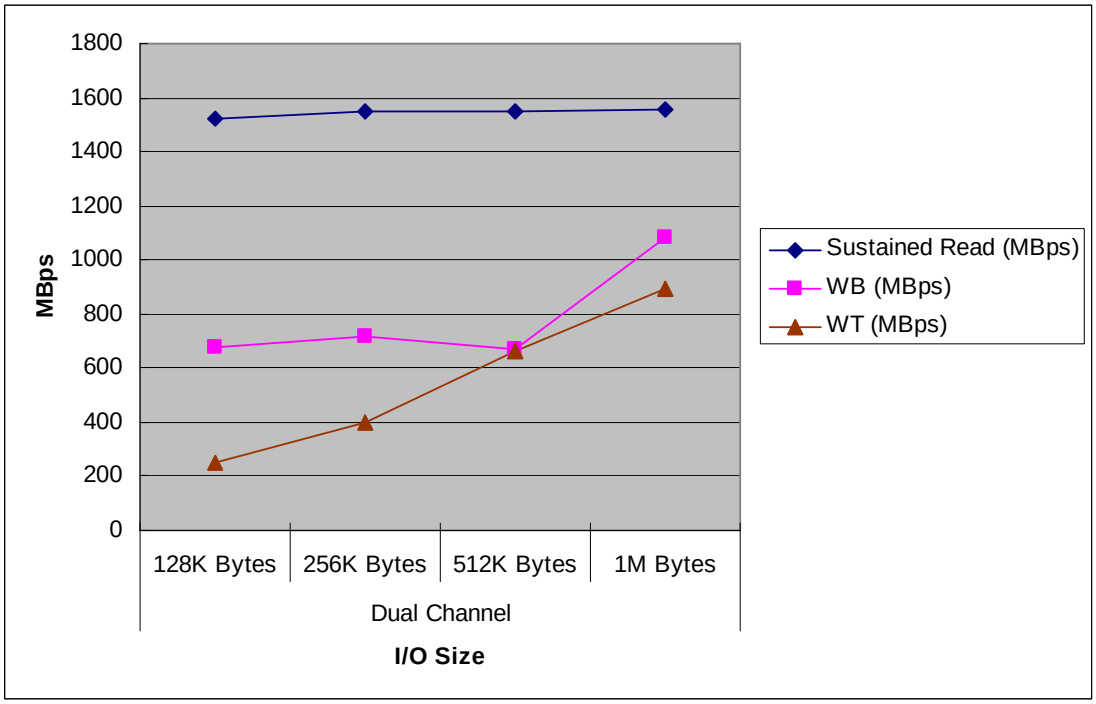
2.2 End-to-End RAID 6 Performance

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	1525.68	675.50	252.10
	256K Bytes	1547.21	717.49	397.48
	512K Bytes	1552.37	671.05	666.40
	1M Bytes	1558.18	1083.22	896.52



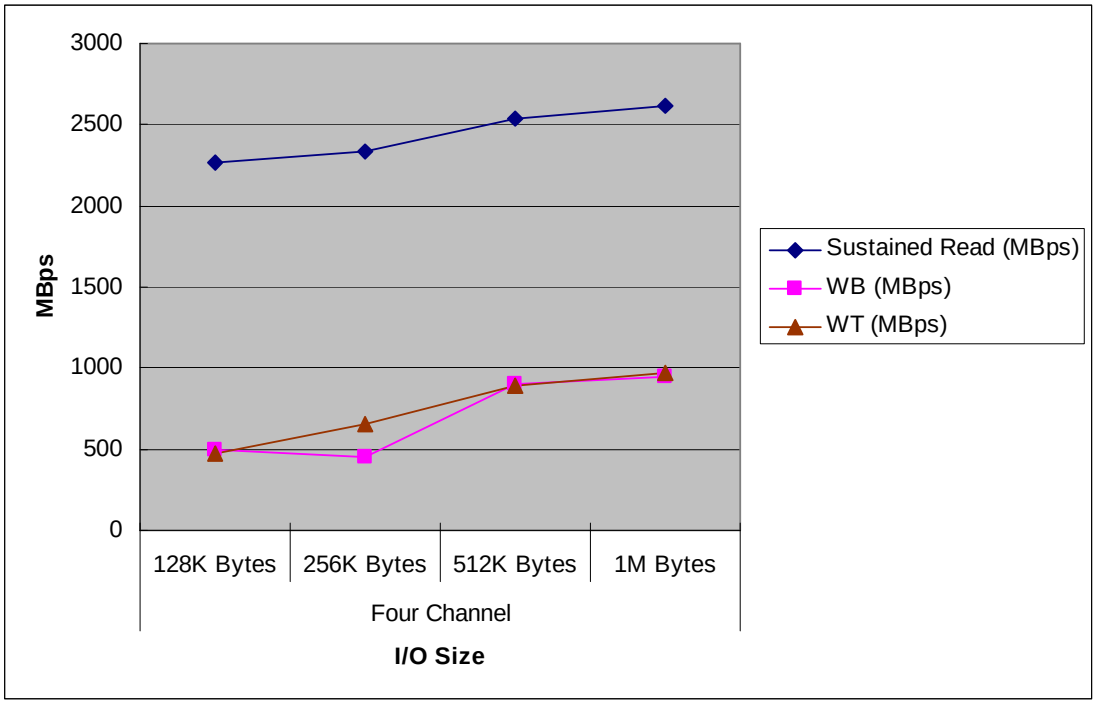
Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Dual Channel	512 Bytes	142511.99	47708.31
	4K Bytes	119587.19	36593.24

>> 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	2271.35	495.58	468.31
	256K Bytes	2336.56	452.72	655.24
	512K Bytes	2534.18	905.50	895.72
	1M Bytes	2613.41	949.99	964.87



Data Access Rate (IOPS)

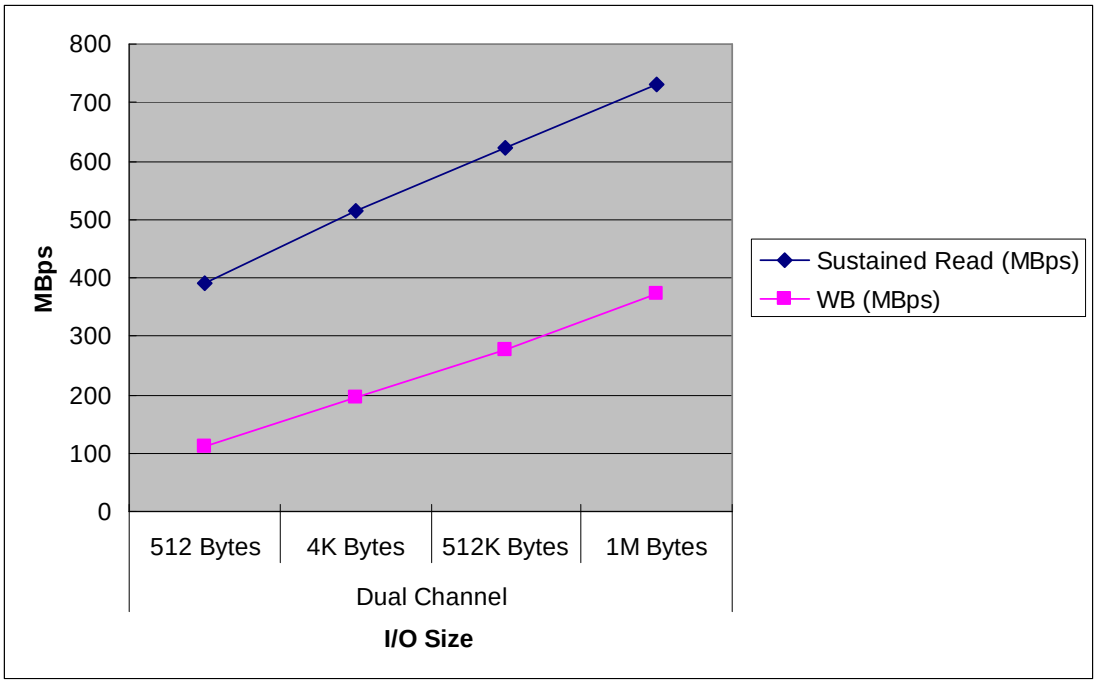
I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Four Channel	512 Bytes	124496.82	55491.45
	4K Bytes	106244.65	38295.87

2.22 Random I/O

>> Dual Channel

Data Transfer Rate (MBps)

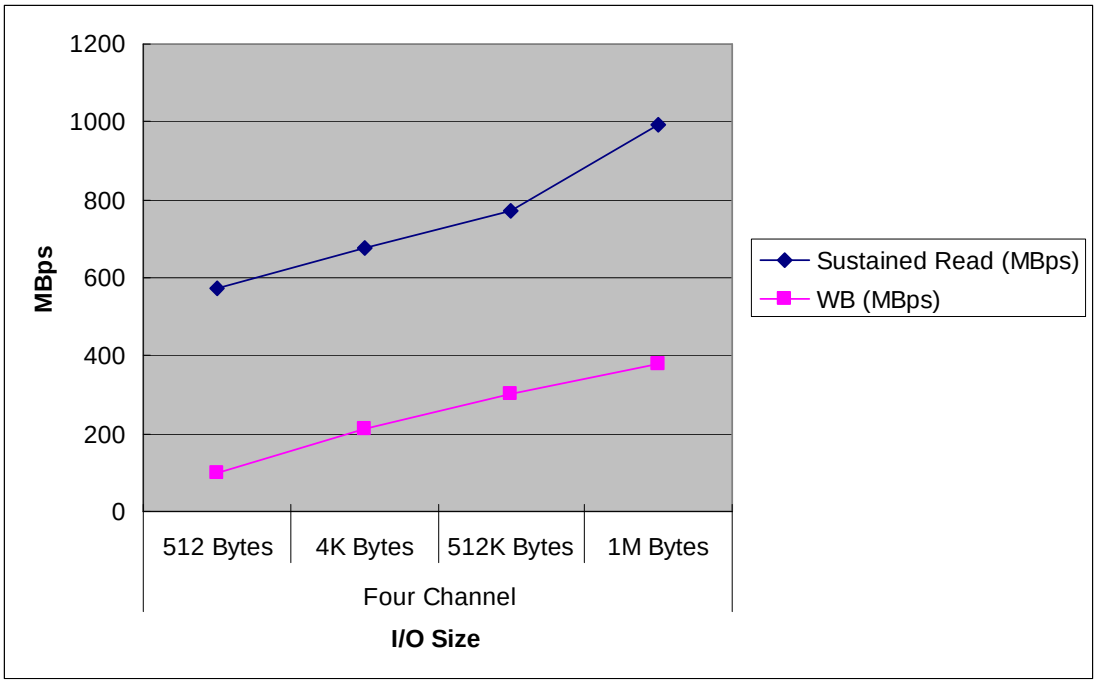
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	391.17	110.19
	256K Bytes	515.30	194.05
	512K Bytes	623.74	275.87
	1M Bytes	729.92	374.40



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	573.10	98.35
	256K Bytes	676.73	212.86
	512K Bytes	772.58	301.49
	1M Bytes	993.48	377.88



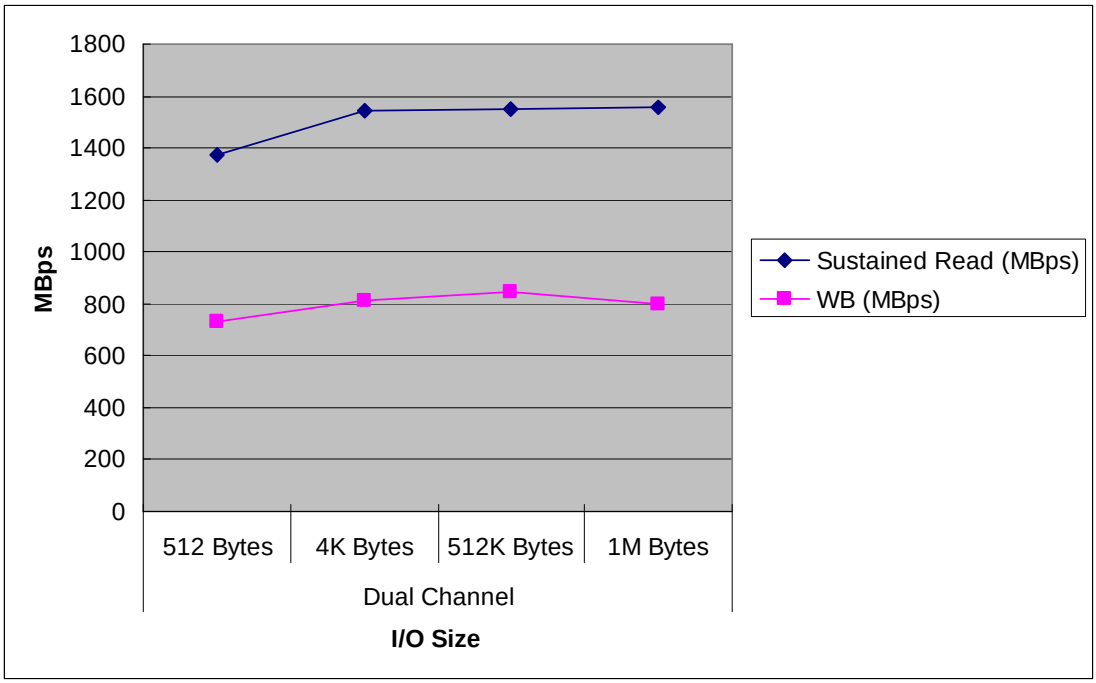
2.3 Degraded RAID 5 Performance

2.31 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

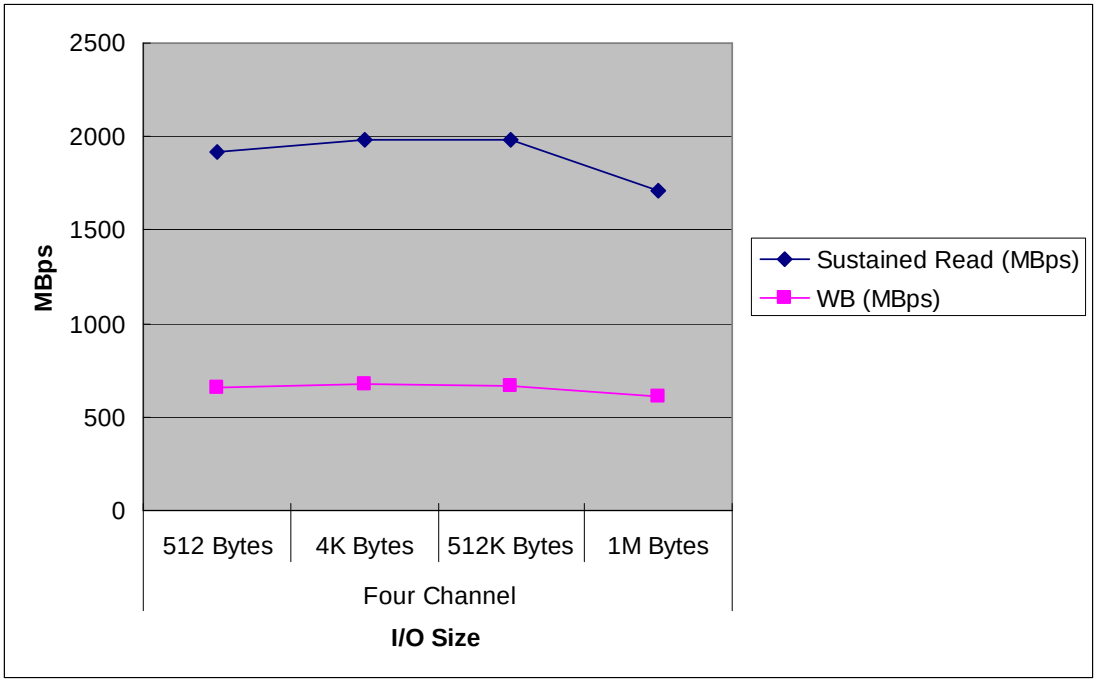
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1376.55	730.77
	256K Bytes	1542.51	814.45
	512K Bytes	1548.87	847.97
	1M Bytes	1558.02	795.57



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1914.56	656.93
	256K Bytes	1980.41	677.85
	512K Bytes	1983.71	667.30
	1M Bytes	1708.97	609.61



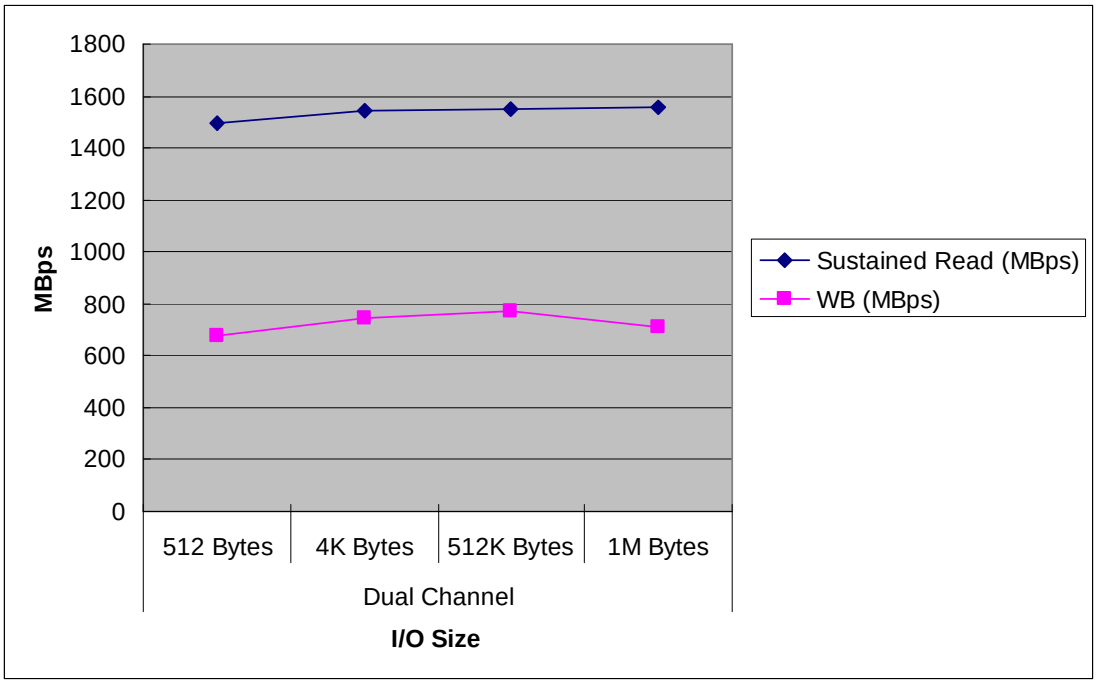
2.4 Degraded RAID 6 Performance

2.41 Sequential I/O – 1 Drive Failed

>> Dual Channel

Data Transfer Rate (MBps)

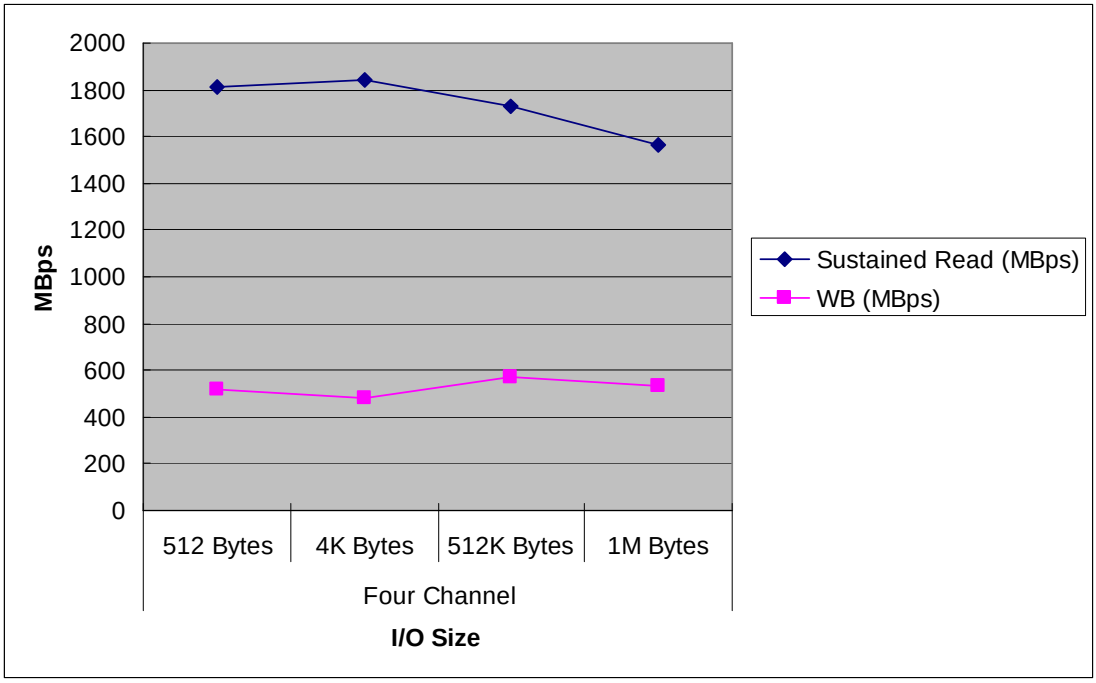
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1497.86	679.63
	256K Bytes	1543.36	747.20
	512K Bytes	1551.54	772.41
	1M Bytes	1558.08	707.81



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1813.79	516.63
	256K Bytes	1842.33	483.25
	512K Bytes	1725.97	570.26
	1M Bytes	1560.42	532.84

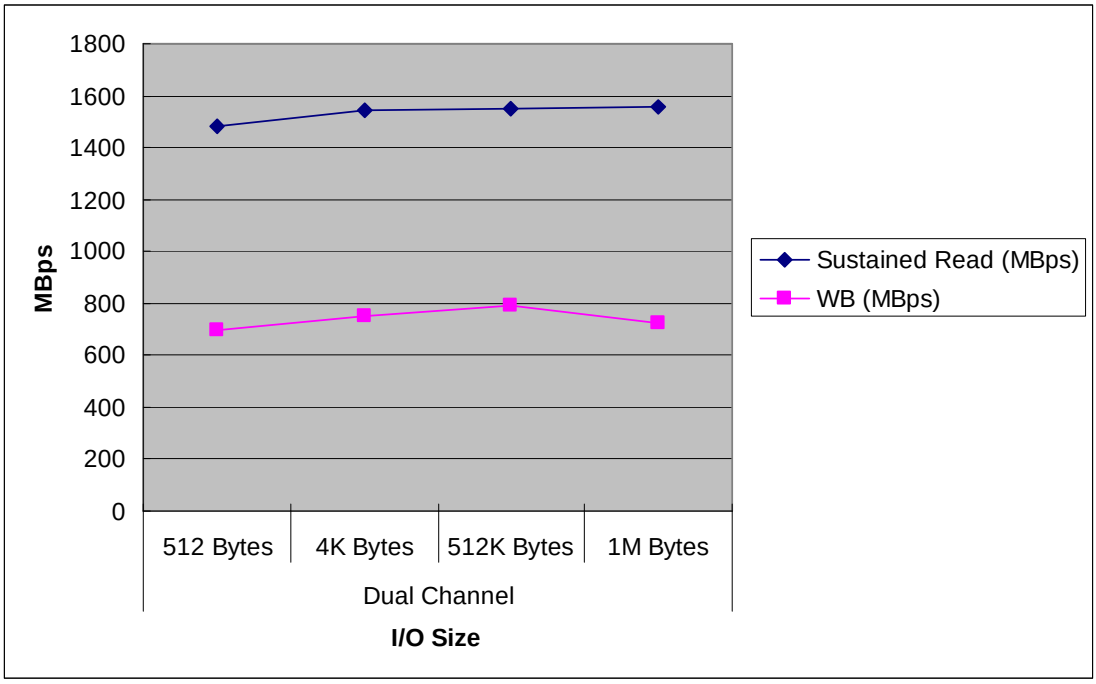


2.42 Sequential I/O – 2 Drives Failed

>> Dual Channel

Data Transfer Rate (MBps)

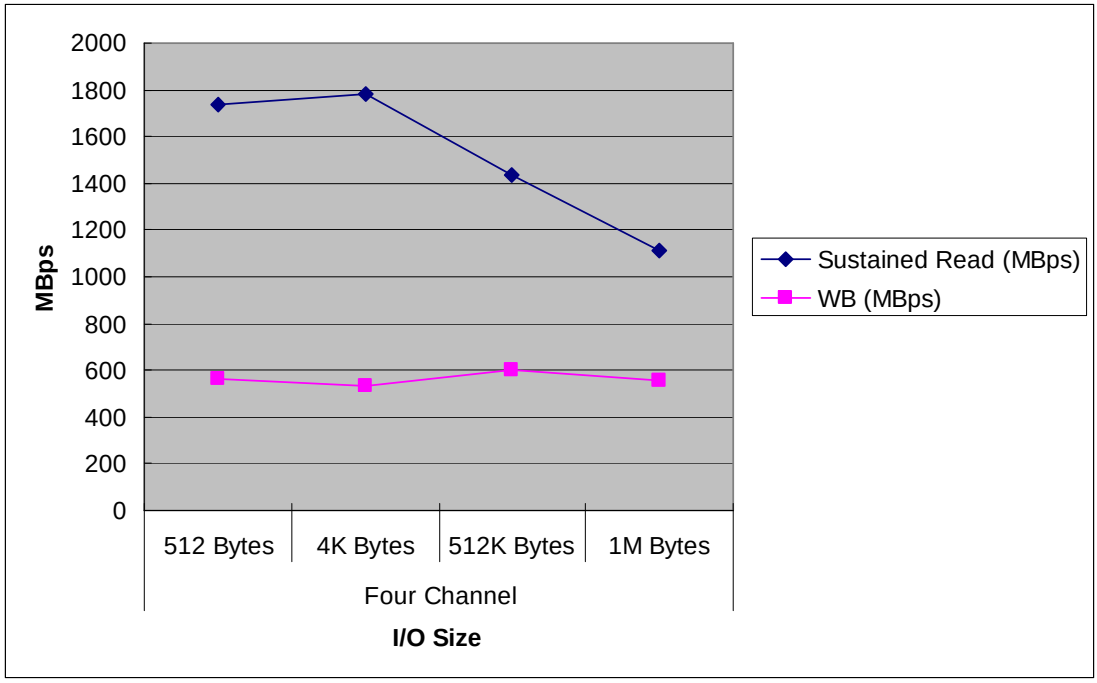
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	1479.50	694.62
	256K Bytes	1541.06	748.89
	512K Bytes	1550.74	789.19
	1M Bytes	1557.01	723.90



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	1735.80	560.80
	256K Bytes	1779.75	537.17
	512K Bytes	1438.97	598.67
	1M Bytes	1113.44	557.39



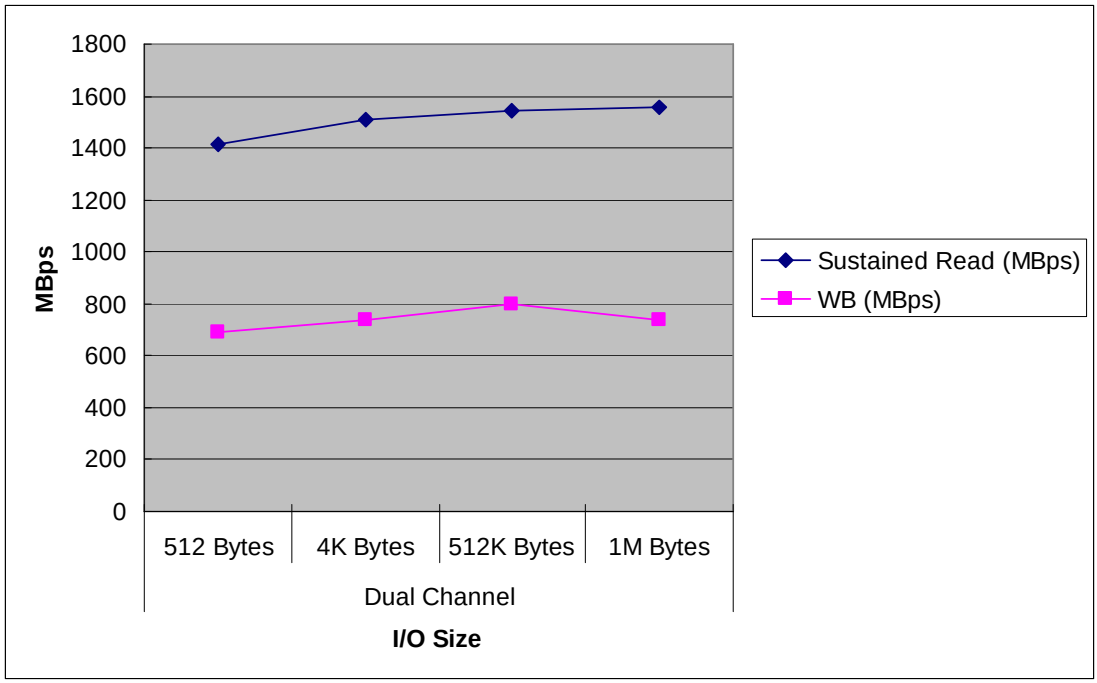
2.5 Rebuilding RAID 5 Performance

2.51 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

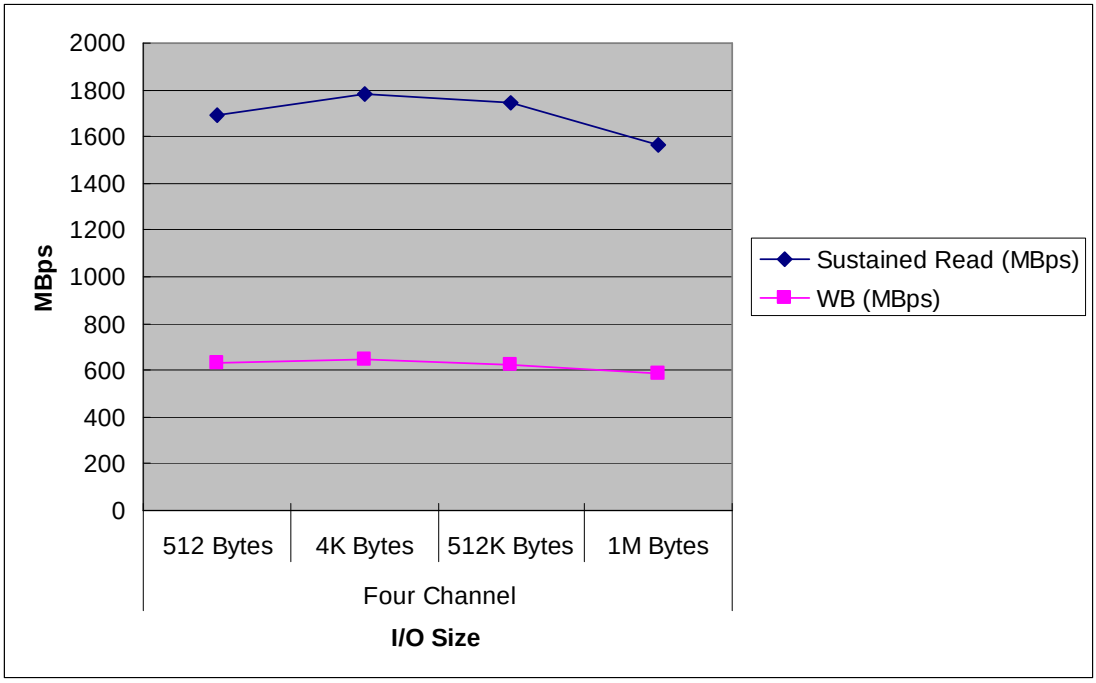
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1412.59	690.08
	256K Bytes	1511.41	735.20
	512K Bytes	1542.17	795.98
	1M Bytes	1556.36	737.49



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1691.40	631.26
	256K Bytes	1782.98	646.00
	512K Bytes	1742.66	621.63
	1M Bytes	1564.21	584.56



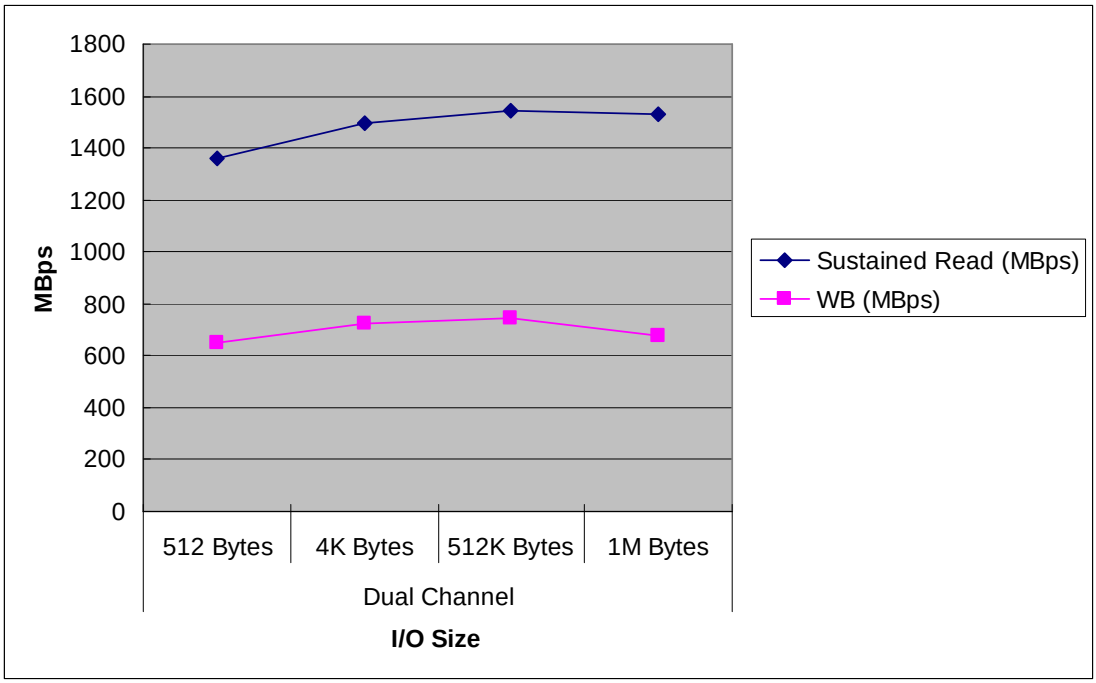
2.6 Rebuilding RAID 6 Performance

2.61 Sequential I/O – 2 Drives Rebuilding

>> Dual Channel

Data Transfer Rate (MBps)

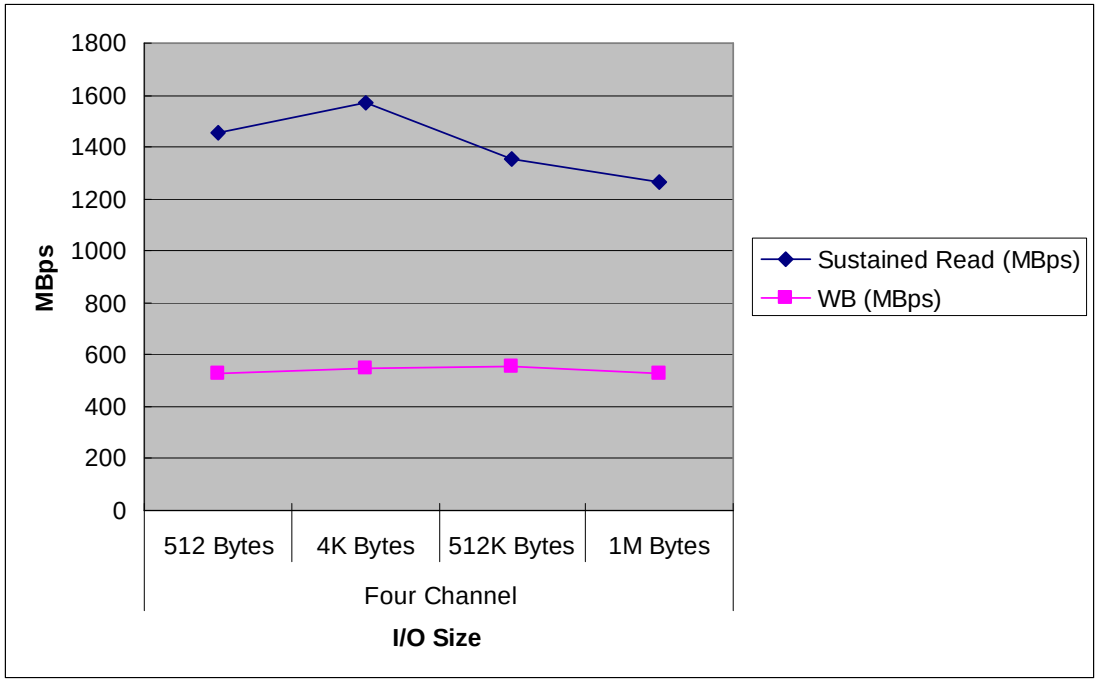
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1360.78	651.68
	256K Bytes	1492.30	723.06
	512K Bytes	1539.49	745.36
	1M Bytes	1532.49	679.18



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1456.66	530.11
	256K Bytes	1568.62	548.13
	512K Bytes	1356.12	557.24
	1M Bytes	1263.94	529.10



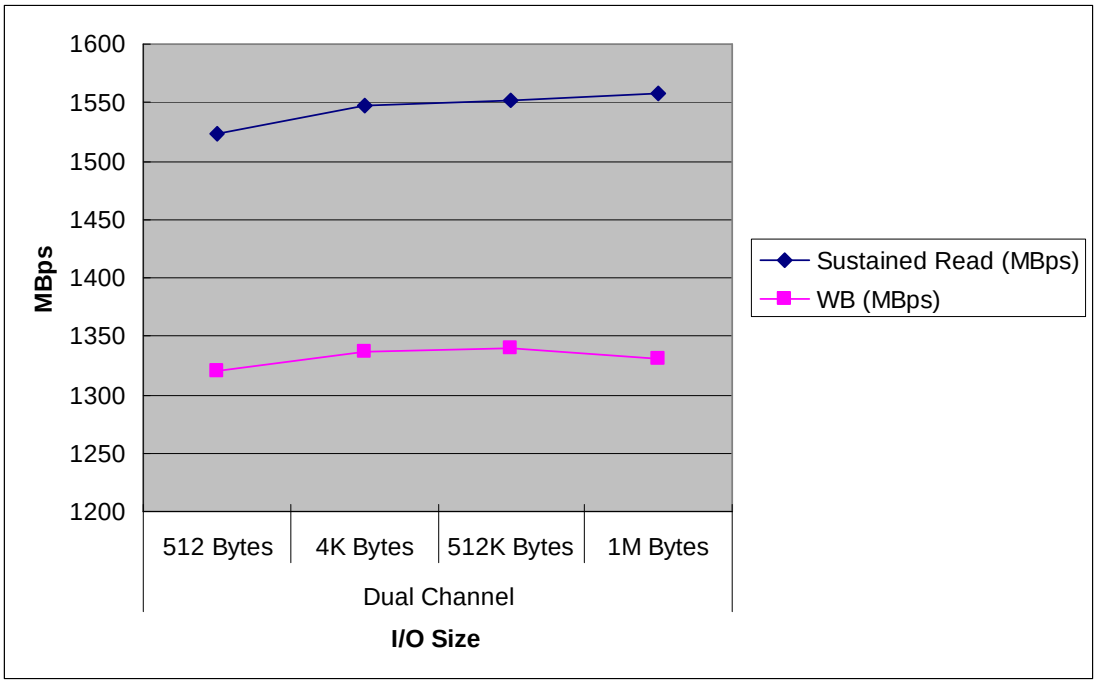
2.7 All Cache Hit RAID 5 Performance

2.71 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

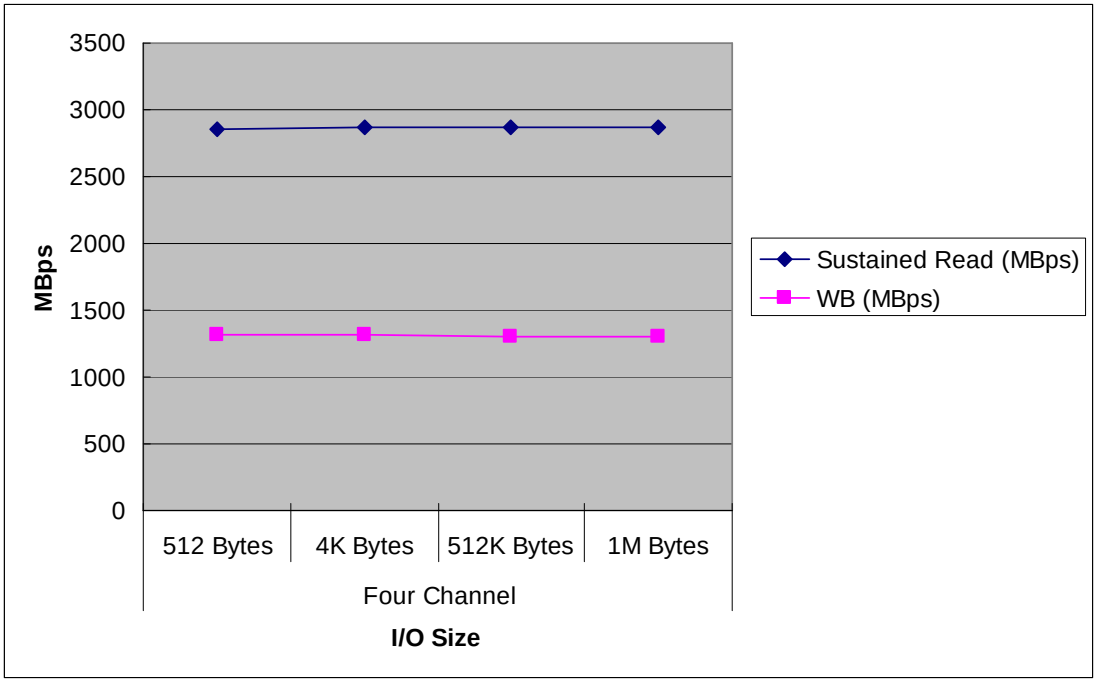
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1522.60	1320.97
	256K Bytes	1548.02	1337.03
	512K Bytes	1552.10	1339.52
	1M Bytes	1558.31	1331.05



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	2858.58	1310.65
	256K Bytes	2865.22	1314.57
	512K Bytes	2867.44	1309.18
	1M Bytes	2864.62	1297.49



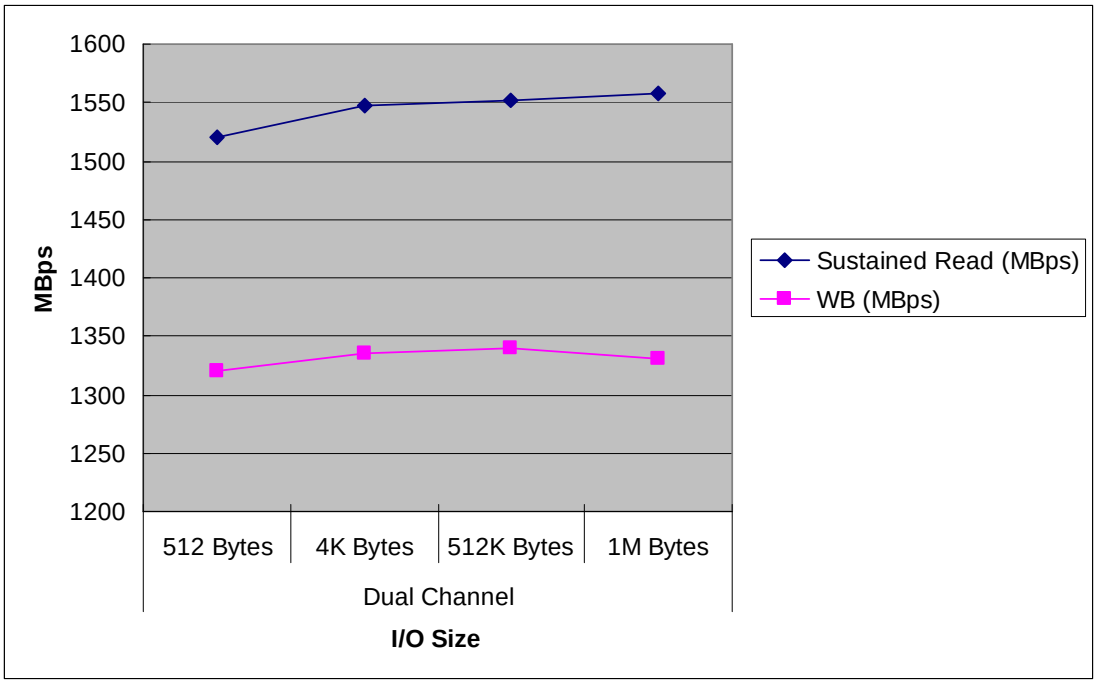
2.8 All Cache Hit RAID 6 Performance

2.81 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

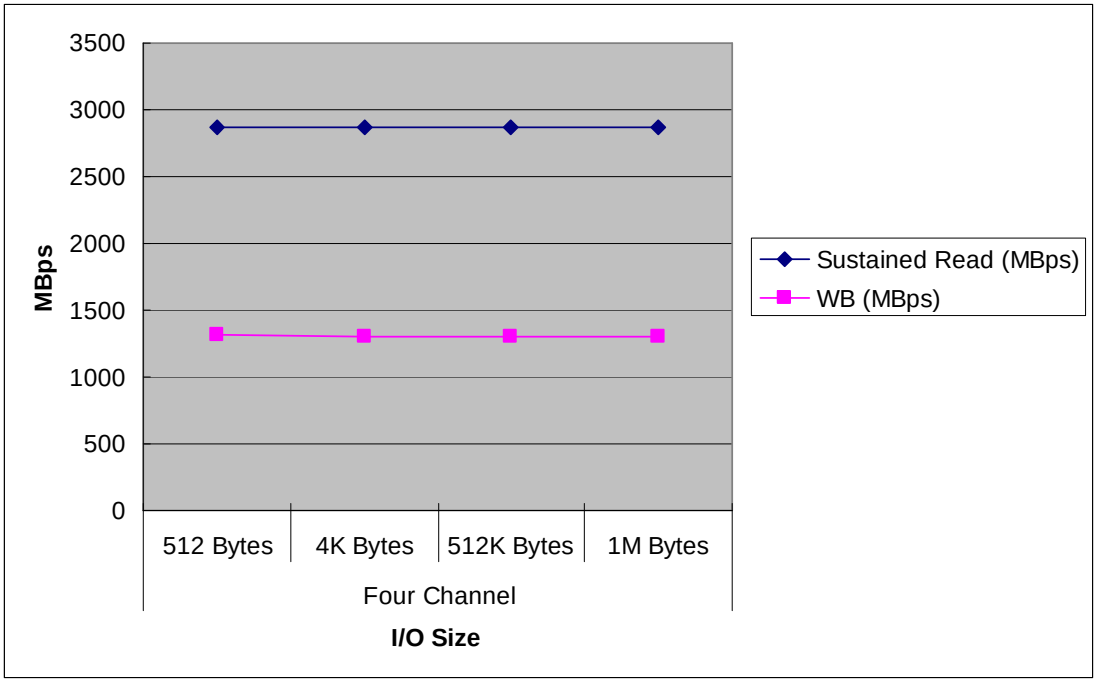
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1520.36	1319.89
	256K Bytes	1548.11	1335.83
	512K Bytes	1552.29	1339.15
	1M Bytes	1558.42	1330.84



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	2867.29	1310.31
	256K Bytes	2871.46	1309.00
	512K Bytes	2873.08	1307.73
	1M Bytes	2870.56	1298.66



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	719.89	719.89	242.73	242.73

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	1940.15	15.16	596.41	4.66

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Dual Channel	8K Bytes	962.73	7.52

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	736.63	736.63	240.39	240.39

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	4587.07	35.84	1426.28	11.14

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	2635.81	2635.81

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	739.13	739.13	152.52	152.52

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	4571.83	35.72	900.39	0.703

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	1835.86	14.34

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

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