Subsystem Performance Testing Report for

EonStor® DS S16E-R2142-6

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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 S16E-R2142-6
	FW	3.85D.21 (FA385D21_224_IFT_ESDSG6S6G.BIN)
	RAM	1GB DDR II SDRAM
	Drives	RAID: Hitachi SAS 300GB (Model: HUS156030VLS600; Capacity: 300GB; Speed: 6G; 15,000 RPM) JBOD Hitachi SAS 300GB (Model: HUS156030VLS600; Capacity: 300GB; Speed: 6G; 15,000 RPM)
	Channels	Host Channel - Channel 0, 1 , 2 , 3, 4 , 5
		Drive Channel - Channel 6, 7
		RCC Channel – Channel 8
	Virtual Volumes (RAID5/6) (Four Channels)	LV0 - Host channel 0; AID 112; LUN 0; 8 drives/channel; 1 partition
		LV1 - Host channel 1; BID 113; LUN 0; 8 drives/channel; 1 partition
		LV2 - Host channel 0; AID 112; LUN 0; 8 drives/channel; 1 partition
		LV3 - Host channel 1; BID 113; LUN 0; 8 drives/channel; 1 partition
	Virtual Volumes (RAID5/6) (Four Groups)	LV0 - Host channel (0,1,2); AID 112; LUN 0; 8 drives/channel; 1 partition
		LV1 - Host channel (3,4,5); BID 113; LUN 0; 8 drives/channel; 1 partition

		LV2 - Host channel (0,1,2); AID 112; LUN 0; 8 drives/channel; 1 partition
		LV3 - Host channel (3,4,5); 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.c.33
HBA	OS Register	MaximumSGList: FF (Hexadecimal)
		NumberOfRequests: FF (Hexadecimal)
	Intel	Intel Pro/1000 PT Quad Port LP (Drive : 9.12.36) * 2
	On Board	Intel 82576 Gigabit Dual Port Network Adapter(Drive:10.6.15)
Server * 2 (Host)	M/B	SUPERMICRO X8 DTN Single
	CPU	Intel Xeon CPU E5506 2.13GHz
	RAM	Kingston 2GB DDRIII 1333 DIMM * 12
	PCI	PCI-X 64-bit/133MHz *3,PCI-E2.0 X8*2,PCI-E X4*1
	System Drive	SATA WD1500HLFS 150G(WXL908026216)
	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.

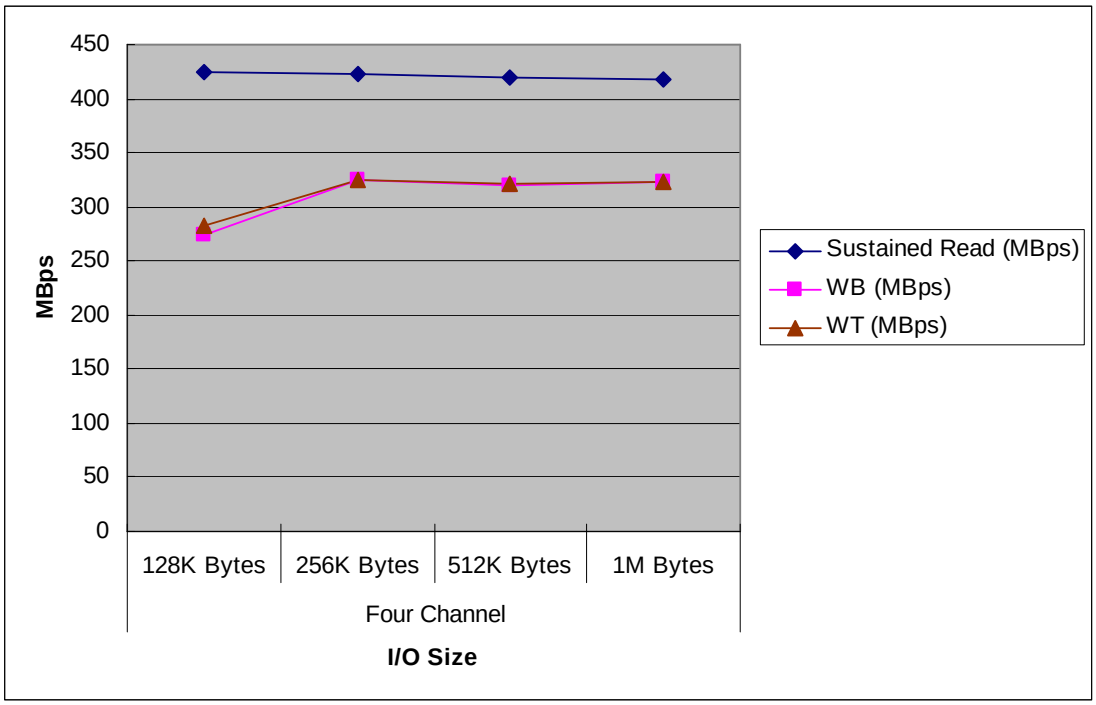
2.1 End-to-End RAID 5 Performance

2.11 Sequential I/O

>> 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	424.68	273.61	282.29
	256K Bytes	422.54	324.18	324.78
	512K Bytes	420.22	320.06	322.16
	1M Bytes	418.08	322.39	323.05



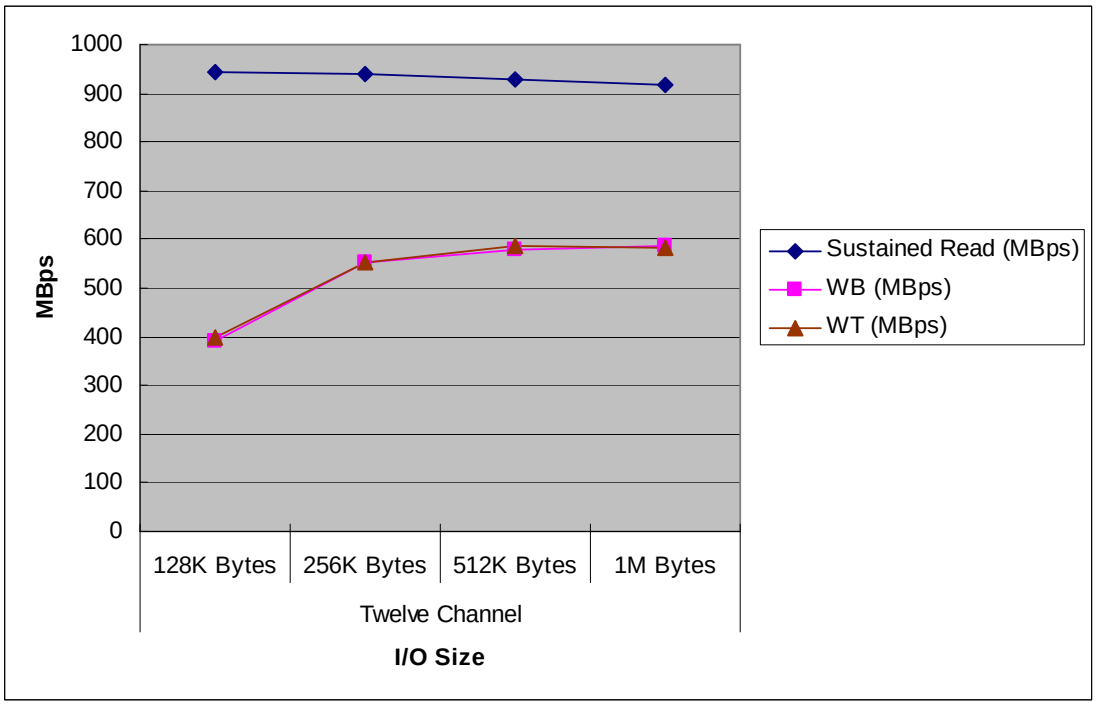
Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Four Channel	512 Bytes	94040.11	38648.65
	4K Bytes	63052.27	26765.02

>> Twelve Channel (Four Channels in 1 group)

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	944.41	390.99	400.35
	256K Bytes	939.55	554.43	551.96
	512K Bytes	927.88	578.99	585.45
	1M Bytes	918.45	585.13	582.49



Data Access Rate (IOPS)

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

2.12 Random I/O

>> Four Channel

Data Transfer Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Four Channel	512 Bytes	6559.61	3742.55
	4K Bytes	6550.26	3723.55

>> Twelve Channel (Four Channels in 1 group)

Data Transfer Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Twelve Channel	512 Bytes	6340.45	3716.53
	4K Bytes	6336.30	3713.64

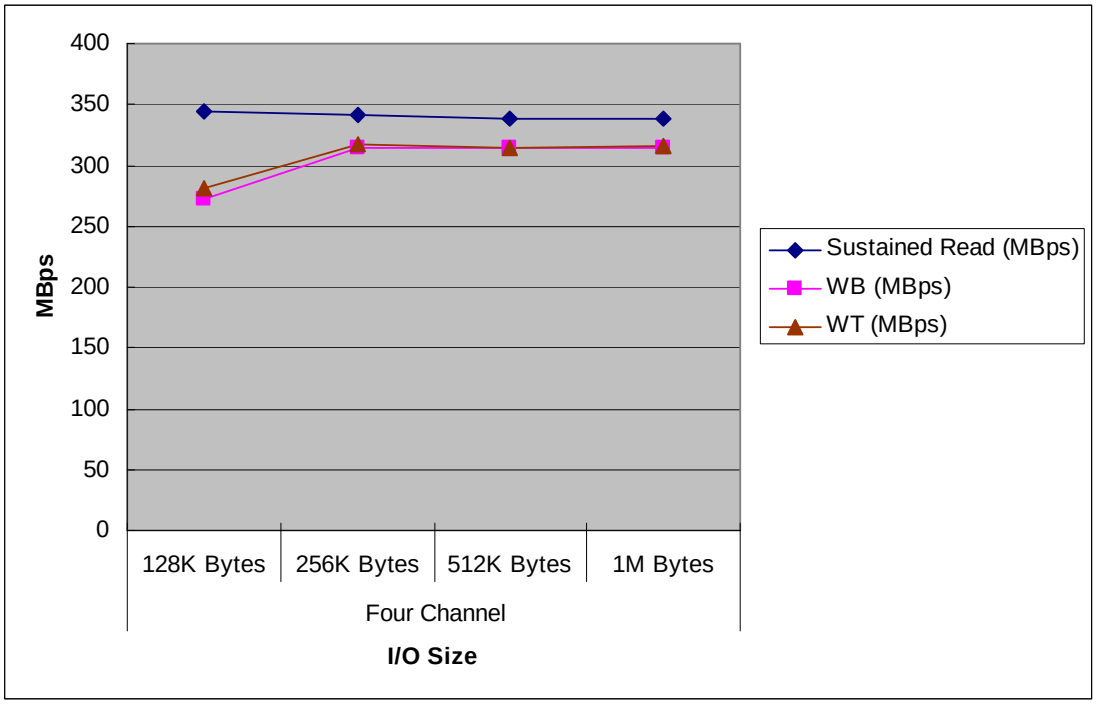
2.2 End-to-End RAID 6 Performance

2.21 Sequential I/O

>> 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	344.10	272.26	280.48
	256K Bytes	341.42	314.15	317.16
	512K Bytes	338.87	314.15	314.94
	1M Bytes	338.25	314.41	316.32



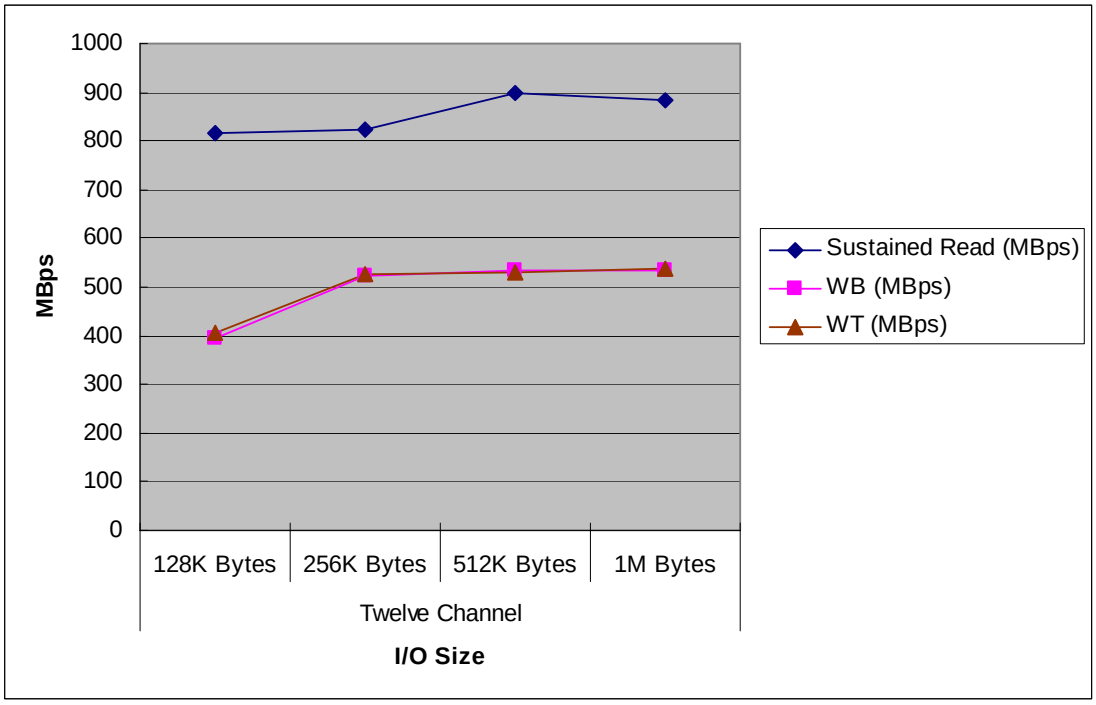
Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Four Channel	512 Bytes	6550.57	2677.86
	4K Bytes	6548.95	2642.50

>> Twelve Channel (Four Channels in 1 group)

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)	WT (MB/sec)
Host Channels	**I/O Size**			
Twelve Channel	128K Bytes	817.36	395.69	407.59
	256K Bytes	822.87	521.57	525.89
	512K Bytes	899.69	533.94	531.17
	1M Bytes	882.34	533.13	536.43



Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Twelve Channel	512 Bytes	6550.57	2677.86
	4K Bytes	6548.95	2642.50

2.22 Random I/O

>> Four Channel

Data Transfer Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Dual Channel	512 Bytes	6348.90	2653.10
	4K Bytes	6336.64	2625.21

>> Twelve Channel (Four Channels in 1 group)

Data Transfer Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Dual Channel	512 Bytes	6559.61	3742.55
	4K Bytes	6550.26	3723.55

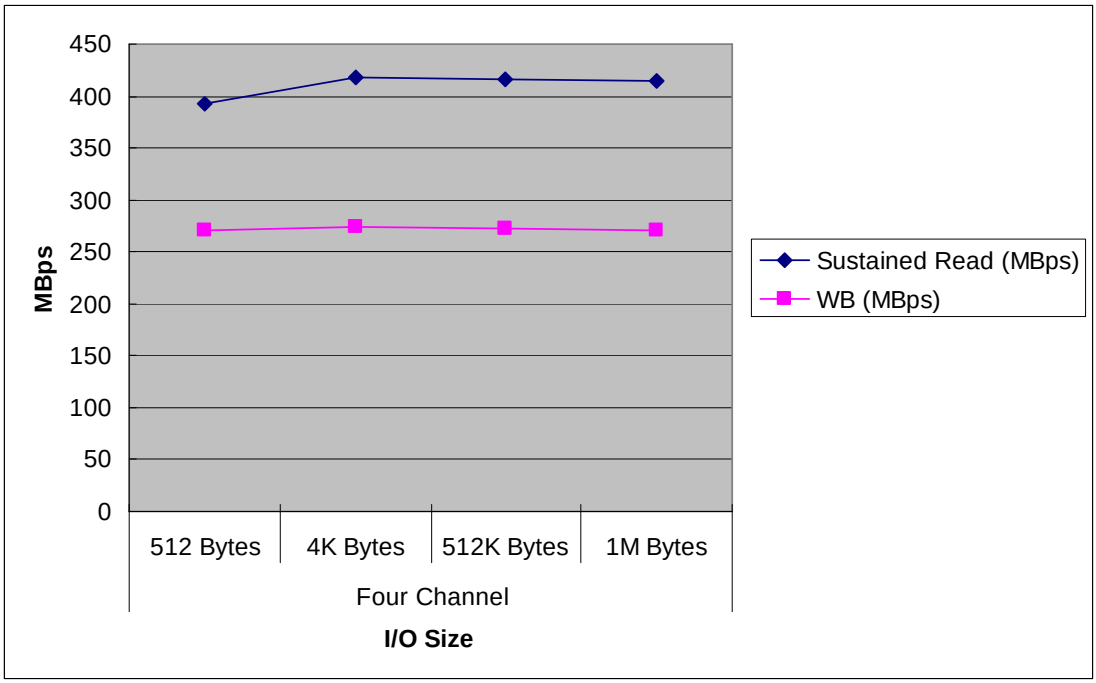
2.3 Degraded RAID 5 Performance

2.31 Sequential I/O

>> Four Channel

Data Transfer Rate (MBps)

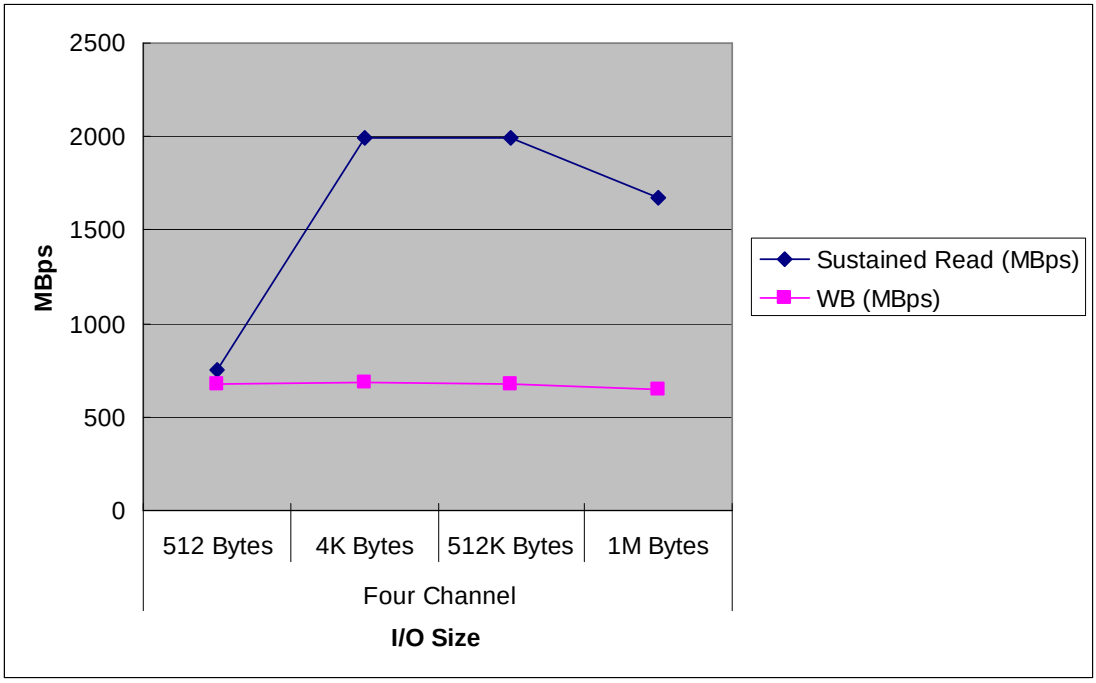
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	392.18	271.50
	256K Bytes	417.29	274.58
	512K Bytes	416.23	271.63
	1M Bytes	415.06	270.88



>> Twelve Channel (4 Channels in 1 group)

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Twelve Channel	128K Bytes	849.10	395.24
	256K Bytes	840.87	398.02
	512K Bytes	826.34	419.35
	1M Bytes	815.05	421.79



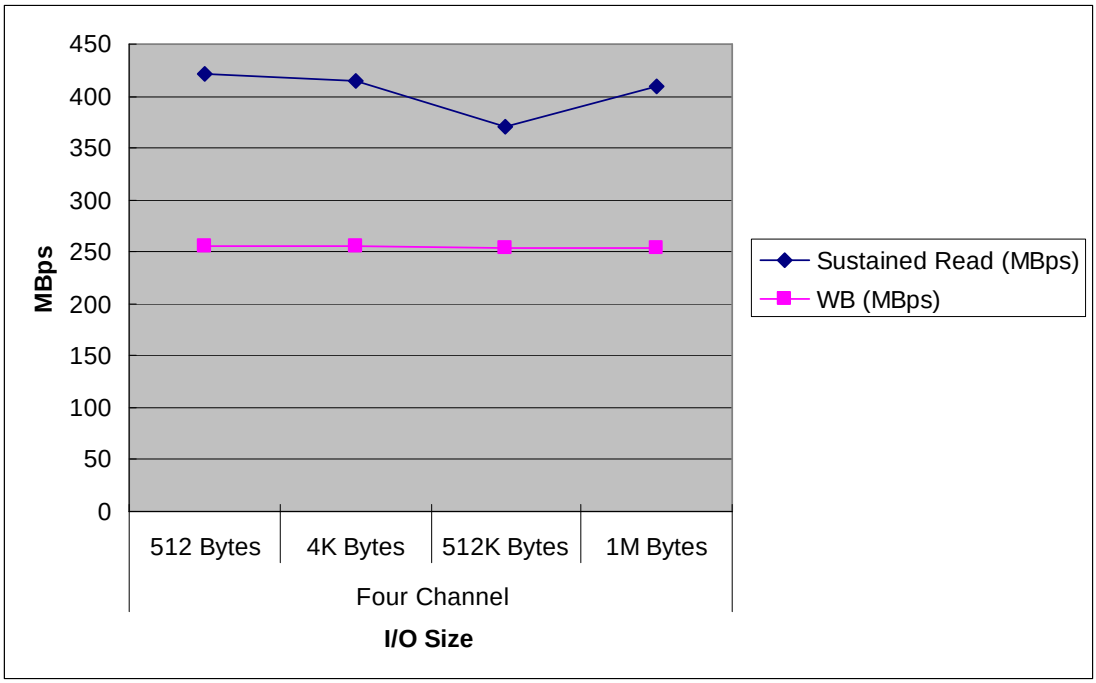
2.4 Degraded RAID 6 Performance

2.41 Sequential I/O – 1 Drive Failed

>> Four Channel

Data Transfer Rate (MBps)

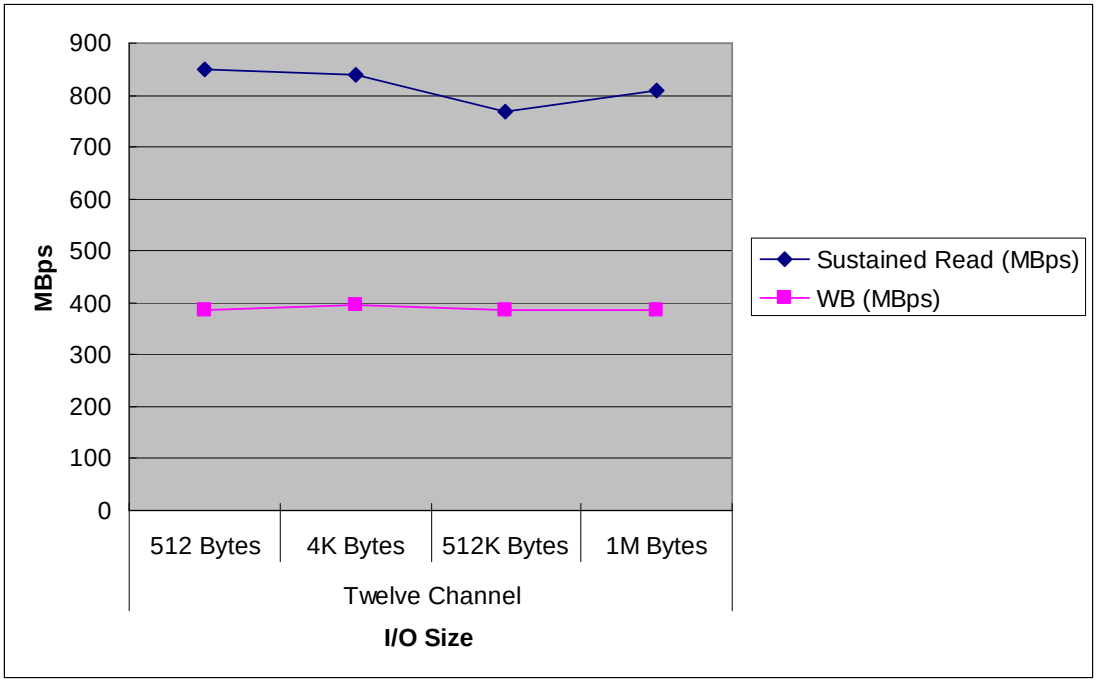
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	420.55	254.67
	256K Bytes	413.98	256.29
	512K Bytes	370.59	253.74
	1M Bytes	409.59	253.32



>> Twelve Channel (4 Channels in 1 group)

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Twelve Channel	128K Bytes	847.63	385.02
	256K Bytes	839.92	396.15
	512K Bytes	769.30	385.21
	1M Bytes	806.98	385.64

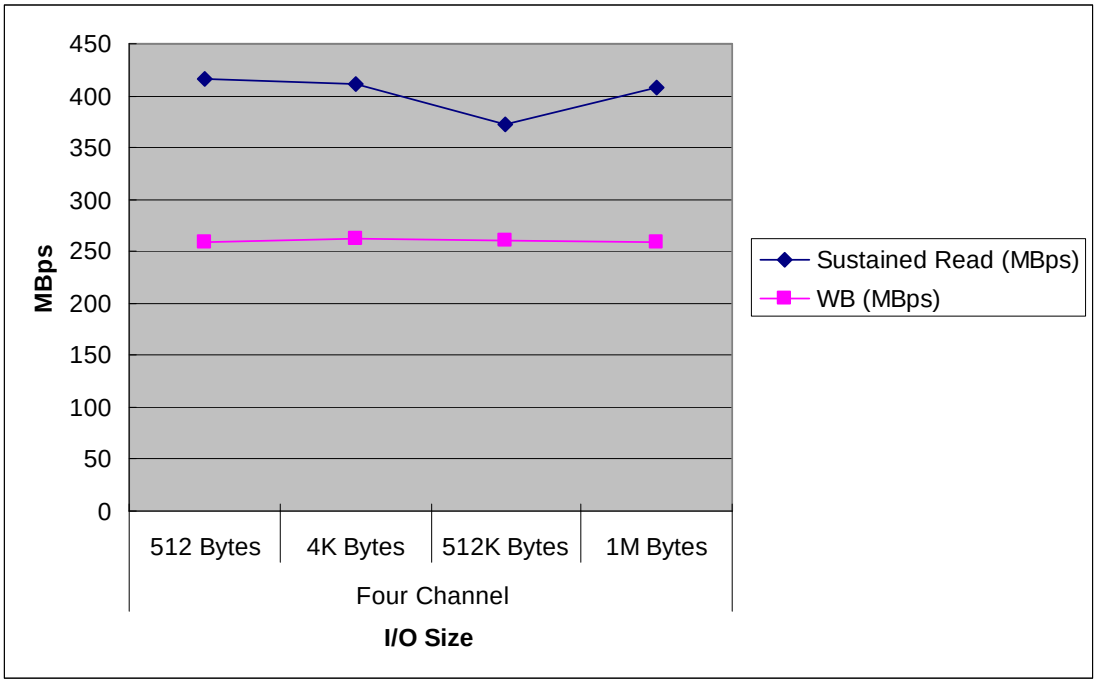


2.42 Sequential I/O – 2 Drives Failed

>> Four Channel

Data Transfer Rate (MBps)

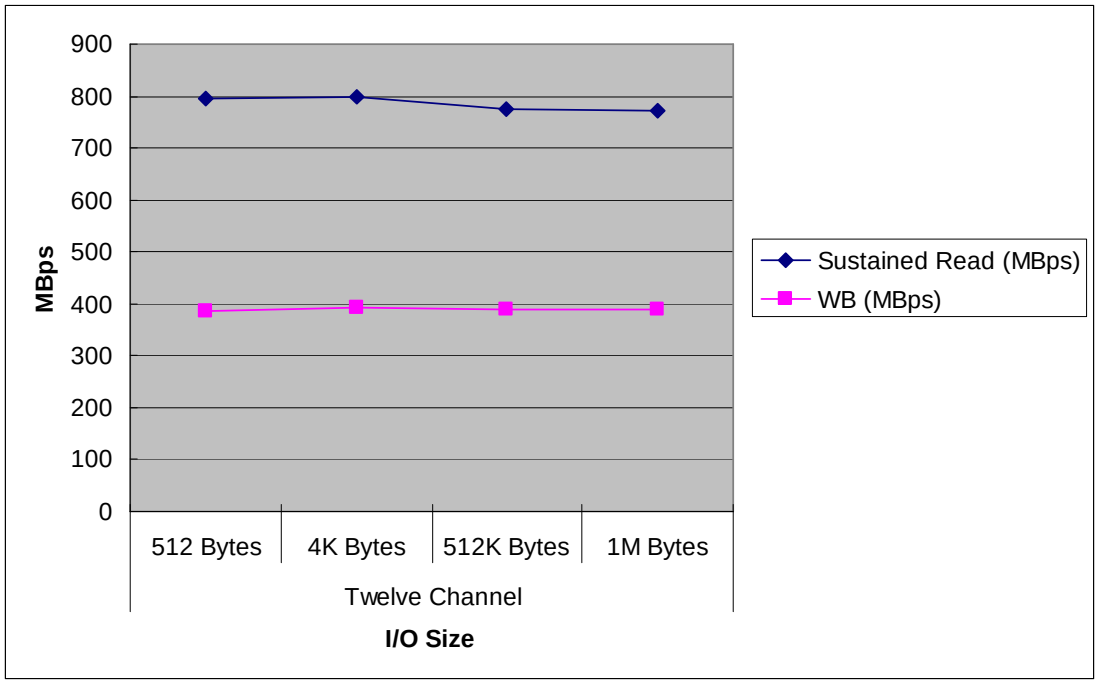
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	416.61	259.34
	256K Bytes	410.34	261.82
	512K Bytes	371.52	259.93
	1M Bytes	407.52	258.61



>> Twelve Channel (4 Channels in 1 group)

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Twelve Channel	128K Bytes	793.79	386.71
	256K Bytes	799.45	393.56
	512K Bytes	774.22	388.42
	1M Bytes	771.16	388.84



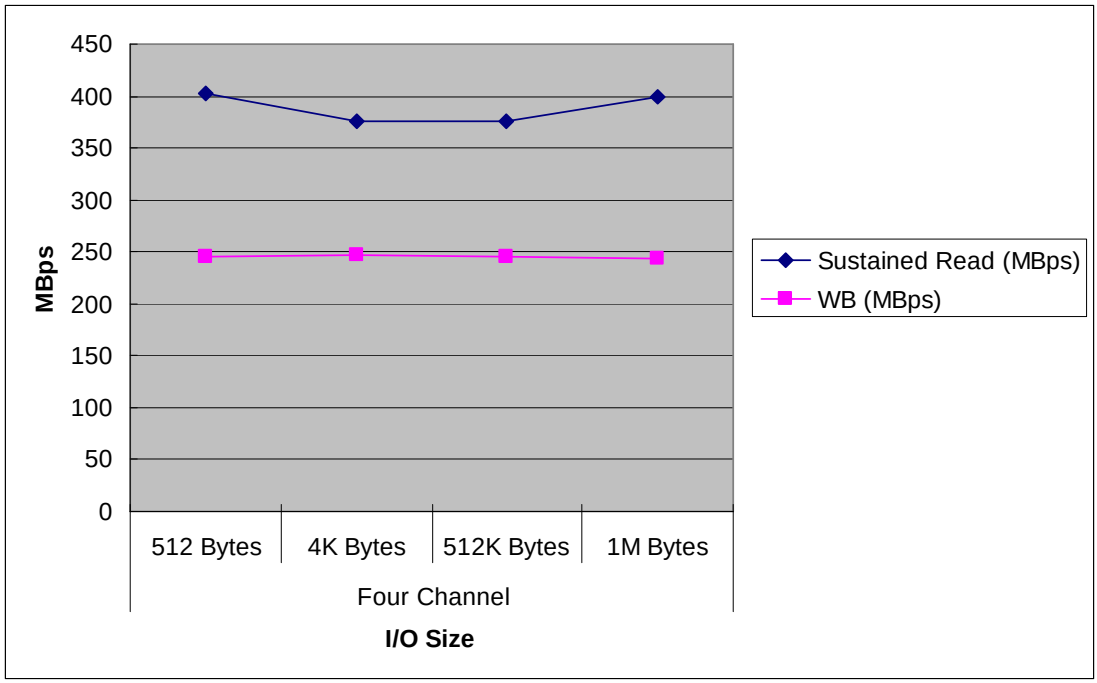
2.5 Rebuilding RAID 5 Performance

2.51 Sequential I/O

>> Four Channel

Data Transfer Rate (MBps)

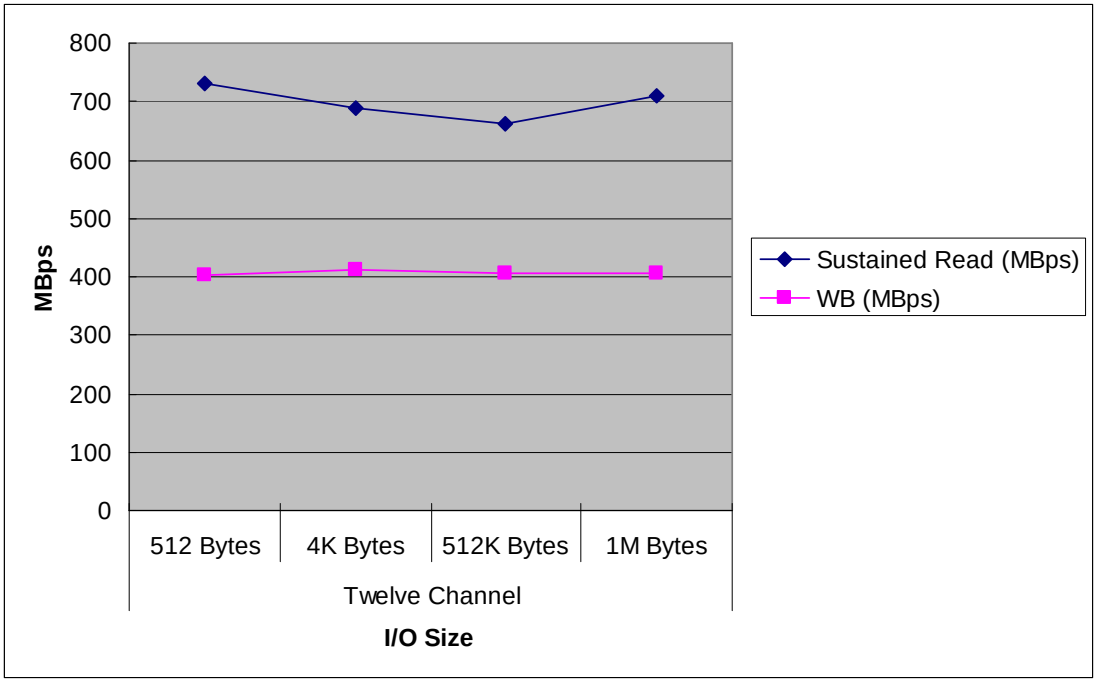
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	402.42	245.28
	256K Bytes	375.46	247.00
	512K Bytes	376.04	244.85
	1M Bytes	399.38	243.17



>> Twelve Channel (4 Channels in 1 gourp)

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Twelve Channel	128K Bytes	732.15	402.09
	256K Bytes	689.22	412.54
	512K Bytes	661.27	406.89
	1M Bytes	709.08	407.14



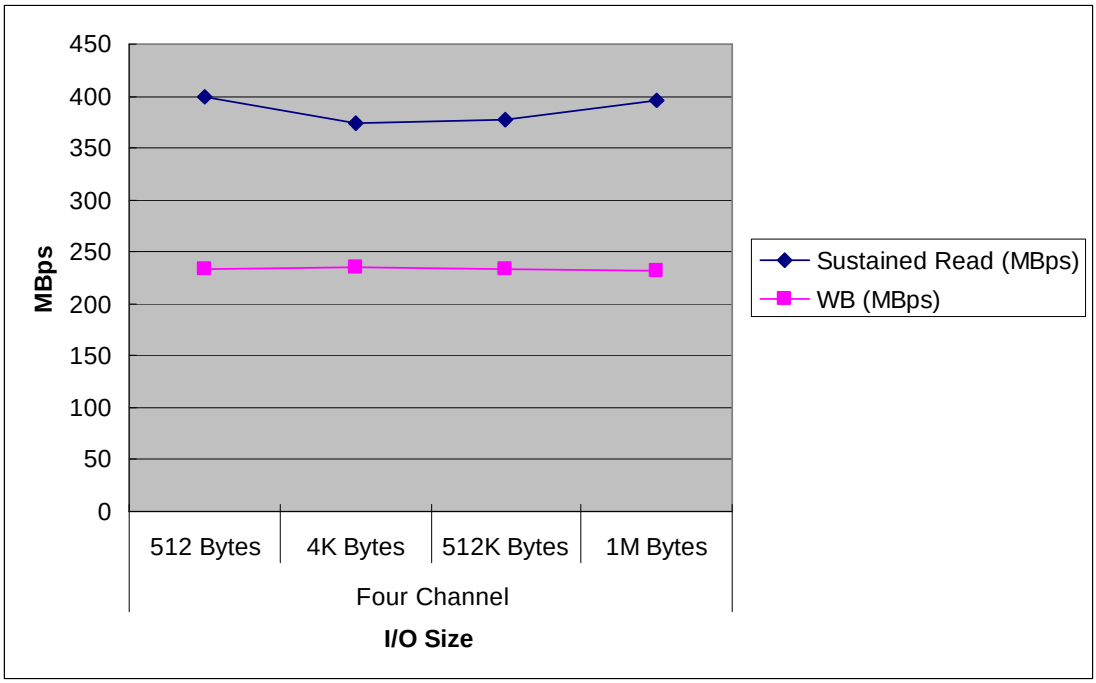
2.6 Rebuilding RAID 6 Performance

2.61 Sequential I/O – 2 Drives Rebuilding

>> Four Channel

Data Transfer Rate (MBps)

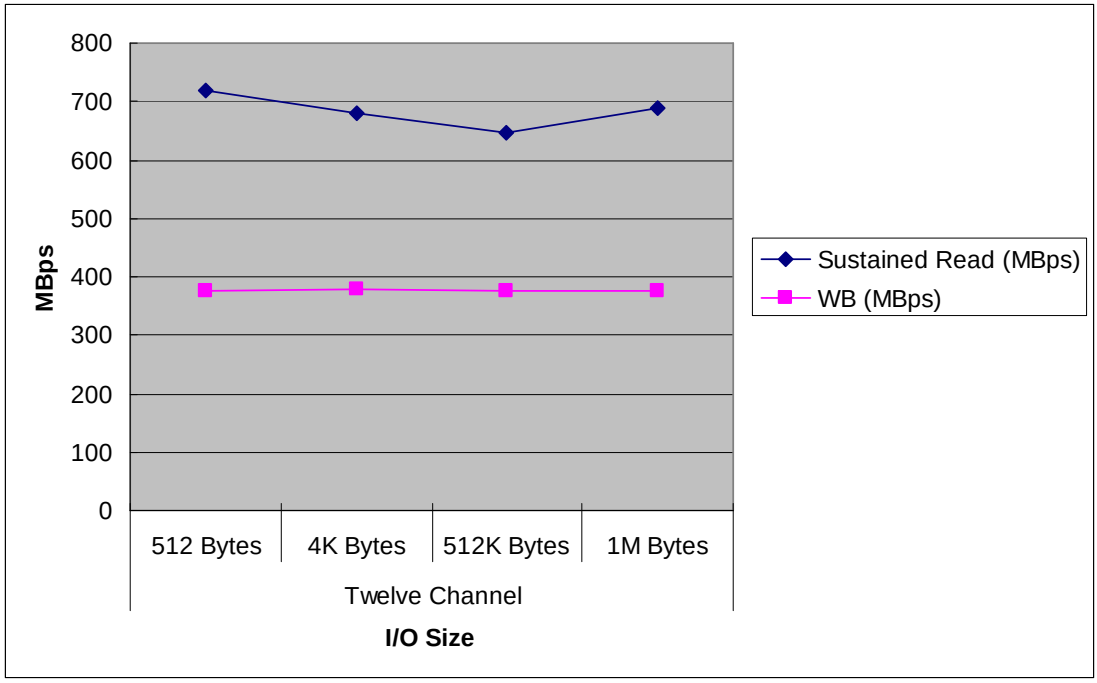
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	398.70	234.08
	256K Bytes	373.46	235.26
	512K Bytes	377.65	232.72
	1M Bytes	395.38	232.47



>> Twelve Channel (4 Channels in 1 group)

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Twelve Channel	128K Bytes	717.48	375.16
	256K Bytes	680.85	380.21
	512K Bytes	647.61	376.99
	1M Bytes	687.44	376.34



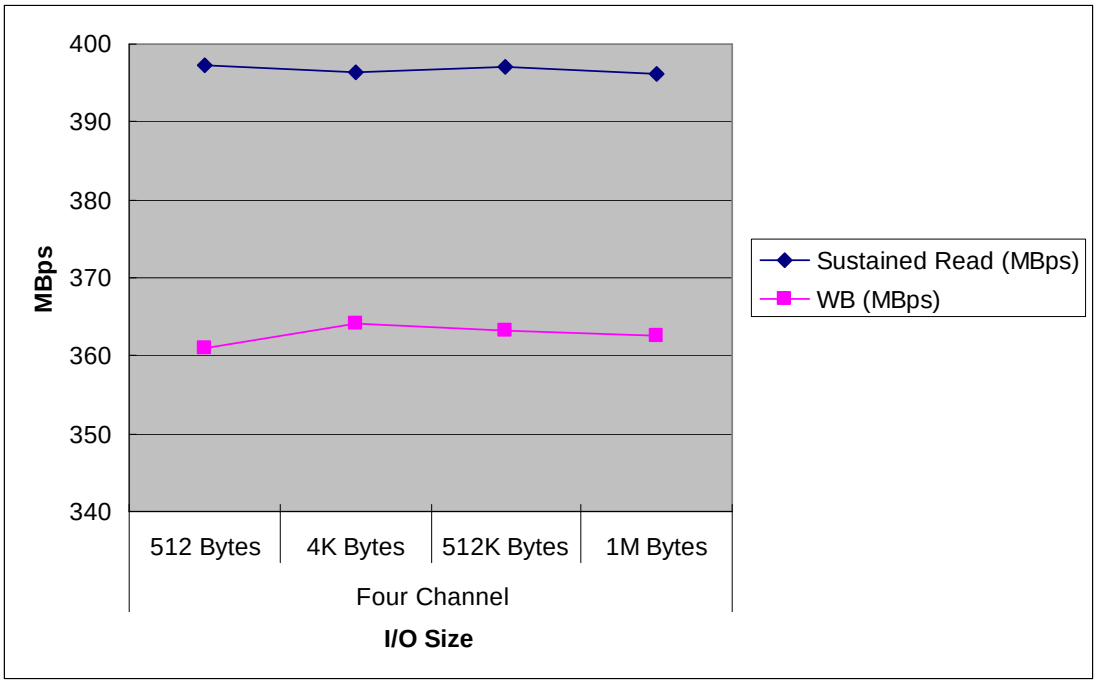
2.7 All Cache Hit RAID 5 Performance

2.71 Sequential I/O

>> Four Channel

Data Transfer Rate (MBps)

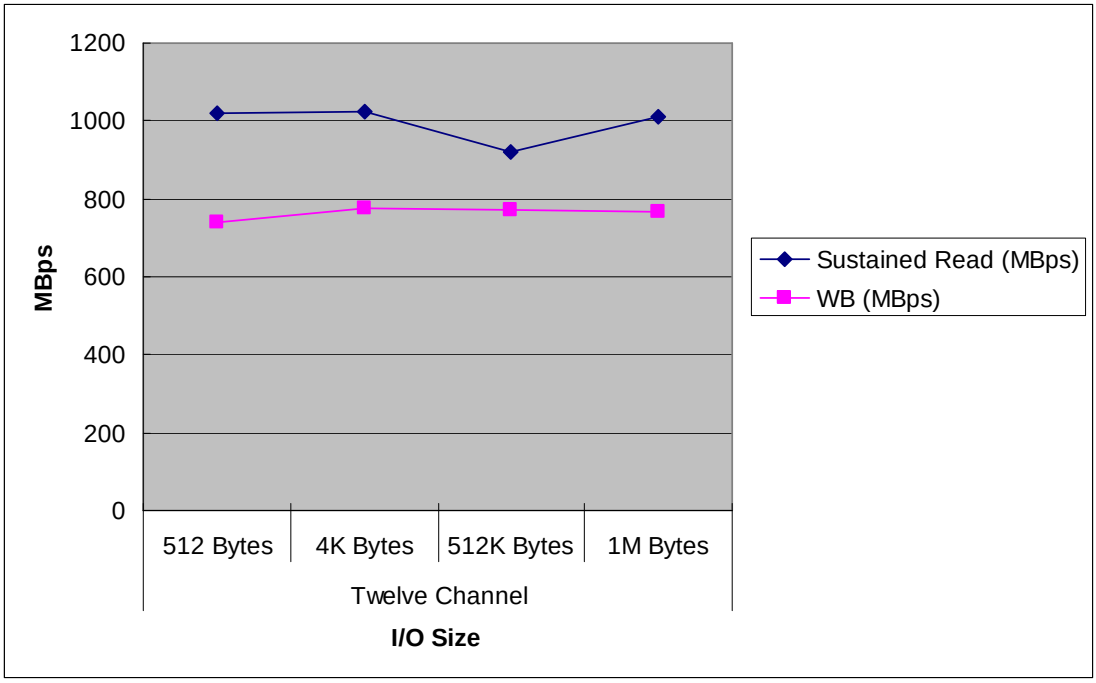
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	397.20	361.02
	256K Bytes	396.42	364.17
	512K Bytes	397.10	363.20
	1M Bytes	396.23	362.65



>> Twelve Channel (4 Channels in 1 group)

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Twelve Channel	128K Bytes	1019.70	740.16
	256K Bytes	1023.26	773.99
	512K Bytes	921.66	770.38
	1M Bytes	1011.56	765.02



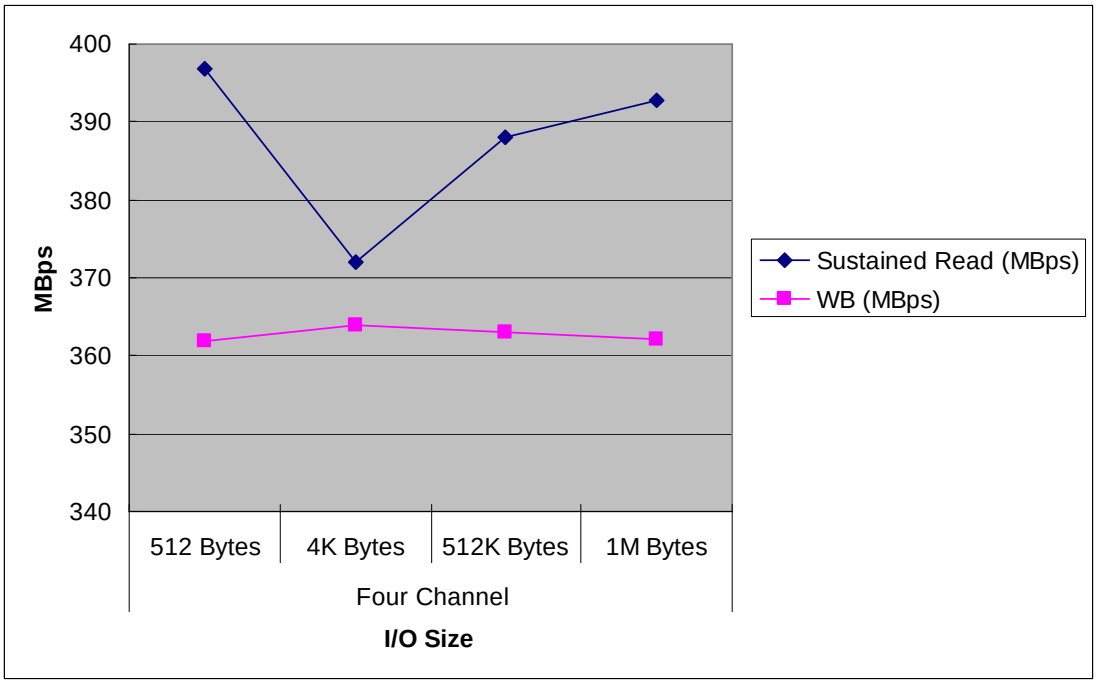
2.8 All Cache Hit RAID 6 Performance

2.81 Sequential I/O

>> Four Channel

Data Transfer Rate (MBps)

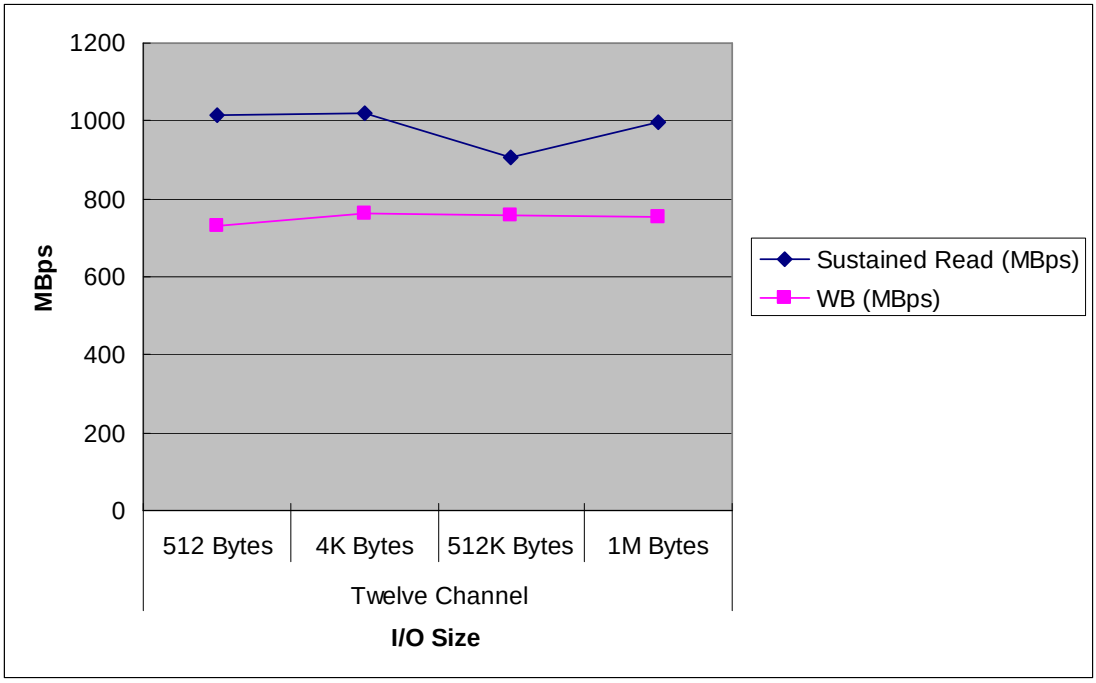
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	396.83	361.77
	256K Bytes	372.10	363.80
	512K Bytes	388.11	362.91
	1M Bytes	392.73	362.03



>> Twelve Channel (4 Channels in 1 group)

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Twelve Channel	128K Bytes	1013.61	729.48
	256K Bytes	1017.53	762.80
	512K Bytes	908.34	756.79
	1M Bytes	994.93	753.01



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

>> Twelve Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Twelve Channel (3 Channels in 1 group)	1M Bytes	410.20	410.20	225.37	225.37

3.12 Random I/O

>> Twelve Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Twelve Channel (3 Channels in 1 group)	8K Bytes	2172.17	16.97	691.24	5.40

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Twelve Channel (3 Channels in 1 group)	8K Bytes	1080.51	8.44

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

3.21 Sequential I/O

>> Six Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Six Channel	1M Bytes	285.77	285.77	158.67	158.67

3.22 Random I/O

>> Six Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Six Channel	8k Bytes	2903.10	22.68	1357.62	10.61

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Six Channel	8K Bytes	2222.70	17.36

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

3.31 Sequential I/O

>> Six Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Six Channel	1M Bytes	288.30	288.30	116.22	7116.22

3.32 Random I/O

>> Six Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Six Channel	8k Bytes	4711.40	36.81	873.51	6.82

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Six Channel	8K Bytes	1740.18	13.60

3.4 Snapshot Copy-on-Write End-to-End RAID 6 Performance

3.41 Sequential I/O

>> Twelve Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Twelve Channel (3 Channels in 1 group)	1M Bytes	409.22	409.22	207.02	207.02

3.42 Random I/O

>> Twelve Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Twelve Channel (3 Channels in 1 group)	8K Bytes	2302.45	17.99	681.84	5.33

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Twelve Channel (3 Channels in 1 group)	8K Bytes	1072.33	8.38

3.5 Split Mirror End-to-End RAID 6 Performance (Source to 1 Target)

3.51 Sequential I/O

>> Six Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Six Channel	1M Bytes	259.71	259.71	150.43	150.43

3.52 Random I/O

>> Six Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Six Channel	8k Bytes	3675.04	28.71	1104.23	8.63

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Six Channel	8K Bytes	1978.75	15.46

3.6 Split Mirror End-to-End RAID 6 Performance (Source to 2 Targets)

3.61 Sequential I/O

>> Six Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Six Channel	1M Bytes	262.58	262.58	112.55	112.55

3.62 Random I/O

>> Six Channel

Data Transfer Rate

I/O Parameters		Read		WB	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**	**IOPS**	**MB/sec**
Six Channel	8k Bytes	3963.80	30.97	741.26	5.79

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Six Channel	8K Bytes	1466.03	11.45

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

Subsystem	1 Raid
Parameters	1 Source to 1 Target
Finish Time	7 Min