Subsystem Performance Testing Report for

EonStor® DS S16F-R2842-6

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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 S16F-R2842-6
	FW	3.86A.05(FA386A05_303_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	Fiber Host Channel - Channel 0, 1 , 2 , 3 ; iSCSI Host Channel – Channel 4,5
		Drive Channel - Channel 6, 7
		RCC Channel – Channel 8
	Logical Drives (RAID 0/5/6) (Dual Hosts)	LV0 - Host channel 0; AID 112; LUN 0; 16 drives/channel; 1 partition
		LV1 - Host channel 1; BID 113; LUN 0; 16 drives/channel; 1 partition
	Logical Drives (RAID 0/5/6) (Four Hosts)	LV0 - Host channel 0; AID 112; LUN 0; 8 drives/channel; 1 partition
		LV1 - Host channel 0; BID 113; LUN 0; 8 drives/channel; 1 partition
		LV2 - Host channel 1; AID 112; LUN 0; 8 drives/channel; 1 partition
		LV3 - Host channel 1; BID 113; LUN 0; 8 drives/channel; 1 partition

	Logical Drives (RAID 0/5/6) All Cache Hit (Eight Hosts)	LV0 - Host channel 0; AID 112; LUN 0; Host channel 1; AID 112; LUN 0; 4 drives/channel; 1 partition
		LV1 - Host channel 0; BID 113; LUN 0; Host channel 1; BID 113; LUN 0; 4 drives/channel; 1 partition
		LV2 - Host channel 2; AID 112; LUN 0; Host channel 3; AID 112; LUN 0; 4 drives/channel; 1 partition
		LV3 - Host channel 2; BID 113; LUN 0; Host channel 3; BID 113; LUN 0; 4 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
		BBU – On
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)
	OS Register	MaximumSGList: FF (Hexadecimal)
		NumberOfRequests: FF (Hexadecimal)
	HBA card	QLE2562 (Driver VER: 9.1.7.18), Bios: v2.02 *2
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
Software	SANWatch	SANWatch_2.1.e.04

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 113; LUN 0
	Split mirror	V.V Size: 100GB (Source) Virtual Volume 1: Host channel 0; ID 112; LUN 0 (Target) Virtual Volume 2

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.

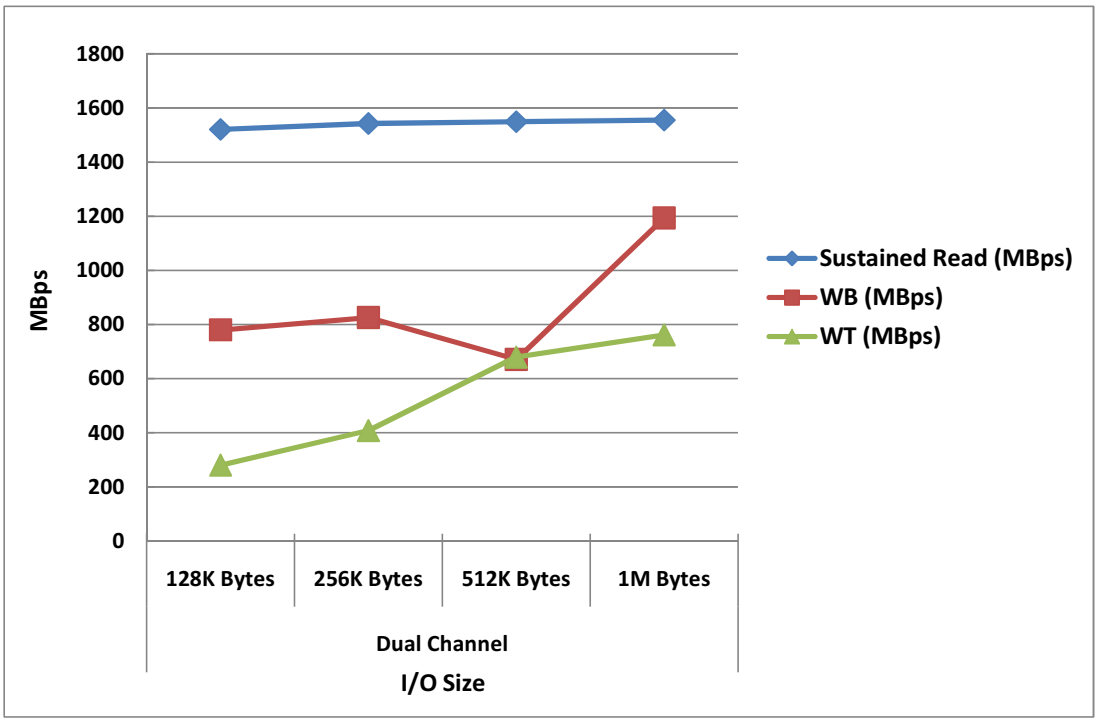
2.1 End-to-End RAID 5 Performance

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	1521.01	779.87	280.97
	256K Bytes	1542.70	826.11	408.54
	512K Bytes	1549.39	671.30	680.14
	1M Bytes	1555.44	1194.37	762.04



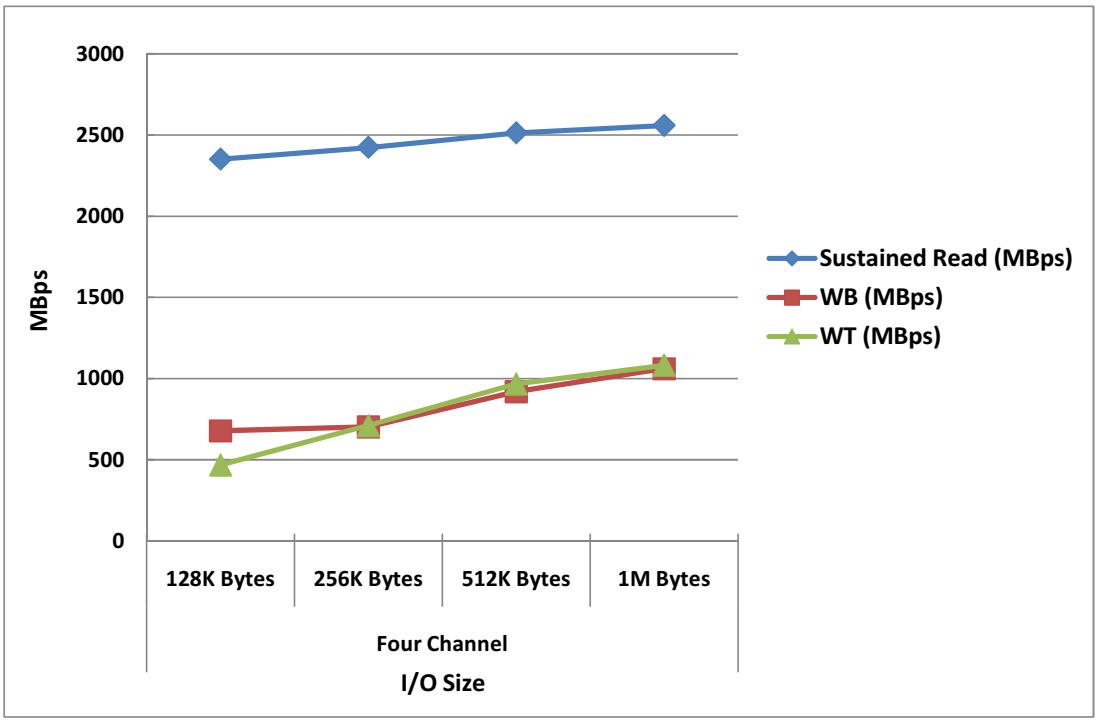
Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Dual Channel	512 Bytes	148431.10	49137.54
	4K Bytes	132057.80	38300.28

>> 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	2351.84	679.45	469.55
	256K Bytes	2424.48	704.53	712.02
	512K Bytes	2514.21	921.08	967.61
	1M Bytes	2559.63	1062.08	1082.91



Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Four Channel	512 Bytes	144220.26	57661.94
	4K Bytes	125716.92	42403.14

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	9094.33	3703.75
	4K Bytes	9081.48	3666.21

>> Four Channel

Data Transfer Rate (IOPS)

I/O Parameters		Read	WB
Host Channels	**I/O Size**	(IOPS)	(IOPS)
Four Channel	512 Bytes	10331.56	3724.36
	4K Bytes	10311.16	3685.96

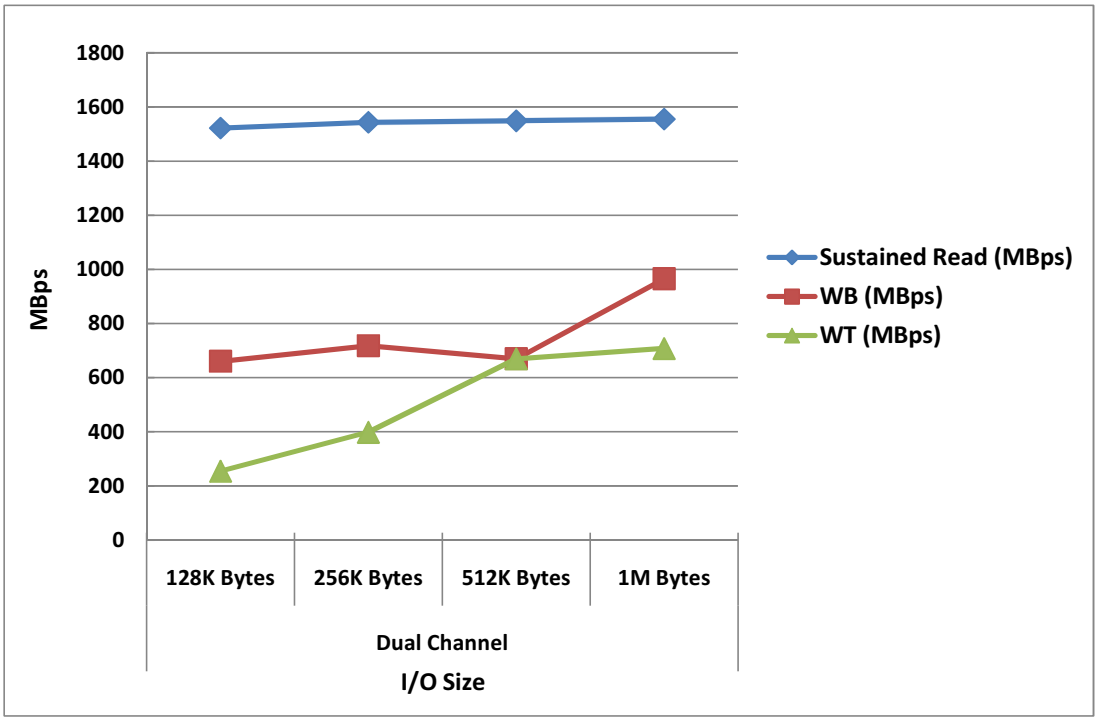
2.2 End-to-End RAID 6 Performance

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	1522.15	660.80	255.10
	256K Bytes	1543.65	717.62	398.70
	512K Bytes	1549.34	670.23	670.03
	1M Bytes	1555.56	965.51	708.11



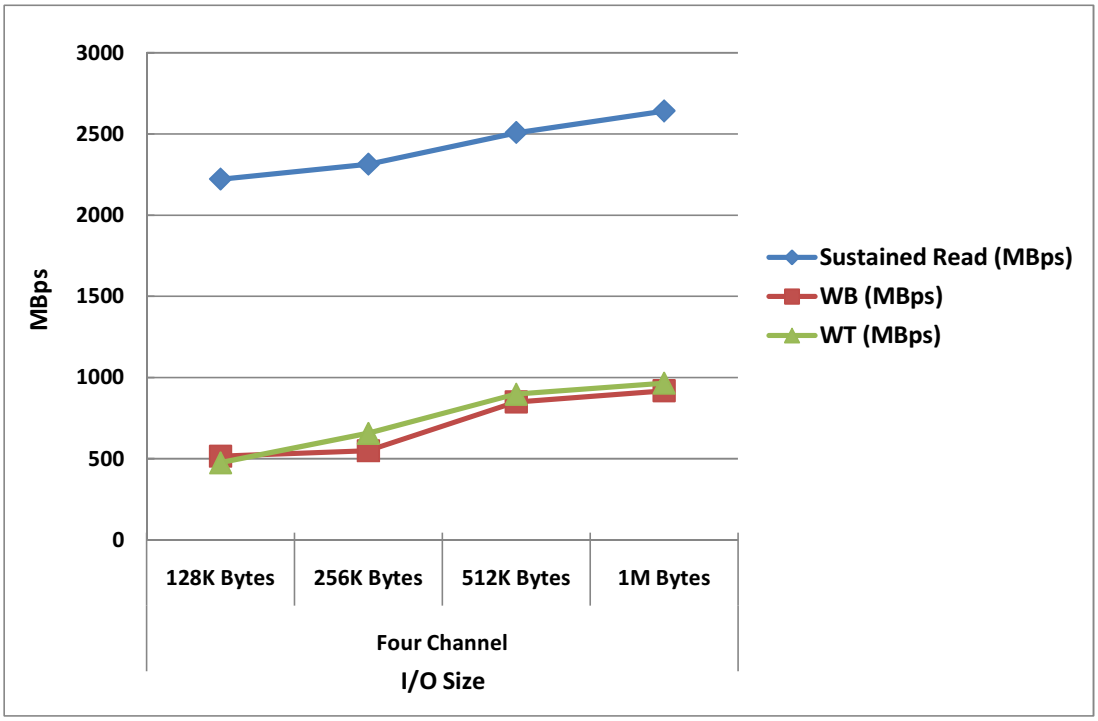
Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Dual Channel	512 Bytes	148254.56	48877.48
	4K Bytes	130496.78	37497.09

>> 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	2223.46	516.69	476.08
	256K Bytes	2314.54	549.54	656.93
	512K Bytes	2509.56	851.29	898.98
	1M Bytes	2642.53	920.30	966.48



Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Four Channel	512 Bytes	145528.65	57140.37
	4K Bytes	124059.76	39371.25

2.22 Random I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read	WB
Host Channels	**I/O Size**	(IOPS)	(IOPS)
Dual Channel	512 Bytes	9079.59	2639.06
	4K Bytes	9099.19	2641.37

>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read	WB
Host Channels	**I/O Size**	(IOPS)	(IOPS)
Four Channel	512 Bytes	10319.73	2646.20
	4K Bytes	10340.30	2638.10

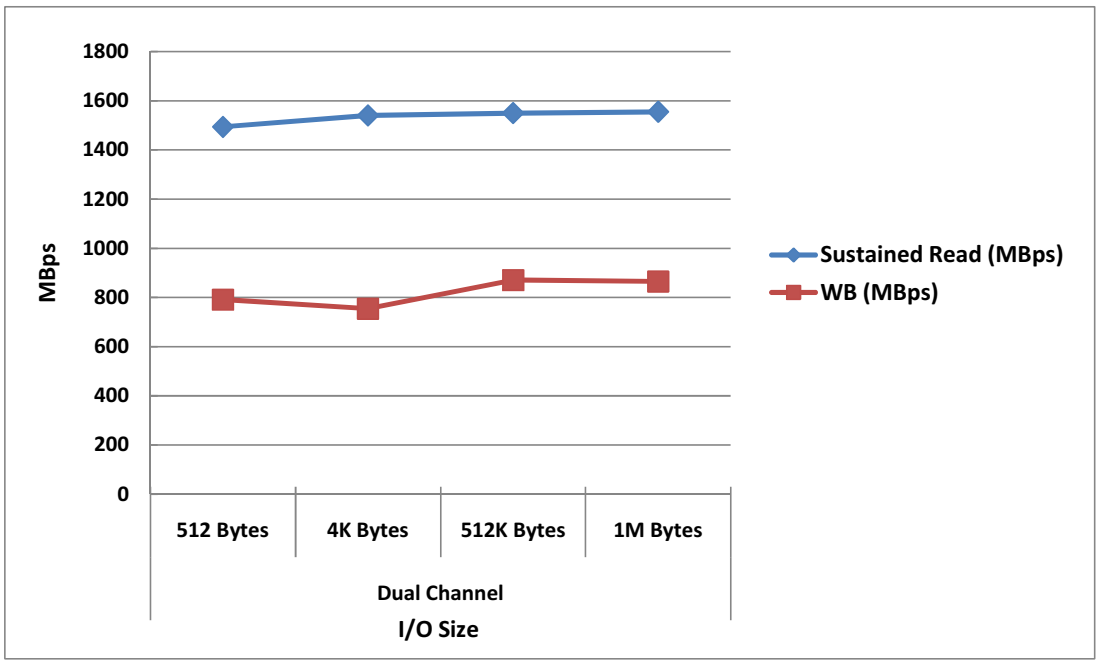
2.3 Degraded RAID 5 Performance

2.31 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

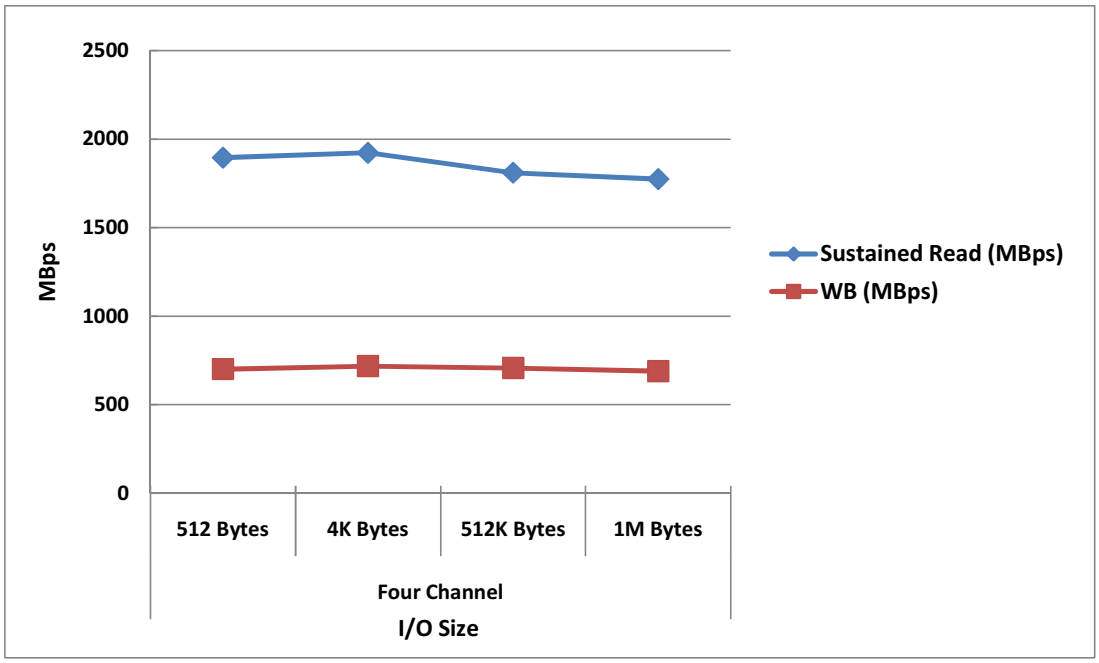
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1493.92	791.12
	256K Bytes	1540.58	753.72
	512K Bytes	1550.05	870.34
	1M Bytes	1555.29	865.01



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1895.05	700.46
	256K Bytes	1922.90	716.95
	512K Bytes	1809.51	705.85
	1M Bytes	1774.10	688.71



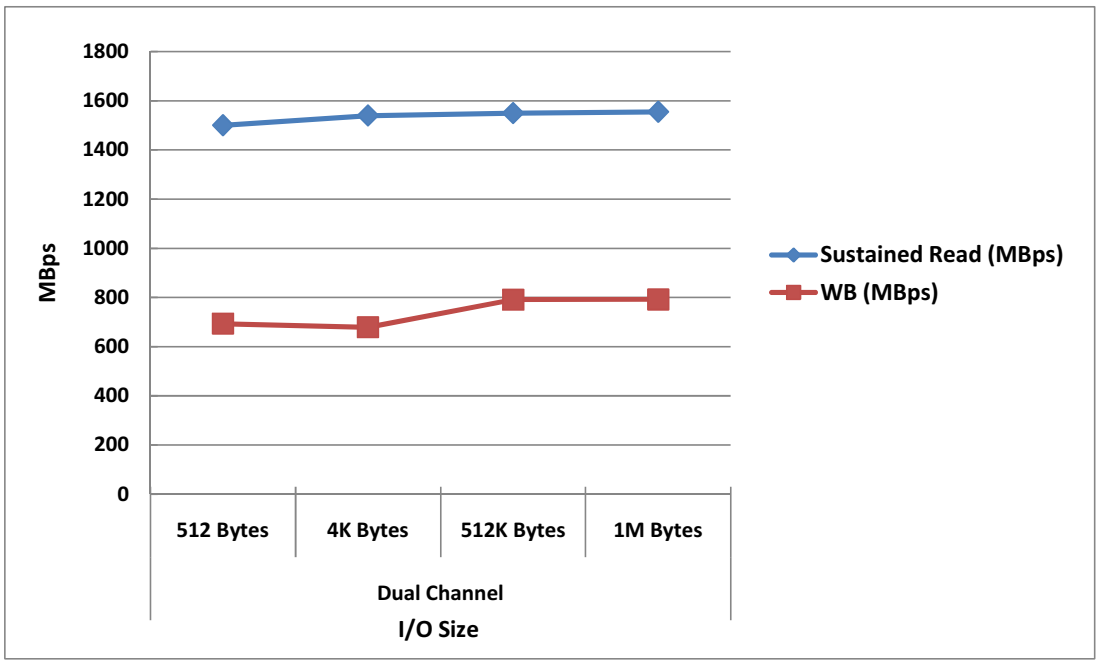
2.4 Degraded RAID 6 Performance

2.41 Sequential I/O – 1 Drive Failed

>> Dual Channel

Data Transfer Rate (MBps)

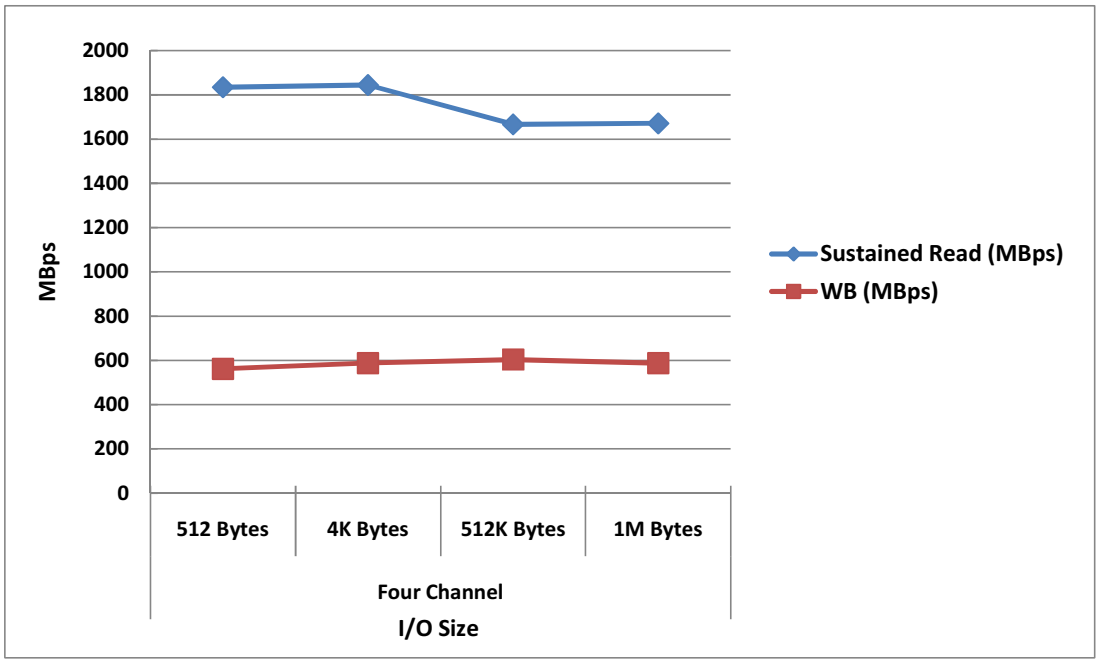
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1500.42	692.67
	256K Bytes	1539.79	678.16
	512K Bytes	1549.92	790.70
	1M Bytes	1555.13	791.95



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1834.78	561.55
	256K Bytes	1844.44	587.67
	512K Bytes	1666.27	603.20
	1M Bytes	1671.71	587.40

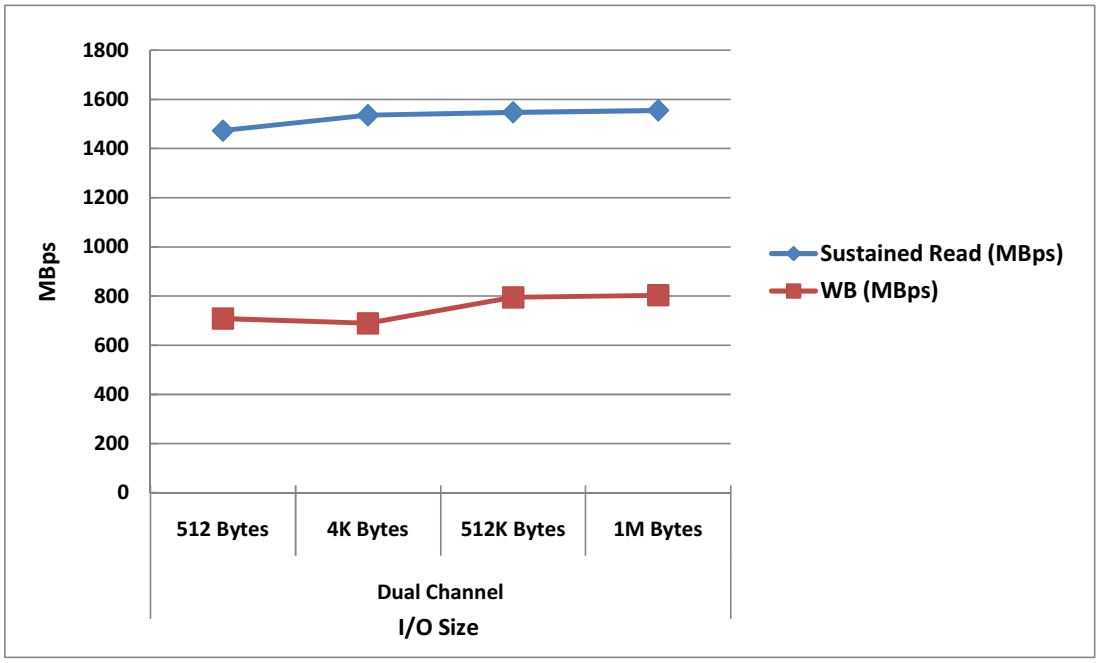


2.42 Sequential I/O – 2 Drives Failed

>> Dual Channel

Data Transfer Rate (MBps)

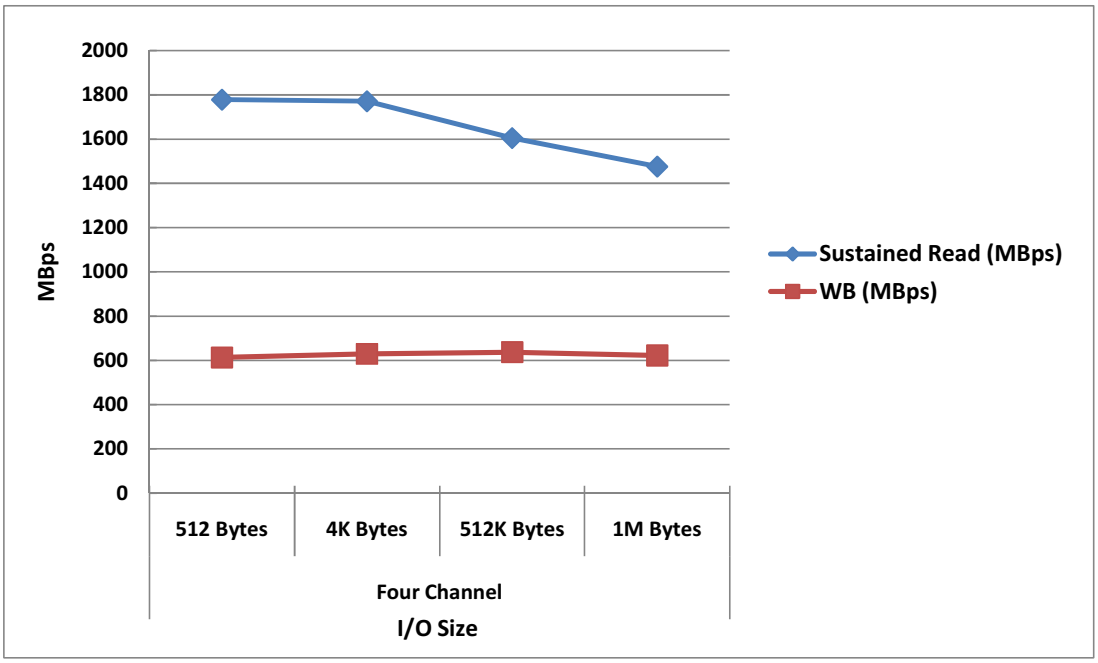
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1473.13	708.56
	256K Bytes	1535.42	689.21
	512K Bytes	1547.20	794.19
	1M Bytes	1554.99	802.60



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1778.43	612.84
	256K Bytes	1771.07	629.12
	512K Bytes	1605.35	636.32
	1M Bytes	1476.03	621.96



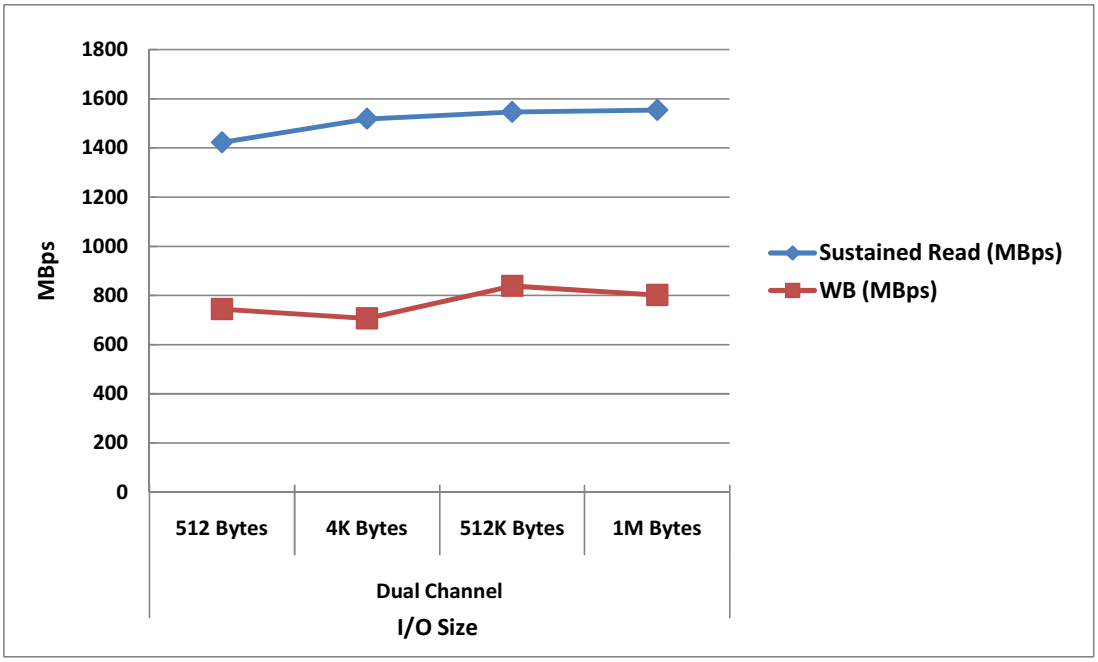
2.5 Rebuilding RAID 5 Performance

2.51 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

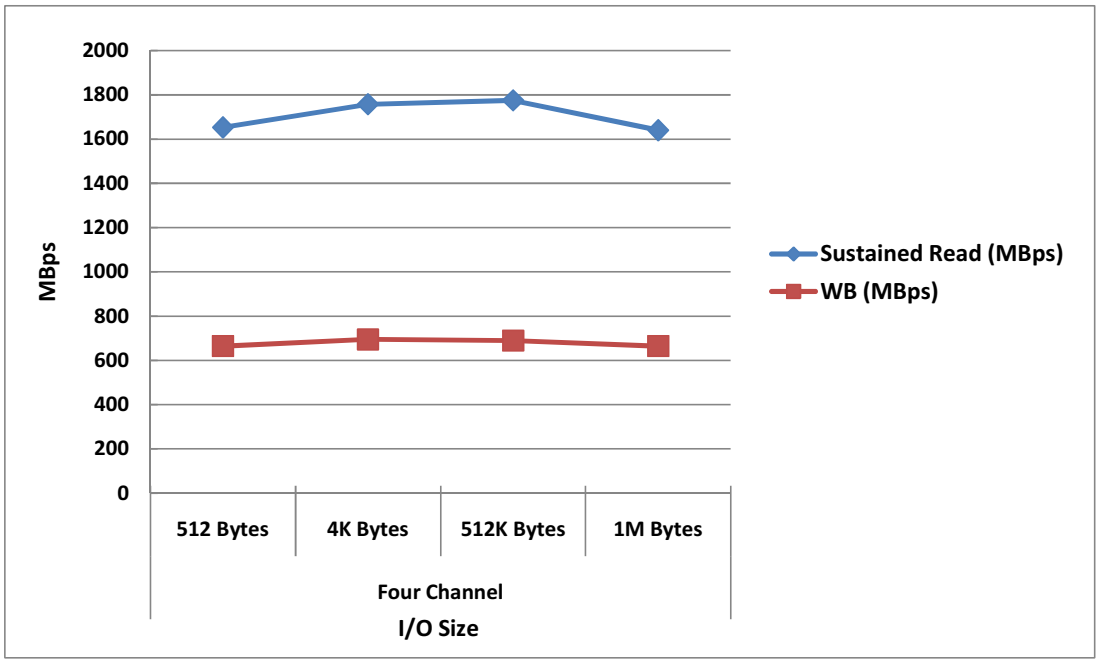
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1422.84	744.58
	256K Bytes	1518.70	706.22
	512K Bytes	1546.13	838.77
	1M Bytes	1554.29	801.21



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1653.07	664.05
	256K Bytes	1757.45	694.38
	512K Bytes	1775.00	688.44
	1M Bytes	1640.24	664.40



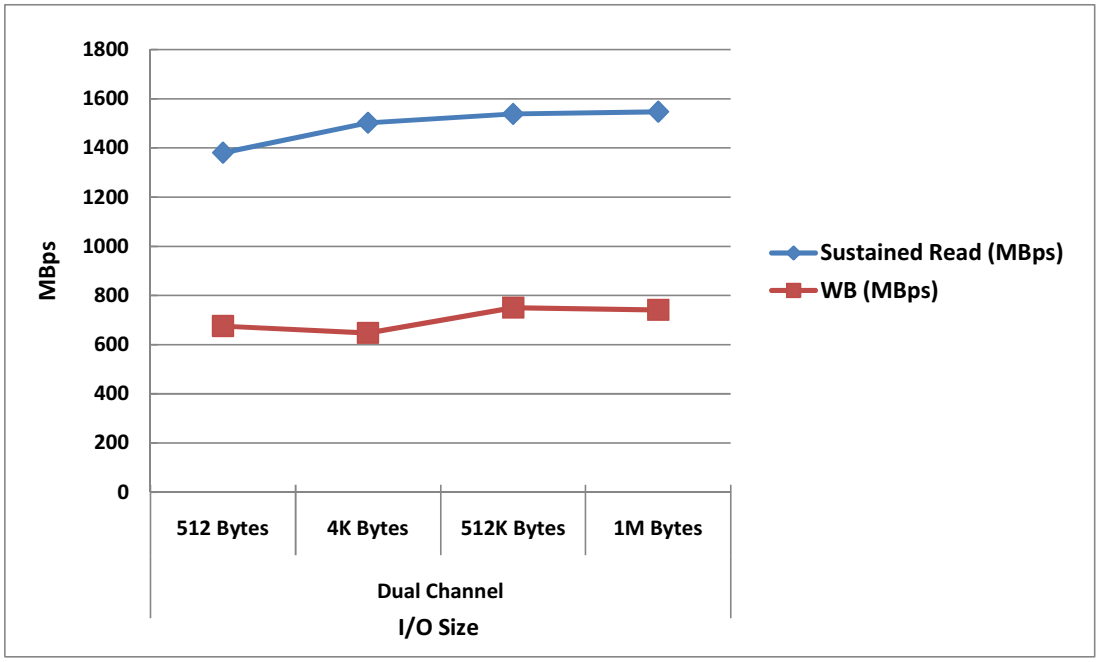
2.6 Rebuilding RAID 6 Performance

2.61 Sequential I/O – 2 Drives Rebuilding

>> Dual Channel

Data Transfer Rate (MBps)

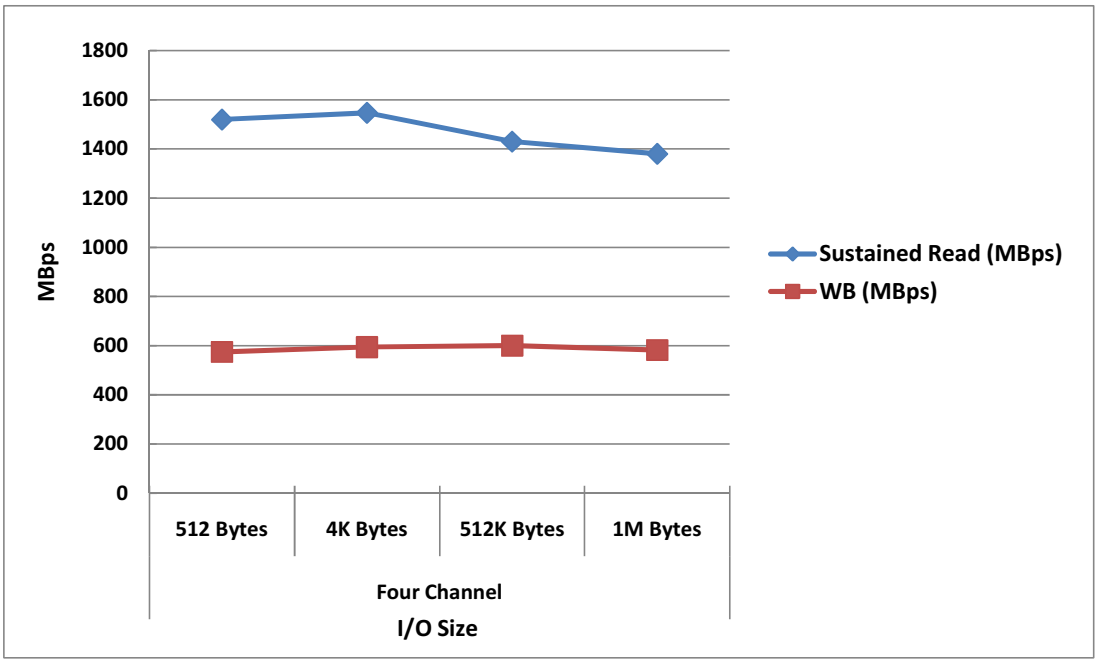
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1380.52	675.25
	256K Bytes	1502.60	646.95
	512K Bytes	1538.11	750.24
	1M Bytes	1547.36	740.97



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1519.35	573.95
	256K Bytes	1546.74	593.57
	512K Bytes	1430.03	599.45
	1M Bytes	1379.99	581.43



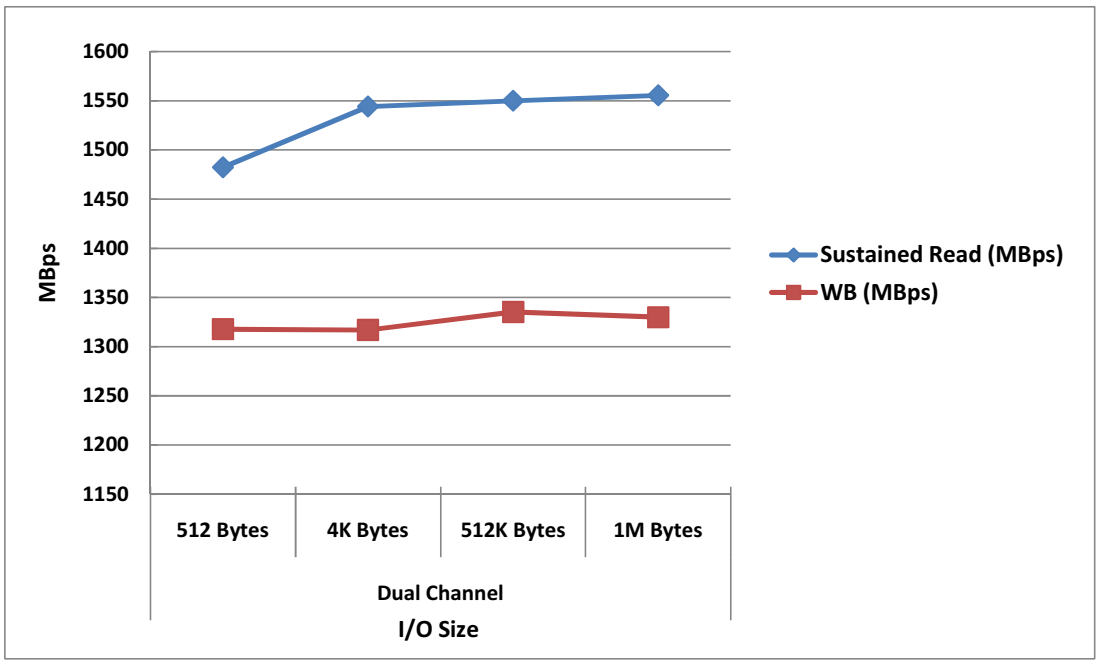
2.7 All Cache Hit RAID 5 Performance

2.71 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

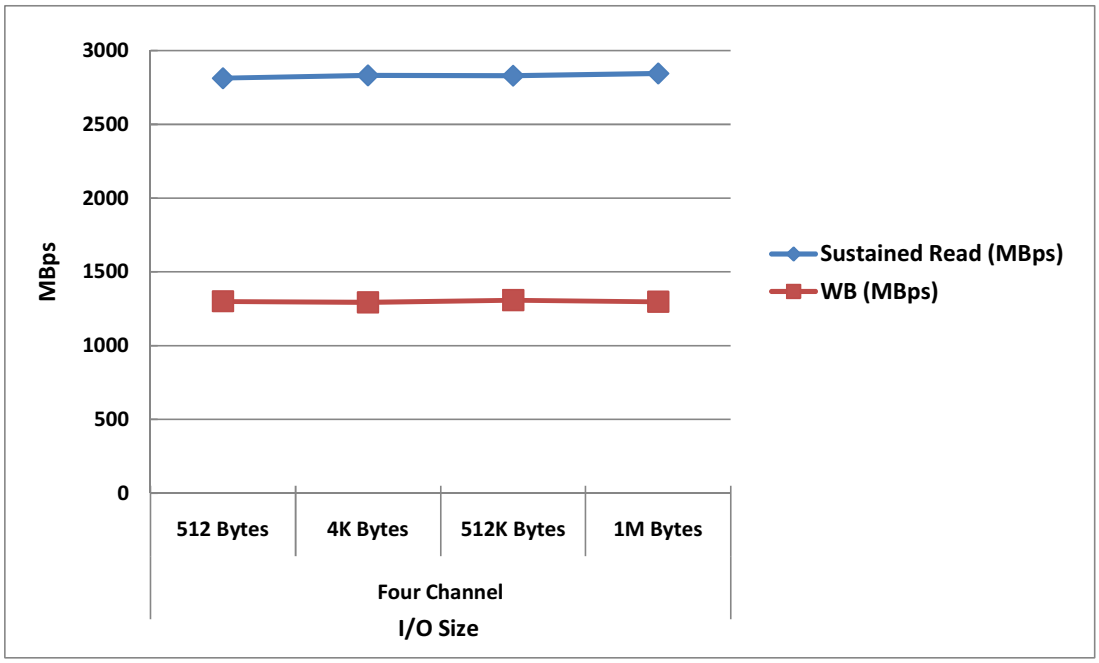
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1482.22	1317.66
	256K Bytes	1544.10	1316.79
	512K Bytes	1549.97	1335.13
	1M Bytes	1555.58	1329.83



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	2812.72	1299.55
	256K Bytes	2832.37	1293.00
	512K Bytes	2829.61	1308.01
	1M Bytes	2844.72	1296.88



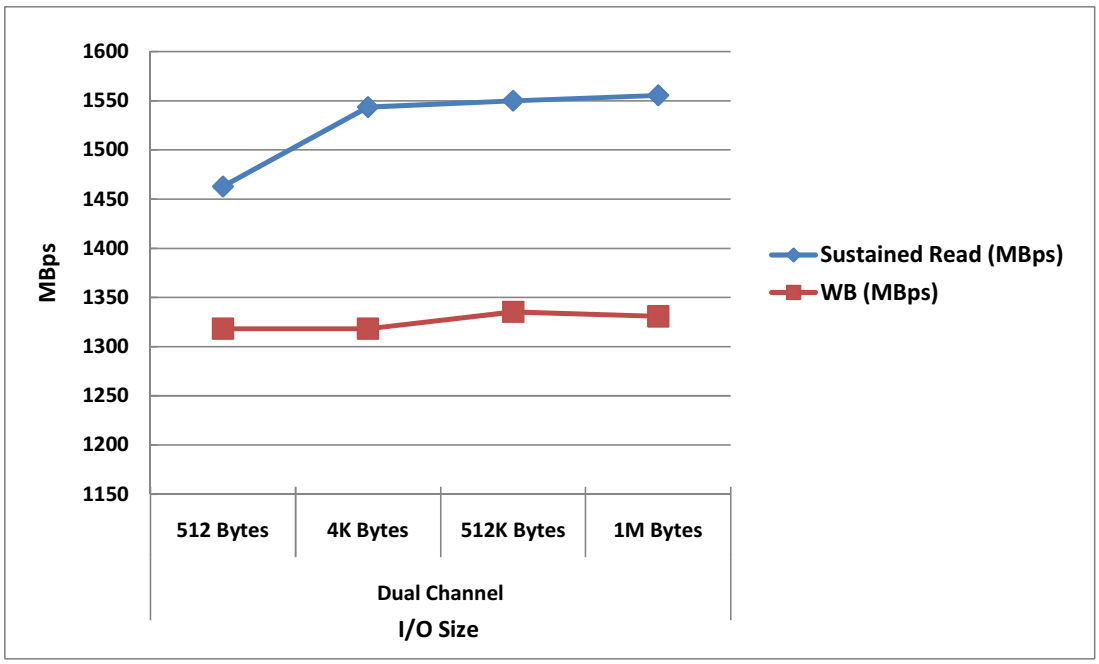
2.8 All Cache Hit RAID 6 Performance

2.81 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

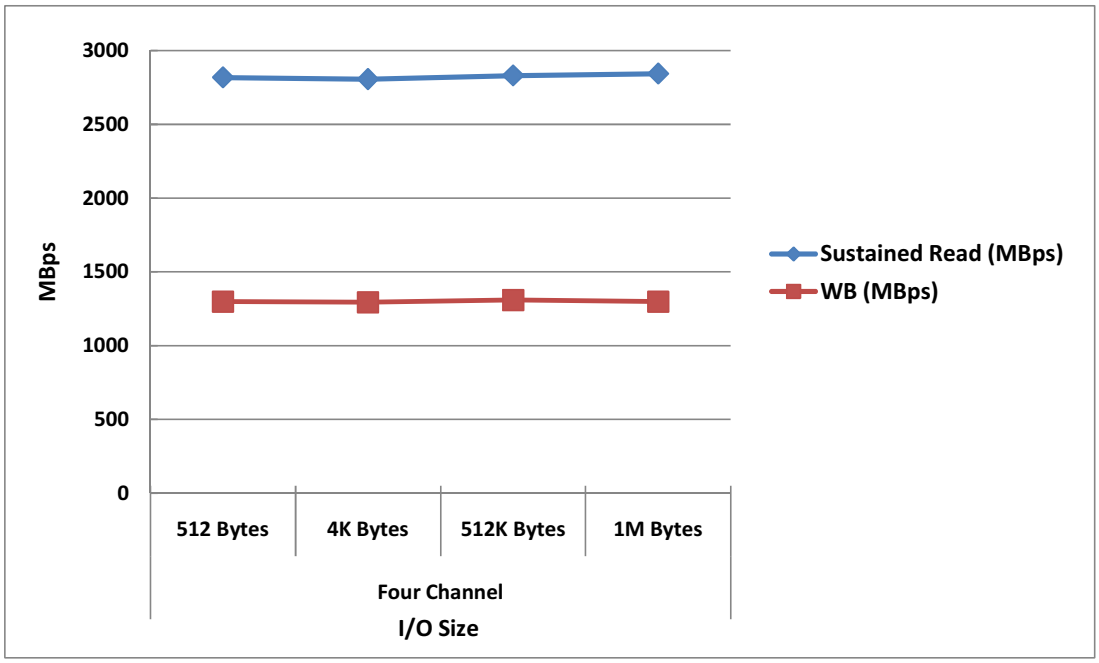
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1462.74	1318.29
	256K Bytes	1543.53	1318.24
	512K Bytes	1549.93	1335.27
	1M Bytes	1555.59	1330.67



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	2818.49	1298.07
	256K Bytes	2806.49	1294.01
	512K Bytes	2830.97	1308.93
	1M Bytes	2843.75	1297.01



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

>> 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	721.12	721.12	350.91	350.91

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	2092.23	16.35	624.84	4.88

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Dual Channel	8K Bytes	970.66	7.58

3.2 Local Sync 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	736.11	736.11	239.89	239.89

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	4408.21	34.44	1463.81	11.44

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	2601.69	20.33

3.3 Local Sync 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	716.53	716.53	156.42	156.42

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	4382.82	34.24	957.61	7.48

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	1903.05	14.87

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

3.41 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	713.05	713.05	309.13	309.13

3.42 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	2079.08	16.24	602.19	4.70

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Dual Channel	8K Bytes	933.12	7.29

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

3.51 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	736.25	736.25	237.59	237.59

3.52 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	4417.81	34.51	1214.77	9.49

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	2292.97	17.91

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

3.61 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	727.56	727.56	151.07	151.07

3.62 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	4387.88	34.28	793.66	6.20

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	1678.61	13.11

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

Subsystem	1 Raid
Parameters	1 Source to 1 Target
Finish Time	11 Min