



Subsystem Performance Testing Report for

EonStor[®] DS S24F-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	DS S24F-R1840-4
	FW	3.85A.12 (FA385A12_123_IPT_ESDSG6S3G.BIN)
	RAM	1GB DDR II SDRAM
	Drives	RAID: Hitachi SAS 450GB (Model: HUS156045VLS600; Capacity: 450GB; Speed: 6G; 15,000 RPM)
		JBOD: Hitachi SAS 450GB (Model: HUS156045VLS600; Capacity: 450GB; Speed: 6G; 15,000 RPM)
	Channels	Host Channel - Channel 0, 1, 2, 3
		Drive Channel - Channel 4, 5
		RCC Channel – Channel 6
	Virtual Volumes (RAID5/6) (Dual Hosts)	LV0 - Host channel 0; AID 112; LUN 0; 20 drives/channel; 1 partition
		LV1 - Host channel 1; BID 113; LUN 0; 20 drives/channel; 1 partition
	Virtual Volumes (RAID5/6) (Four Hosts)	LV0 - Host channel 0; AID 112; LUN 0; 10 drives/channel; 1 partition
		LV1 - Host channel 0; BID 113; LUN 0; 10 drives/channel; 1 partition
		LV2 - Host channel 1; AID 112; LUN 0; 10 drives/channel; 1 partition
LV3 - Host channel 1; BID 113; LUN 0; 10 drives/channel; 1 partition		

	Virtual Volumes (RAID5/6) All Cache Hit (Eight Hosts)	LV0 - Host channel 0; AID 112; LUN 0; Host channel 1; AID 112; LUN 0; 10 drives/channel; 1 partition
		LV1 - Host channel 0; BID 113; LUN 0; Host channel 1; BID 113; LUN 0; 10 drives/channel; 1 partition
		LV2 - Host channel 2; AID 112; LUN 0; Host channel 3; AID 112; LUN 0; 10 drives/channel; 1 partition
		LV3 - Host channel 2; BID 113; LUN 0; Host channel 3; BID 113; LUN 0; 10 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.12
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
	CPU	Intel Xeon E5410 2.33GHz
	RAM	Kingston 2GB DDRII 667 DIMM * 8
	PCI	PCI-X 64-bit/133MHz *3
	System Drive	IDE Seagate 160G (ST3160318AS)
	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.

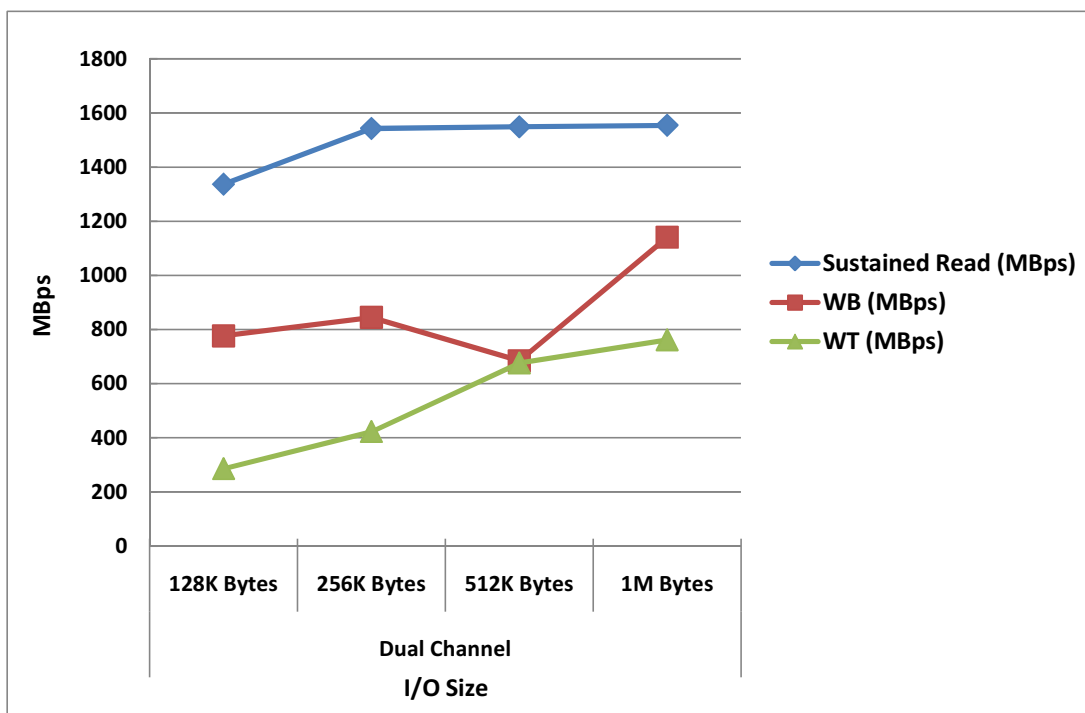
2.1 End-to-End RAID 5 Performance

2.11 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read	WB	WT
Host Channels	I/O Size	(MB/sec)	(MB/sec)	(MB/sec)
Dual Channel	128K Bytes	1337.82	776.66	286.32
	256K Bytes	1543.31	844.89	423.09
	512K Bytes	1549.42	684.63	676.60
	1M Bytes	1555.21	1141.46	762.26



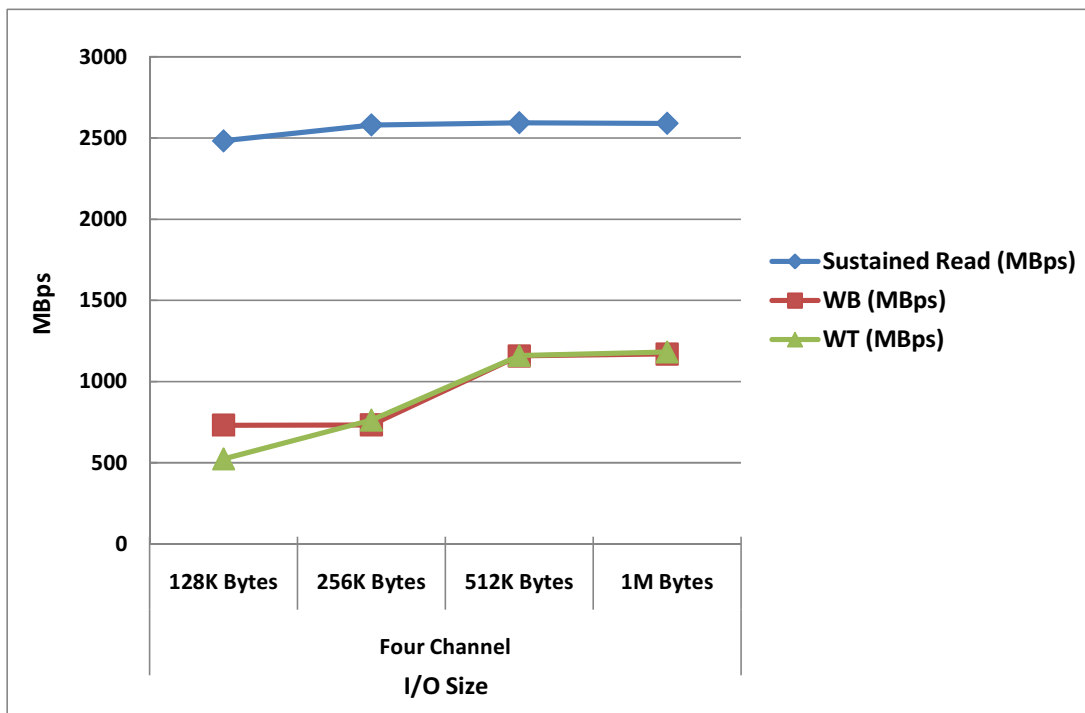
Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Dual Channel	512 Bytes	146844.91	47124.61
	4K Bytes	127299.45	37054.66

>> 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	2483.49	733.02	525.10
	256K Bytes	2582.00	734.04	764.00
	512K Bytes	2595.36	1158.14	1161.04
	1M Bytes	2591.35	1170.85	1183.10



Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Four Channel	512 Bytes	137765.35	54504.61
	4K Bytes	116435.56	41545.62

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	11017.09	4482.05
	4K Bytes	11022.43	4486.58

>> Four Channel**Data Transfer Rate (IOPS)**

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Four Channel	512 Bytes	12315.16	4430.10
	4K Bytes	12313.14	4385.87

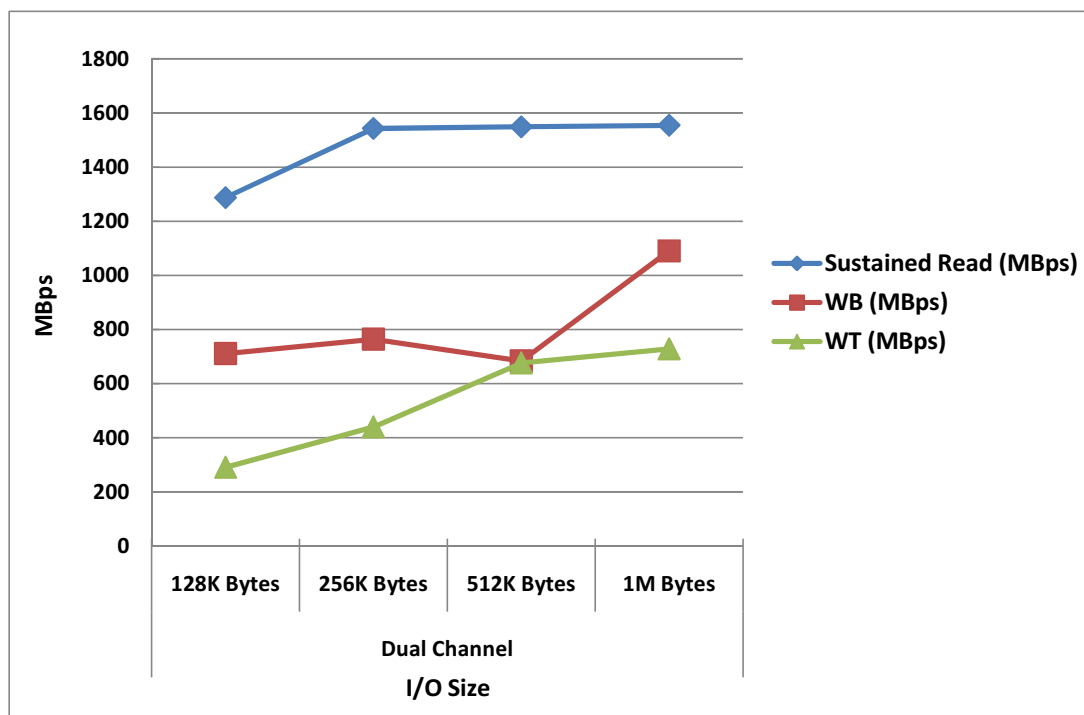
2.2 End-to-End RAID 6 Performance

2.2.1 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read	WB	WT
Host Channels	I/O Size	(MB/sec)	(MB/sec)	(MB/sec)
Dual Channel	128K Bytes	1287.79	711.64	291.56
	256K Bytes	1543.58	764.28	440.67
	512K Bytes	1549.52	684.13	676.93
	1M Bytes	1555.26	1090.81	728.60



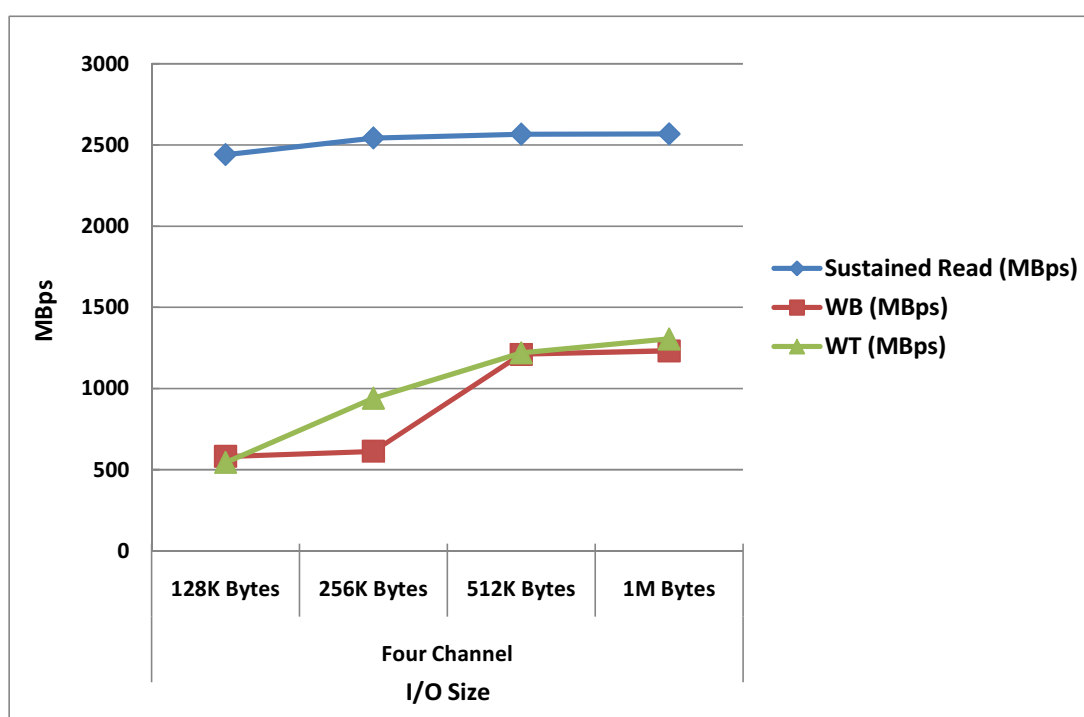
Data Access Rate (IOPS)

I/O Parameters		Read	WB
Host Channels	I/O Size	(IOPS)	(IOPS)
Dual Channel	512 Bytes	147107.61	47112.08
	4K Bytes	125951.52	36538.11

>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read	WB	WT
Host Channels	I/O Size	(MB/sec)	(MB/sec)	(MB/sec)
Four Channel	128K Bytes	2441.96	583.19	546.21
	256K Bytes	2543.71	615.20	942.06
	512K Bytes	2567.11	1212.42	1220.80
	1M Bytes	2568.42	1233.02	1306.71



Data Access Rate (IOPS)

I/O Parameters		Read	WB
Host Channels	I/O Size	(IOPS)	(IOPS)
Four Channel	512 Bytes	137857.35	54984.77
	4K Bytes	117076.82	39719.59

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	11016.10	3153.95
	4K Bytes	11031.46	3141.41

>> Four Channel

Data Transfer Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Four Channel	512 Bytes	12298.87	3078.73
	4K Bytes	12319.93	3058.37

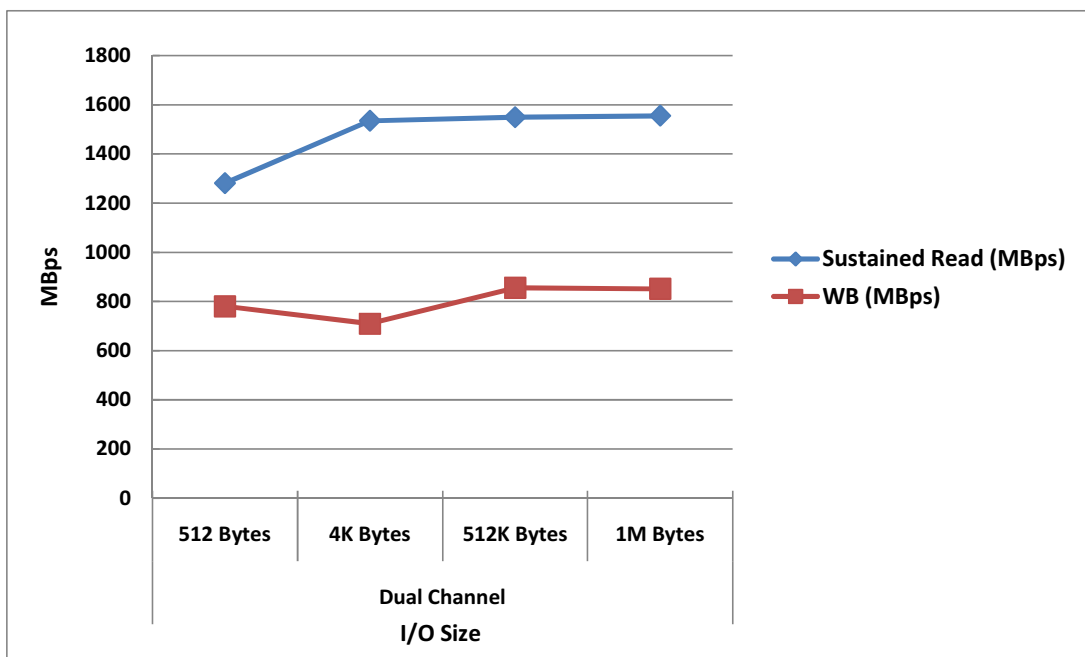
2.3 Degraded RAID 5 Performance

2.3.1 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

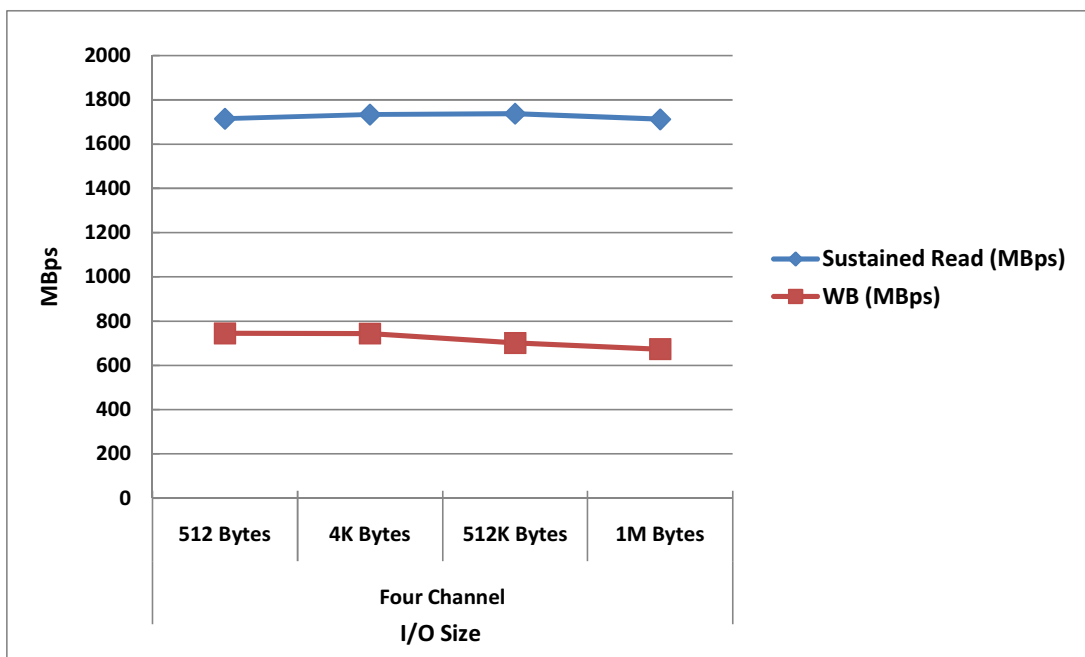
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1280.80	779.60
	256K Bytes	1535.29	709.20
	512K Bytes	1549.33	855.36
	1M Bytes	1555.33	851.16



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1715.06	744.37
	256K Bytes	1734.03	743.68
	512K Bytes	1737.49	700.56
	1M Bytes	1712.52	672.60



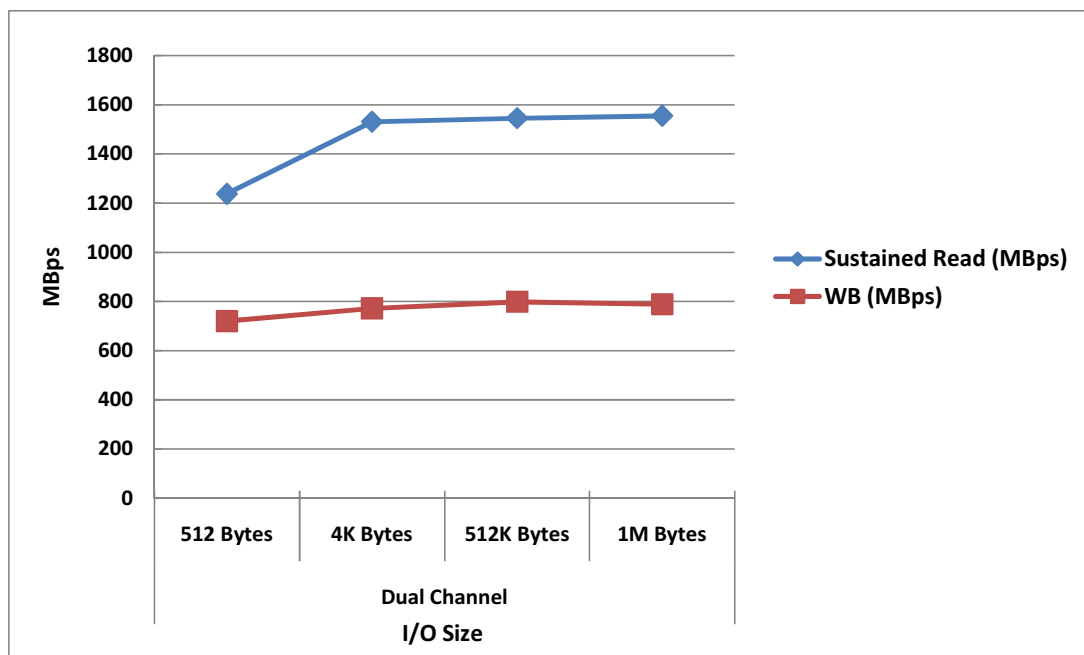
2.4 Degraded RAID 6 Performance

2.4.1 Sequential I/O – 1 Drive Failed

>> Dual Channel

Data Transfer Rate (MBps)

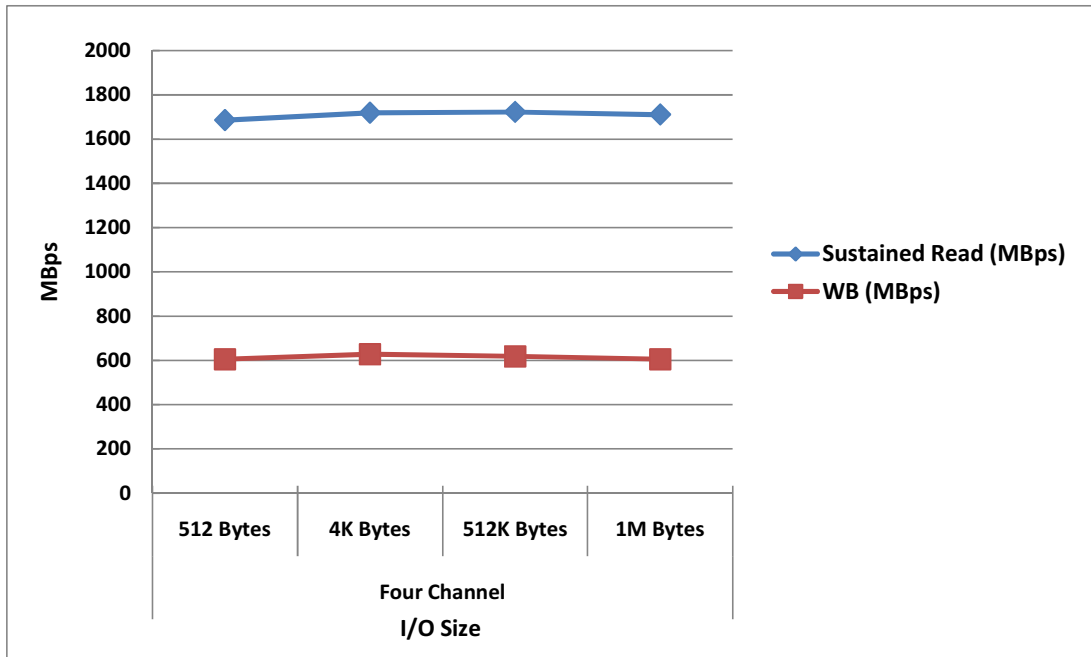
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1237.81	719.98
	256K Bytes	1530.80	771.99
	512K Bytes	1545.56	798.39
	1M Bytes	1555.26	788.29



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1685.70	605.32
	256K Bytes	1719.13	627.68
	512K Bytes	1722.80	617.79
	1M Bytes	1710.79	605.65

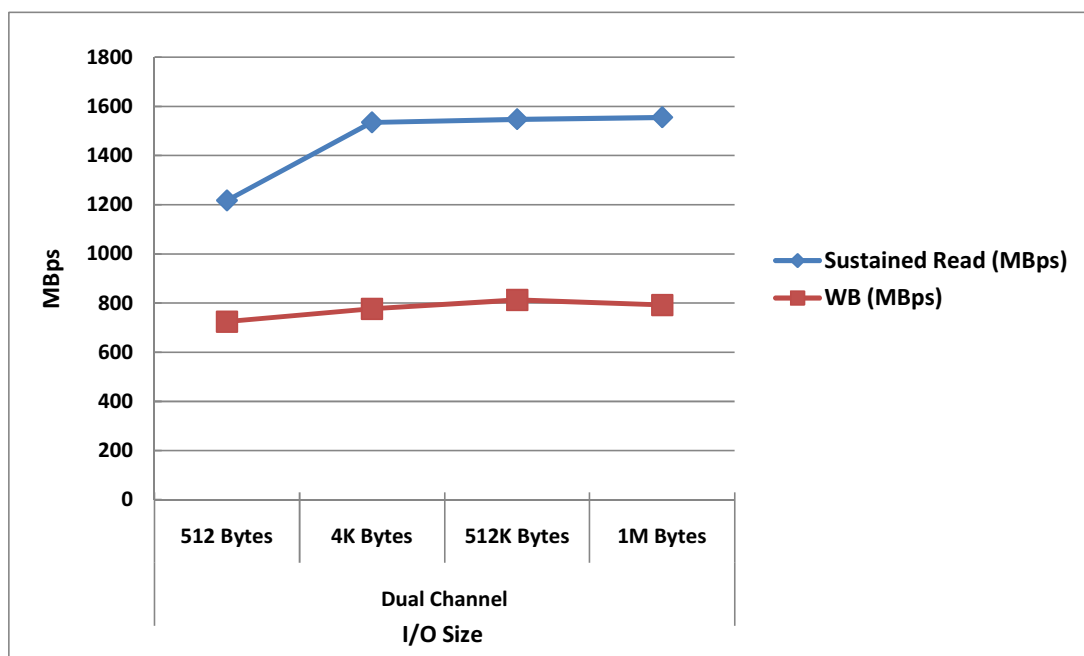


2.42 Sequential I/O – 2 Drives Failed

>> Dual Channel

Data Transfer Rate (MBps)

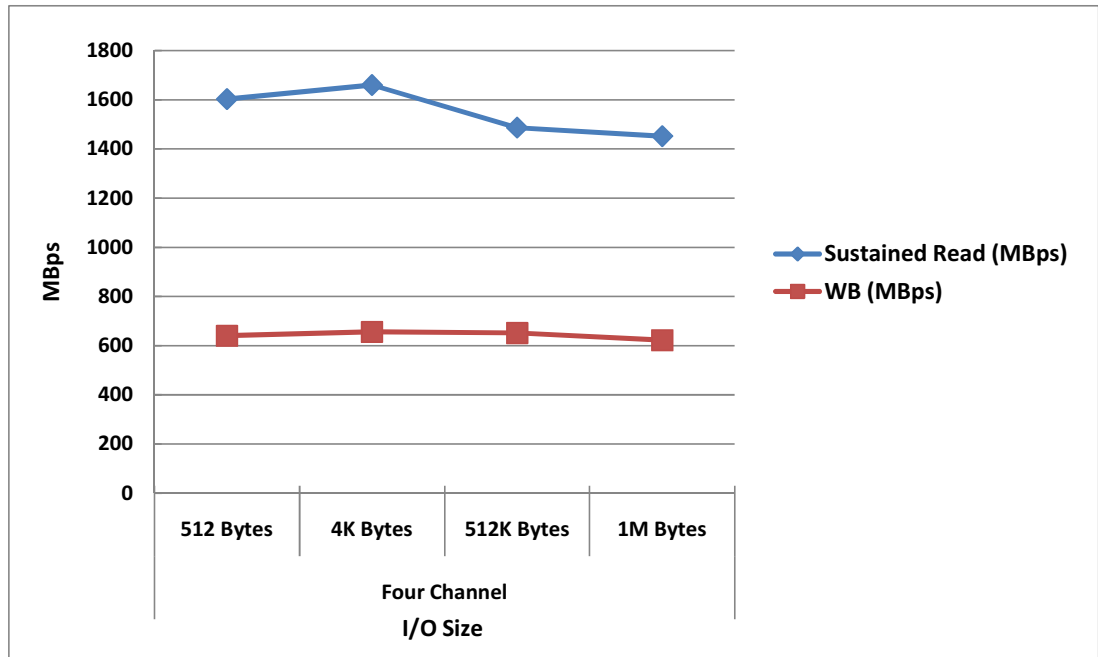
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1216.77	723.91
	256K Bytes	1534.41	776.63
	512K Bytes	1547.37	812.12
	1M Bytes	1555.08	791.60



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1603.17	640.01
	256K Bytes	1659.81	655.24
	512K Bytes	1486.37	651.27
	1M Bytes	1452.24	621.69



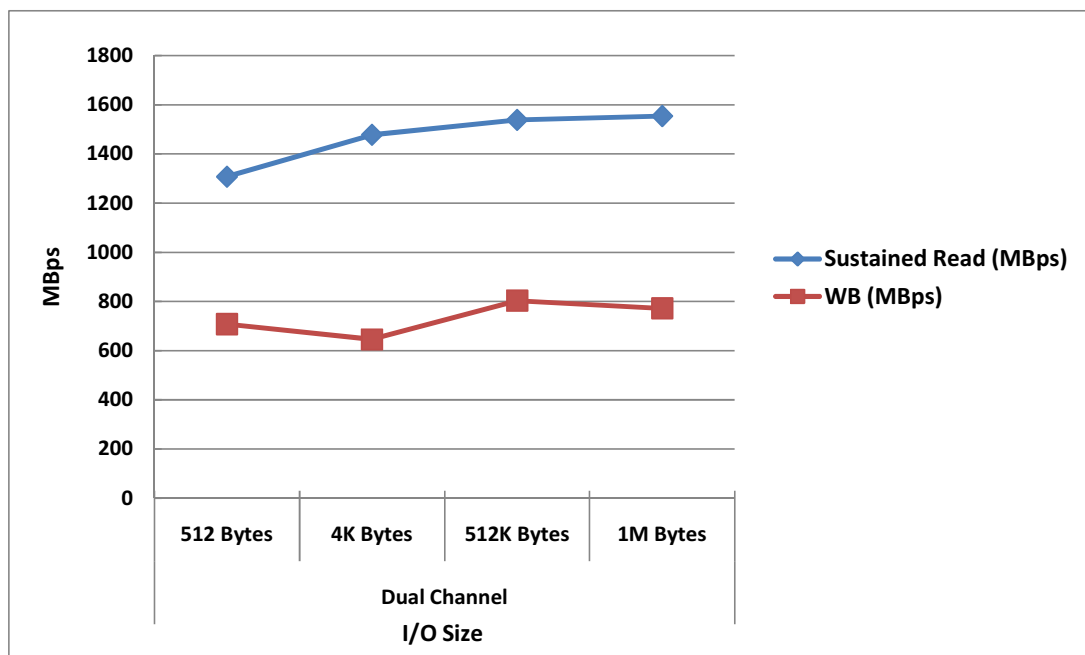
2.5 Rebuilding RAID 5 Performance

2.5.1 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

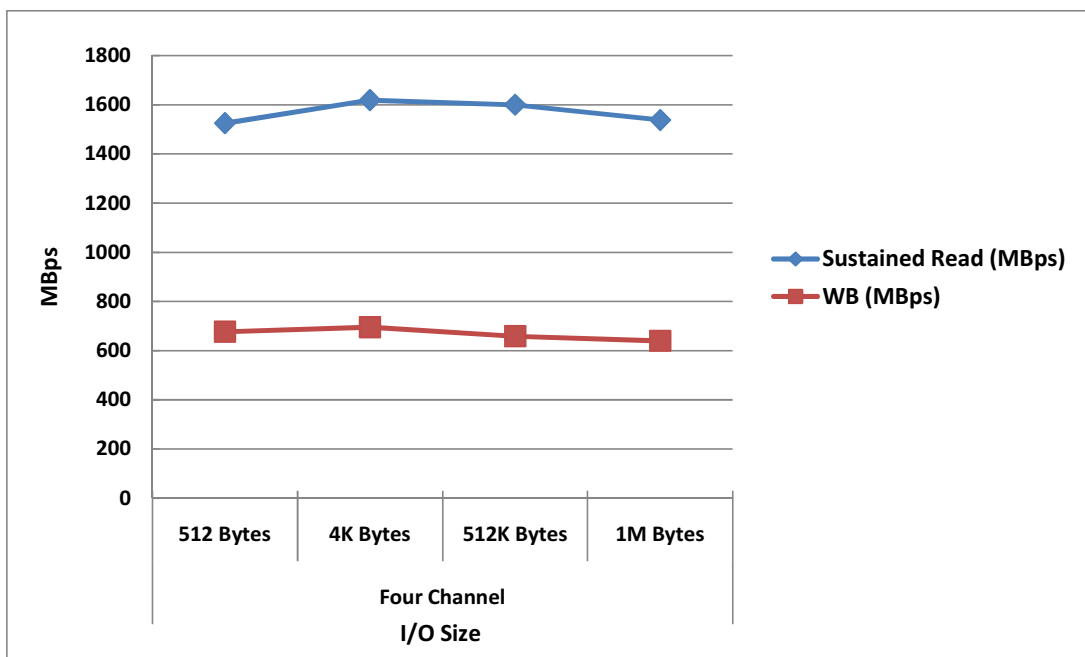
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1307.42	707.11
	256K Bytes	1478.03	645.21
	512K Bytes	1538.27	802.65
	1M Bytes	1554.05	771.17



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1525.14	676.55
	256K Bytes	1618.84	695.06
	512K Bytes	1599.81	658.10
	1M Bytes	1538.02	639.31



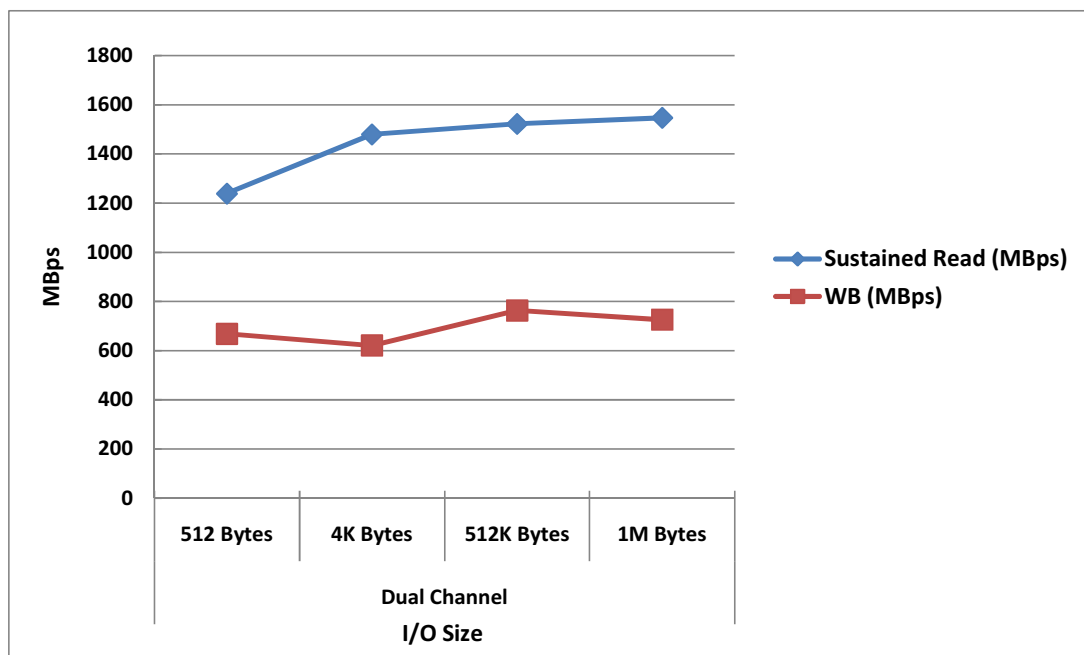
2.6 Rebuilding RAID 6 Performance

2.6.1 Sequential I/O – 2 Drives Rebuilding

>> Dual Channel

Data Transfer Rate (MBps)

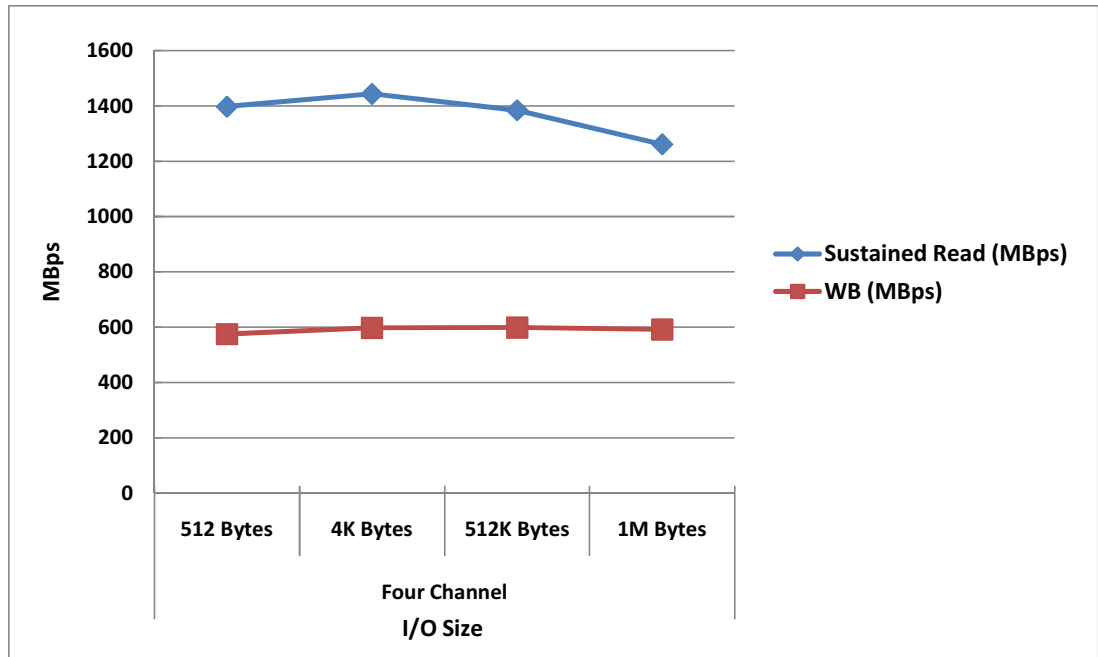
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1238.92	667.63
	256K Bytes	1479.19	620.02
	512K Bytes	1522.04	762.88
	1M Bytes	1546.86	725.39



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1397.48	574.69
	256K Bytes	1443.67	597.72
	512K Bytes	1384.30	598.38
	1M Bytes	1260.83	591.50



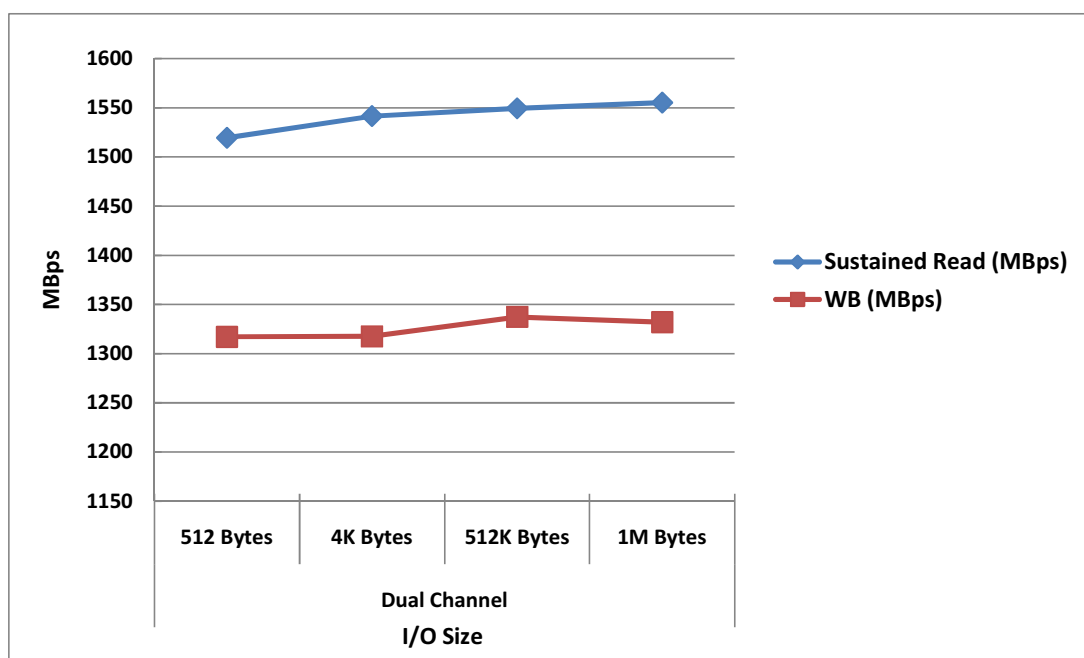
2.7 All Cache Hit RAID 5 Performance

2.7.1 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

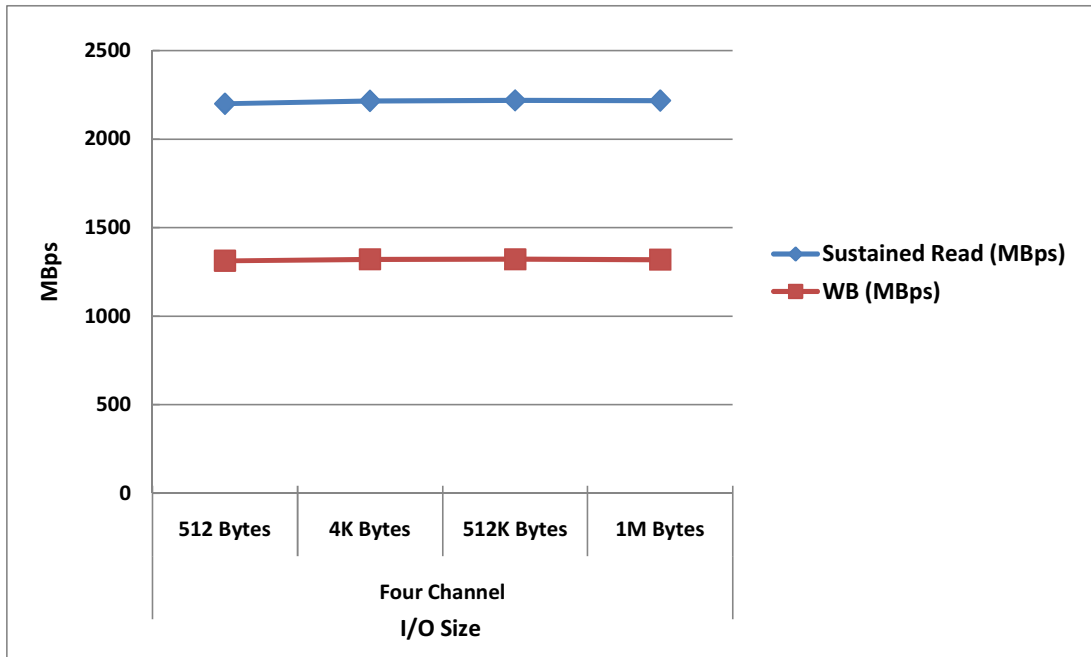
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1519.48	1316.88
	256K Bytes	1541.59	1317.51
	512K Bytes	1549.48	1337.27
	1M Bytes	1555.32	1331.94



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	2199.87	1312.60
	256K Bytes	2216.43	1320.20
	512K Bytes	2219.01	1320.93
	1M Bytes	2217.99	1318.75



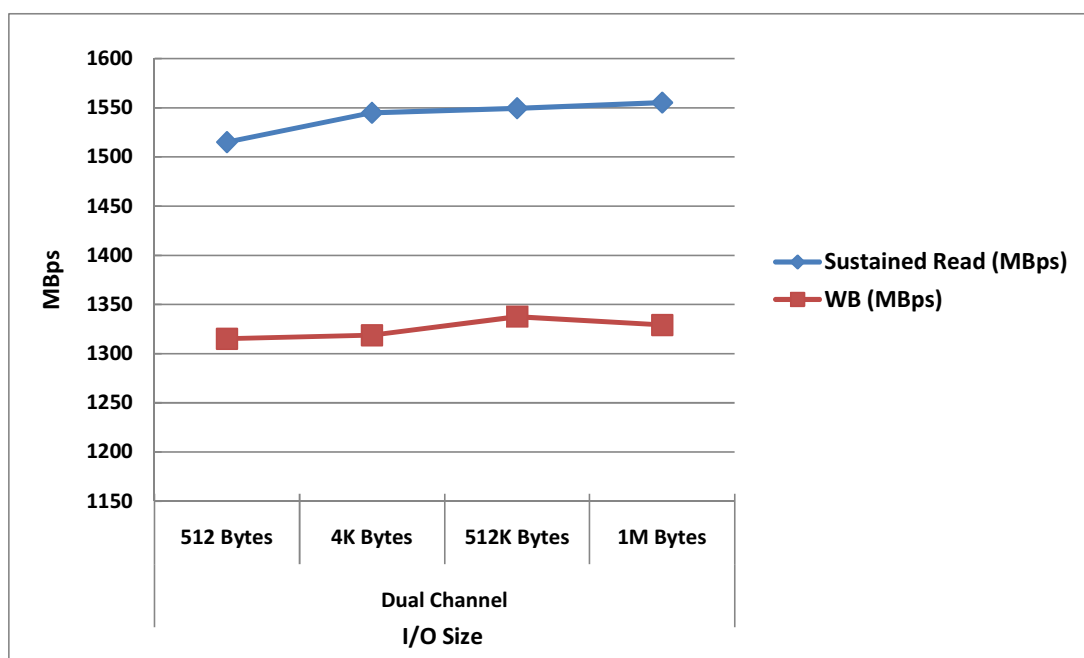
2.8 All Cache Hit RAID 6 Performance

2.8.1 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

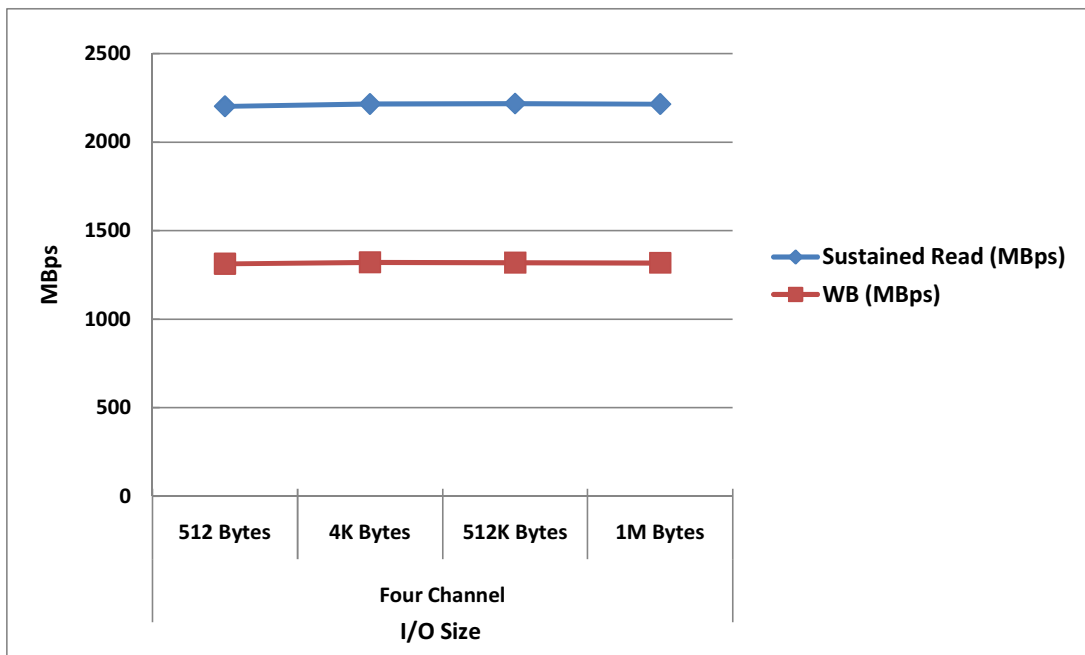
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1514.94	1314.96
	256K Bytes	1544.80	1318.50
	512K Bytes	1549.45	1337.55
	1M Bytes	1555.26	1329.01



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	2201.65	1312.12
	256K Bytes	2215.55	1320.08
	512K Bytes	2217.65	1318.77
	1M Bytes	2214.27	1317.63



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	705.32	705.32	407.76	407.76

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	1866.96	14.59	629.23	4.92

I/O Parameters		OLTP : 60 % Read / 40 % Write			
Host Channels	I/O Size	IOPS		MB/sec	
Dual Channel	8K Bytes	991.41		7.75	

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

3.2.1 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	777.20	777.20	243.64	243.64

3.2.2 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	4648.87	36.32	1304.39	10.19

I/O Parameters		OLTP : 60 % Read / 40 % Write			
Host Channels	I/O Size	IOPS		MB/sec	
One Channel	8K Bytes	2423.44		18.93	

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	776.49	776.49	154.55	154.55

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	4633.89	36.20	856.79	6.69

I/O Parameters		OLTP : 60 % Read / 40 % Write			
Host Channels	I/O Size	IOPS		MB/sec	
One Channel	8K Bytes	1719.92		13.44	

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	691.49	691.49	377.50	377.50

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	1886.01	14.73	604.80	4.73

I/O Parameters		OLTP : 60 % Read / 40 % Write			
Host Channels	I/O Size	IOPS		MB/sec	
Dual Channel	8K Bytes	988.71		7.72	

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	777.31	777.31	240.77	240.77

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	4635.67	36.22	1089.74	8.51

I/O Parameters		OLTP : 60 % Read / 40 % Write			
Host Channels	I/O Size	IOPS		MB/sec	
One Channel	8K Bytes	2099.61		16.40	

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	777.34	777.34	150.88	150.88

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	4598.75	35.93	704.43	5.50

I/O Parameters		OLTP : 60 % Read / 40 % Write			
Host Channels	I/O Size	IOPS		MB/sec	
One Channel	8K Bytes	1504.77		11.76	

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

Subsystem	1 Raid
Parameters	1 Source to 1 Target
Finish Time	14 Min