Subsystem Performance Testing Report for

EonStor® DS S24F-G2840-4

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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	DSS24F-G2840-4
	FW	3.85B.26 (FA385B26_222_IFT_ESDSG6S6G.BIN)
	RAM	2 GB DDR II SDRAM
	Drives	RAID: Hitachi SAS 450GB (Model: HITACHI HUS156045VLS600; Capacity: 450GB; Speed: 6G; 15000 RPM) JBOD: Hitachi SAS 300GB (Model: HITACHI HUS156030VLS600; Capacity: 300GB; Speed: 3G; 15000 RPM)
	Channels	Host Channel - Channel 0, 1, 2 ,3
		Drive Channel - Channel 4
	Virtual Volumes (LD RAID5 / 6) (Dual Hosts)	LD0 - Host channel 0; ID 112; LUN 0; 16 drives/channel; 1 partition
		LD1 - Host channel 1; ID 112; LUN 0; 16 drives/channel; 1 partition
	Pool	Single Pool of full size
	Virtual Volumes	2 Virtual Volumes
	All Cache Virtual Volumes (LD RAID5 / 6) (Four Hosts)	LD0 - Host channel 0; ID 112; LUN 0; 8 drives/channel; 1 partition
		LD1 - Host channel 1; ID 112; LUN 0; 8 drives/channel; 1 partition

		LD2 - Host channel 2; ID 112; LUN 0; 8 drives/channel; 1 partition
		LD3 - Host channel 3; ID 112; 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 – Enable
		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.05
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 Edition R2 (With Service Pack 2)
HBA	OS Register	MaximumSGList : FF (Hexadecimal) NumberOfRequests: FF (Hexadecimal)
	QLogic	QLE2562 , BIOS VER: 2.02 ; Driver VER: 9.18.17
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

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.

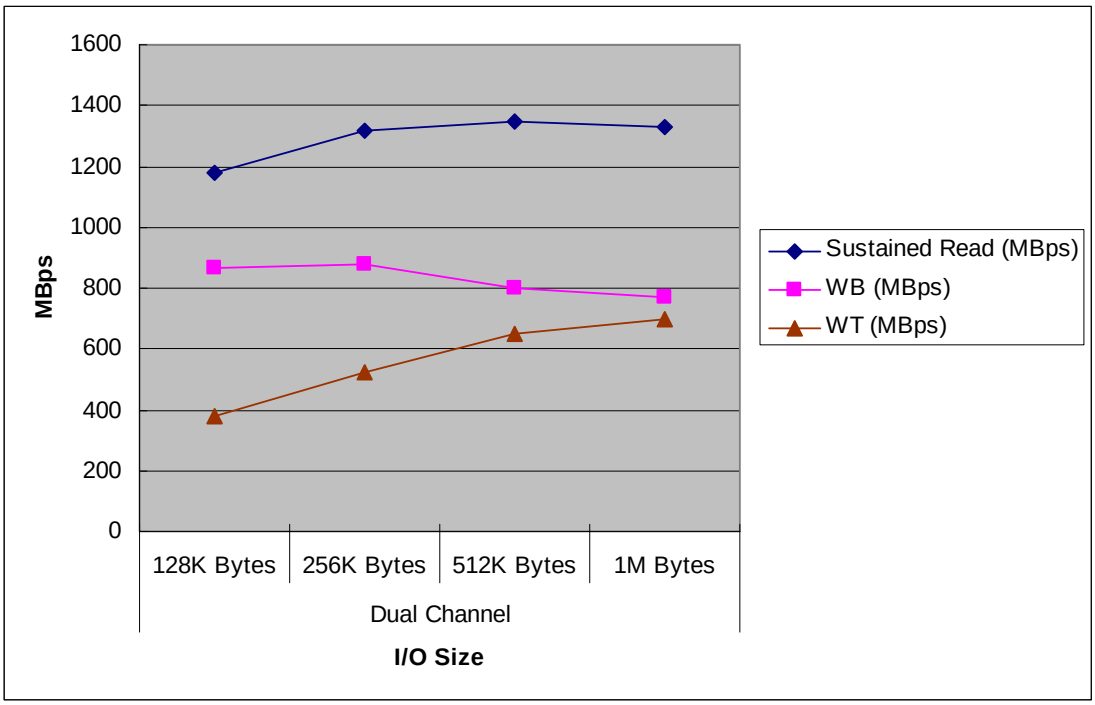
2.1 End-to-End RAID 5 Performance

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	1176.19	868.70	378.94
	256K Bytes	1318.87	876.90	520.57
	512K Bytes	1345.37	798.35	650.13
	1M Bytes	1330.76	768.62	700.51



Data Access Rate (IOPS)

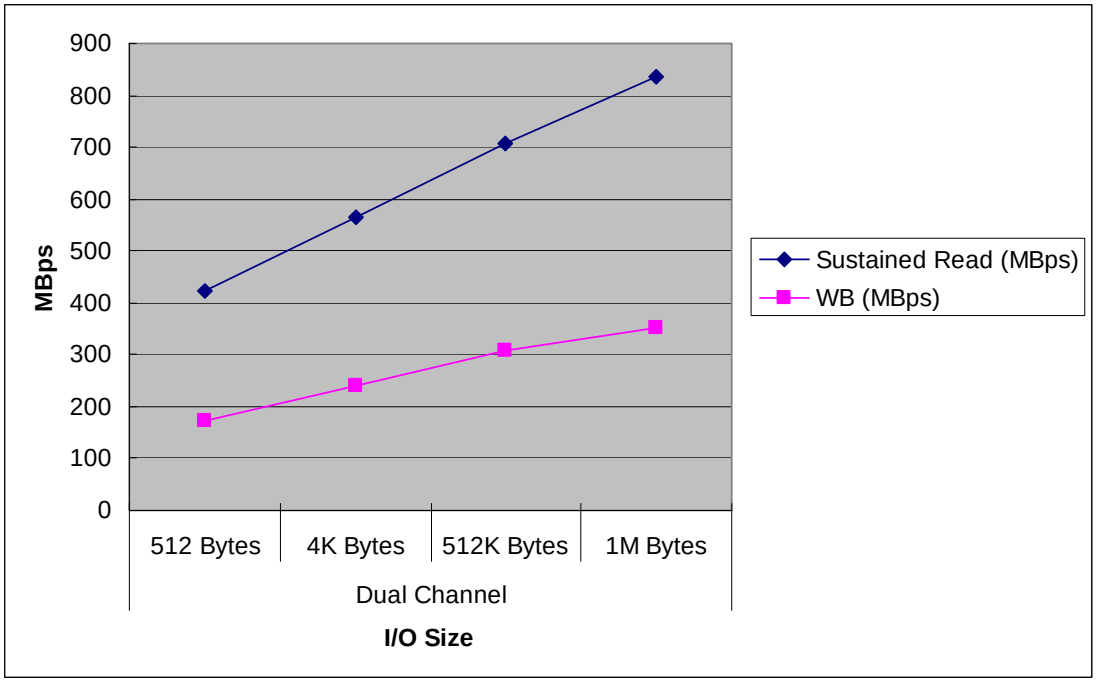
I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	**I/O Size**		
Dual Channel	512 Bytes	67243.14	50115.08
	4K Bytes	55571.89	40886.69

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	422.72	172.22
	256K Bytes	566.52	241.88
	512K Bytes	707.44	306.38
	1M Bytes	835.48	353.44


900
800
700
600
500
400
300
200
100
0
MBps
512 Bytes
4K Bytes
512K Bytes
1M Bytes
Dual Channel
I/O Size
Sustained Read (MBps)
WB (MBps)

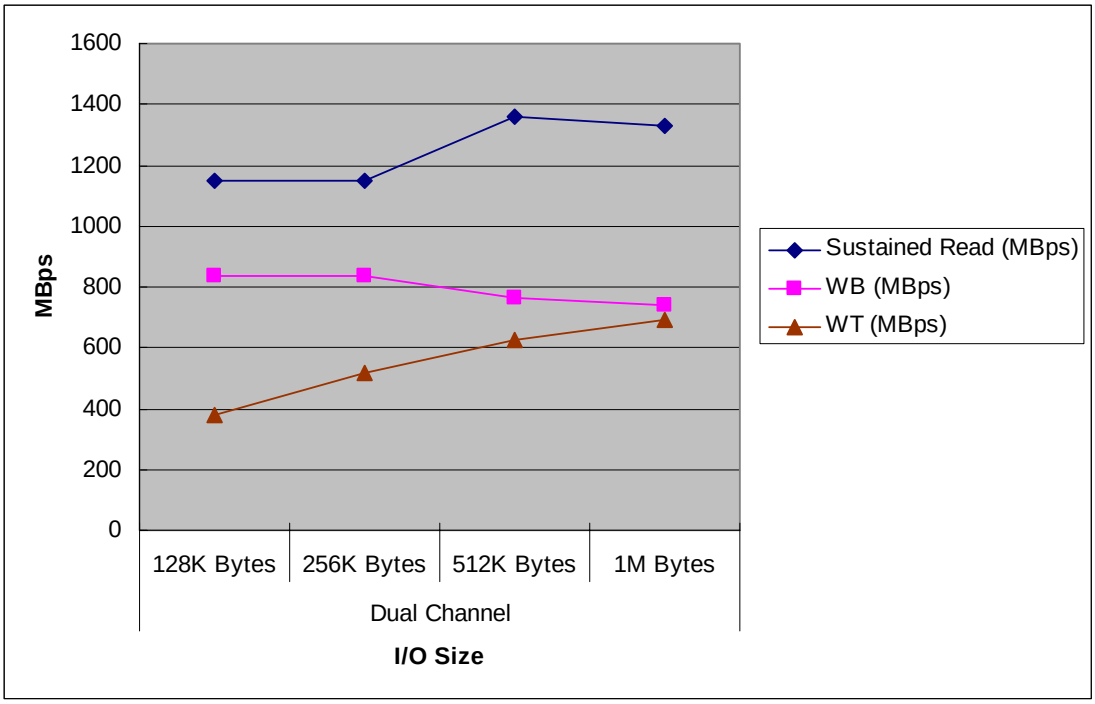
2.2 End-to-End RAID 6 Performance

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	1149.71	836.06	379.23
	256K Bytes	1149.71	836.06	519.57
	512K Bytes	1357.94	761.12	624.10
	1M Bytes	1326.54	738.58	690.26



Data Access Rate (IOPS)

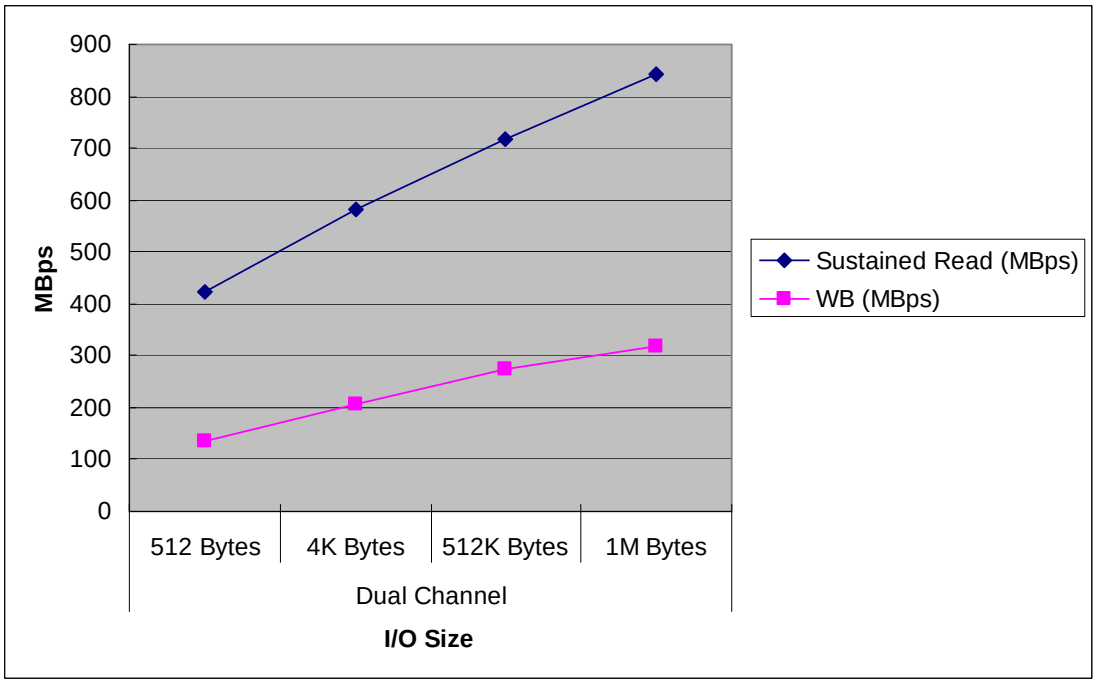
I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Dual Channel	512 Bytes	67412.47	49955.84
	4K Bytes	55820.94	40539.17

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	423.59	135.24
	256K Bytes	580.66	204.85
	512K Bytes	716.35	274.13
	1M Bytes	843.22	316.81



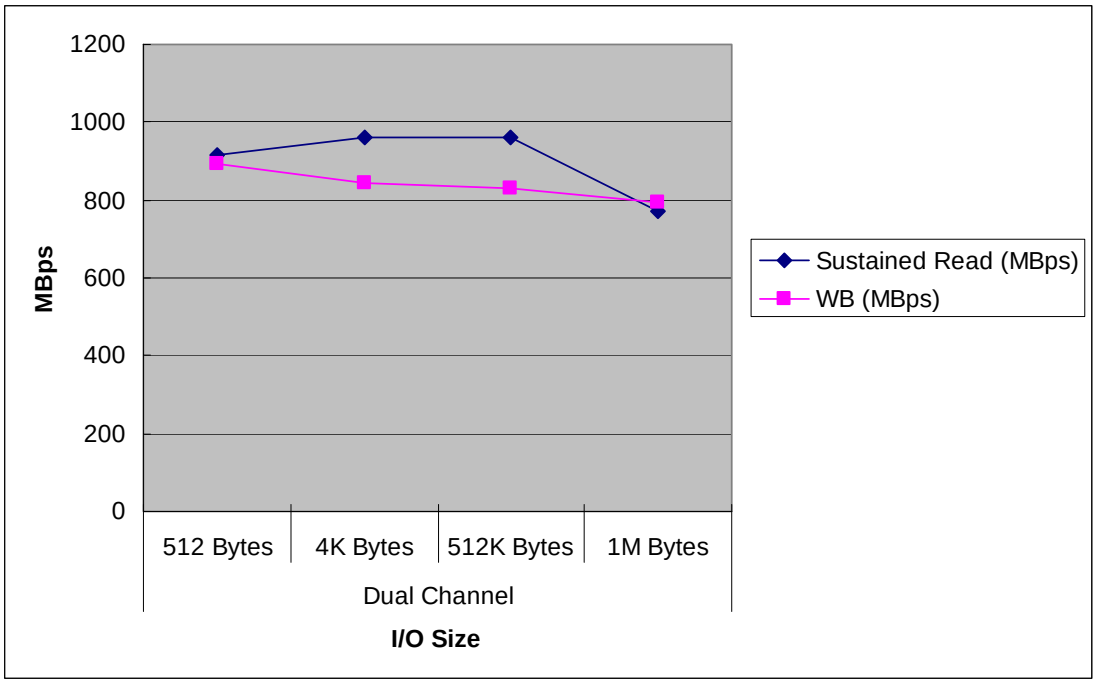
2.3 Degraded RAID 5 Performance

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	917.15	892.92
	256K Bytes	959.56	841.90
	512K Bytes	959.08	828.96
	1M Bytes	769.88	792.73



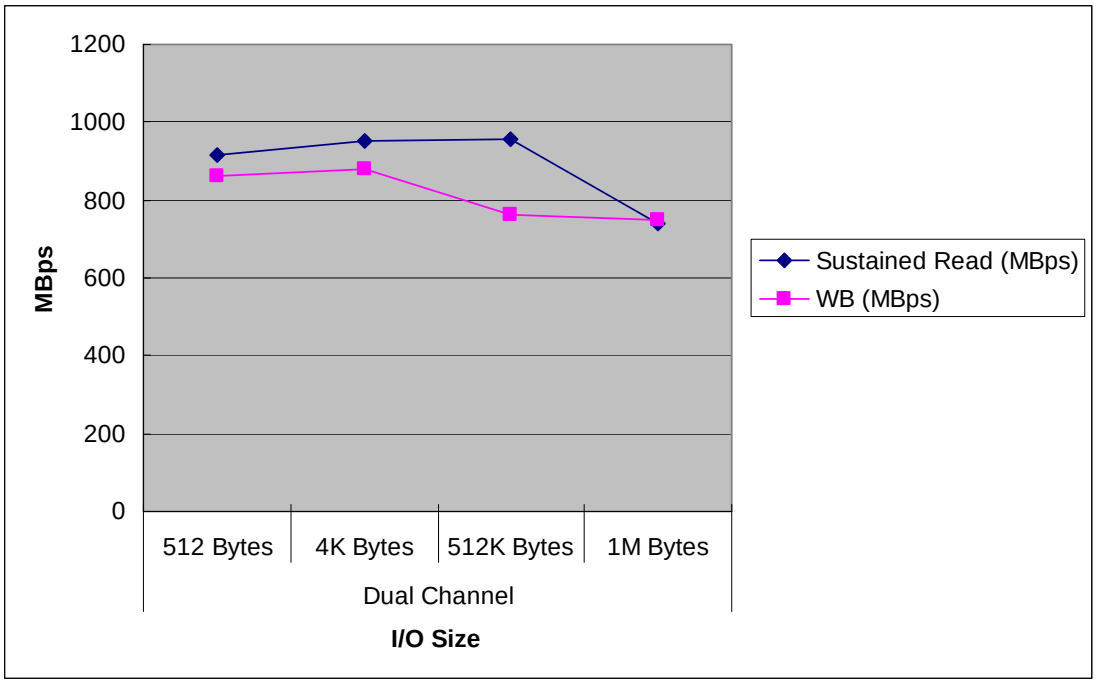
2.4 Degraded RAID 6 Performance

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	915.61	863.38
	256K Bytes	954.02	879.18
	512K Bytes	957.15	760.31
	1M Bytes	739.16	751.12

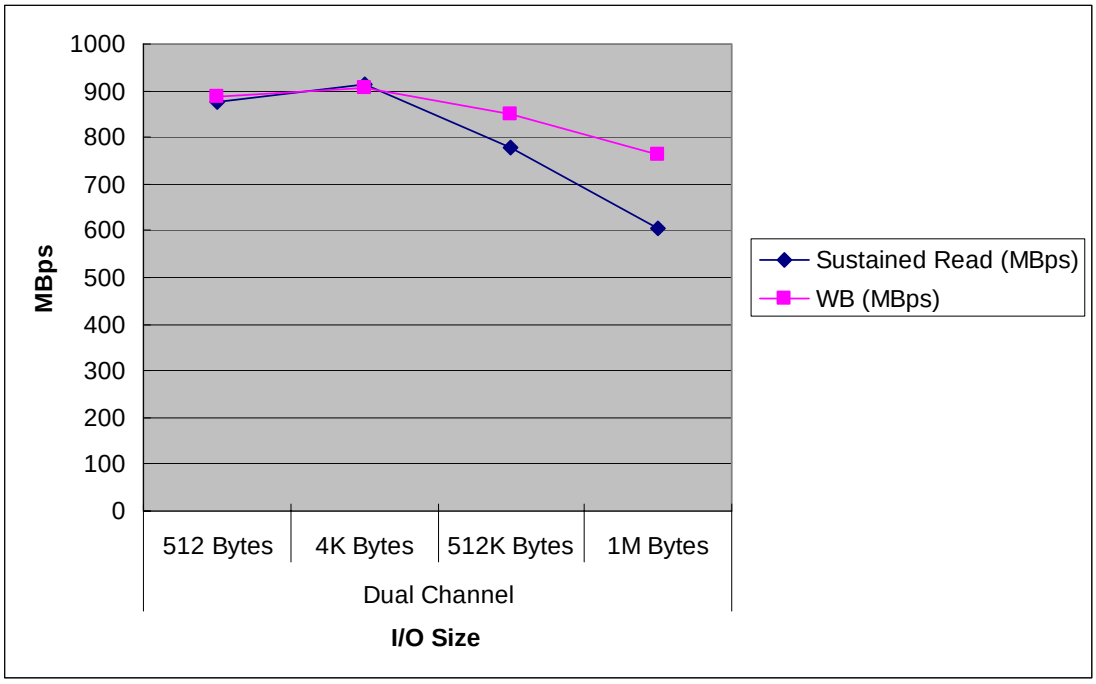


2.42 Sequential I/O – 2 Drives Failed

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	876.44	887.20
	256K Bytes	915.39	906.61
	512K Bytes	776.51	849.83
	1M Bytes	606.75	762.55



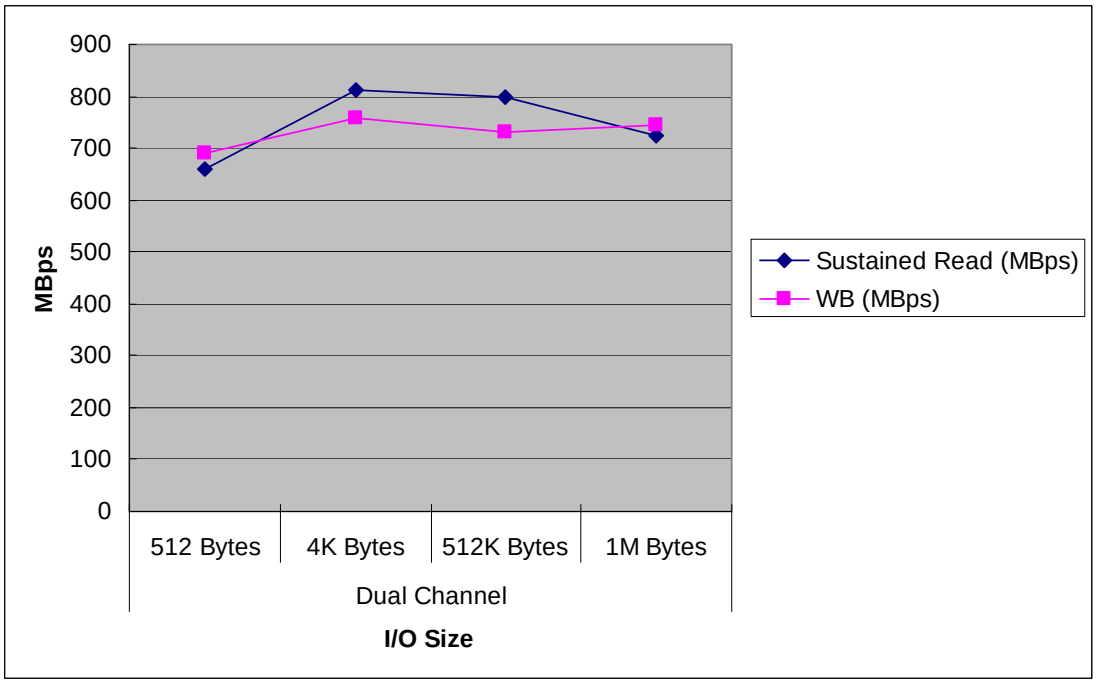
2.5 Rebuilding RAID 5 Performance

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	660.55	689.17
	256K Bytes	810.82	758.34
	512K Bytes	797.25	730.56
	1M Bytes	724.66	744.01



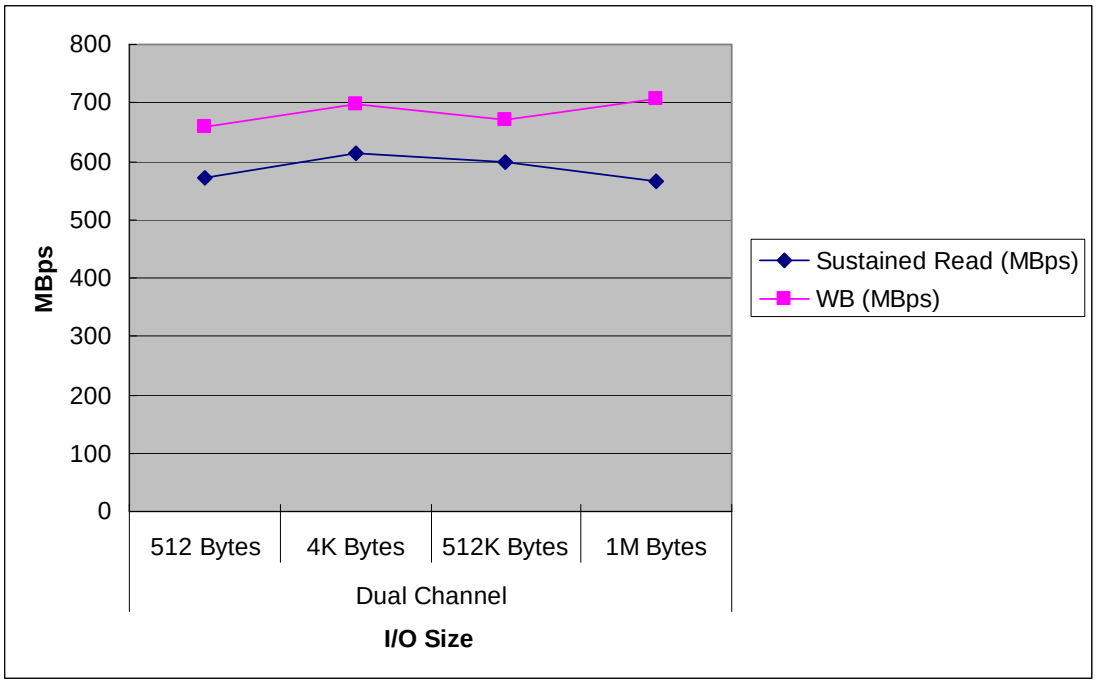
2.6 Rebuilding RAID 6 Performance

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	570.66	657.28
	256K Bytes	612.99	696.52
	512K Bytes	597.70	671.74
	1M Bytes	564.17	705.38



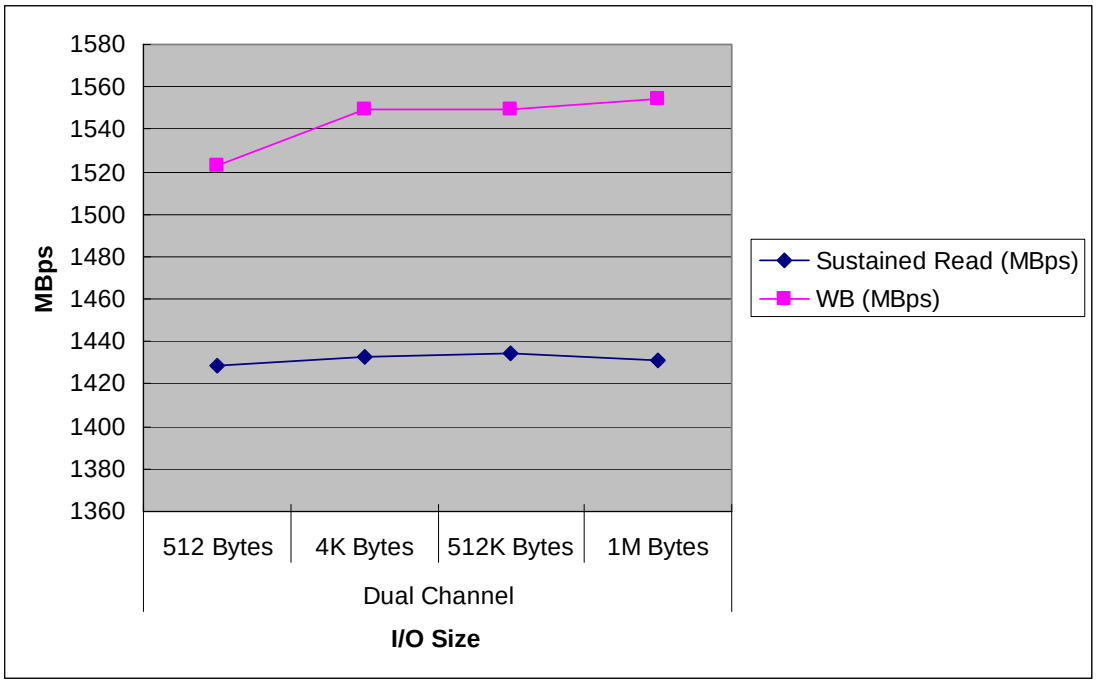
2.7 All Cache Hit RAID 5 Performance

2.71 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

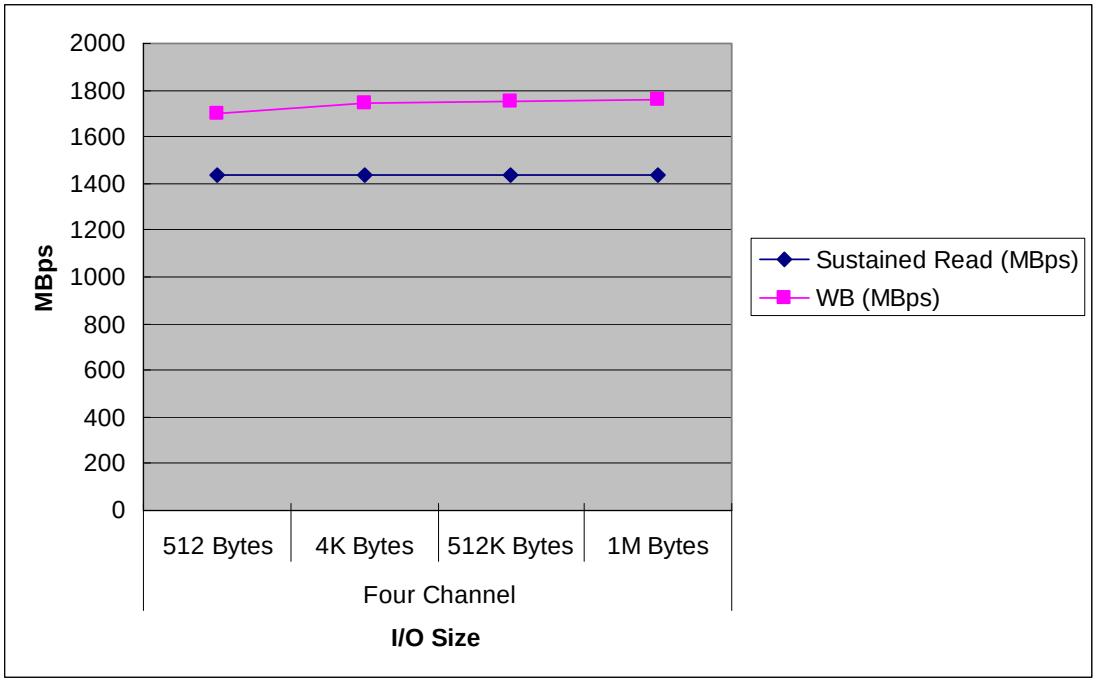
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1428.40	1522.92
	256K Bytes	1432.76	1549.13
	512K Bytes	1434.45	1549.41
	1M Bytes	1431.16	1554.09



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1437.15	1698.78
	256K Bytes	1436.92	1741.01
	512K Bytes	1437.16	1753.63
	1M Bytes	1432.54	1761.58


2000
1800
1600
1400
1200
1000
800
600
400
200
0
MBps
512 Bytes
4K Bytes
512K Bytes
1M Bytes
Four Channel
I/O Size
Sustained Read (MBps)
WB (MBps)

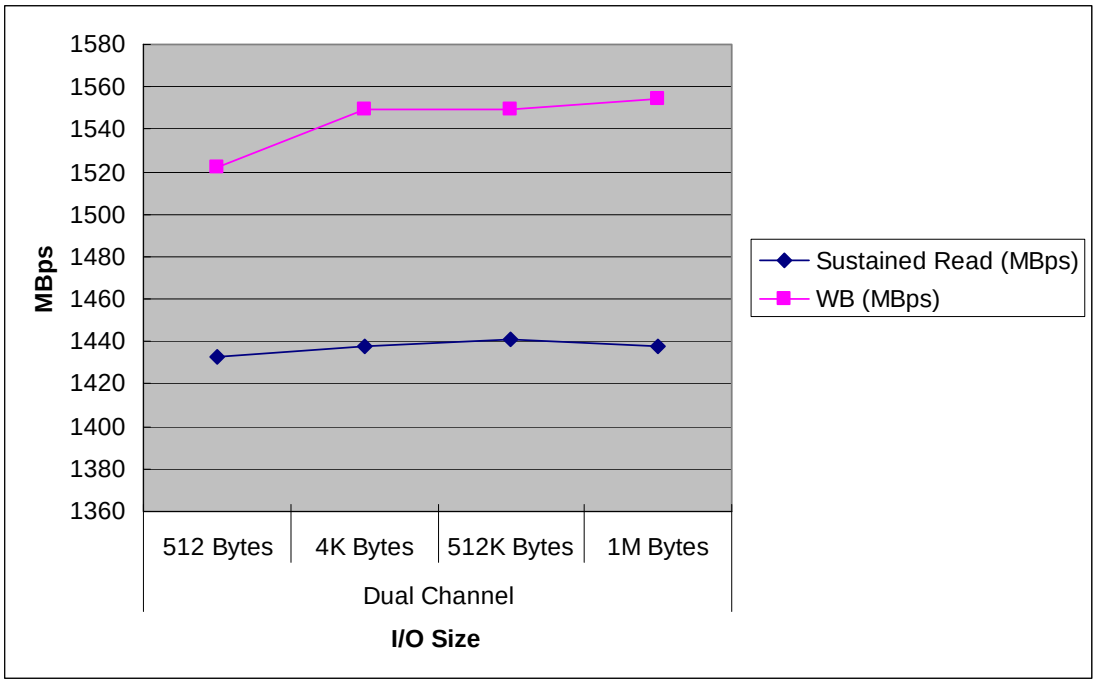
2.8 All Cache Hit RAID 6 Performance

2.81 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

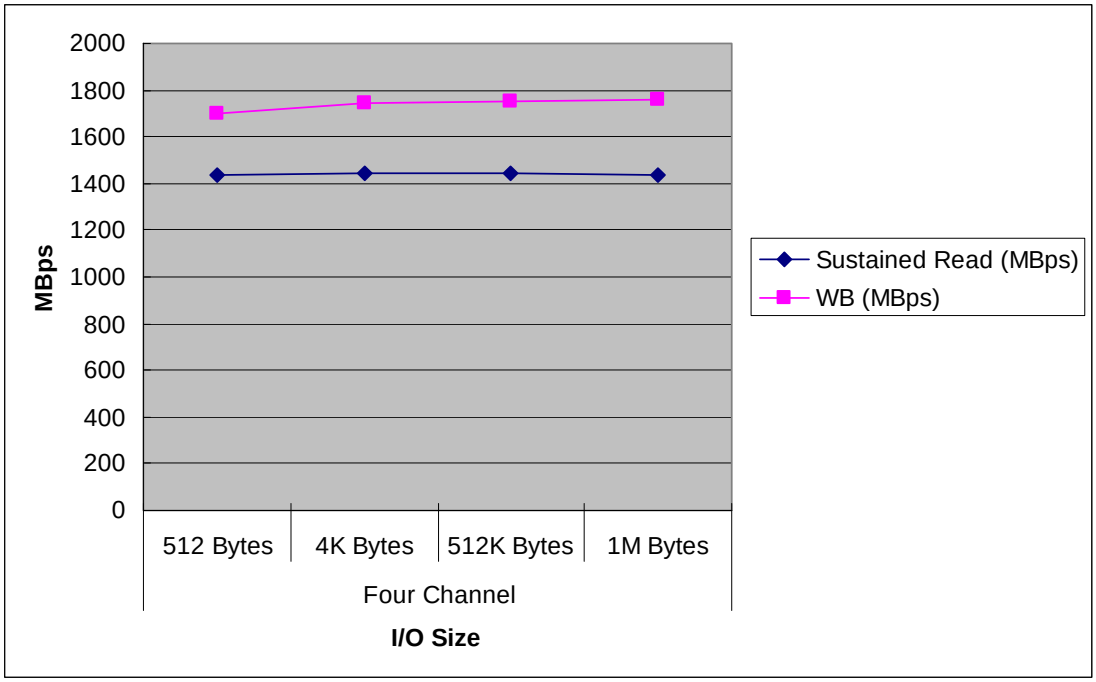
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Dual Channel	128K Bytes	1432.93	1522.20
	256K Bytes	1437.75	1549.14
	512K Bytes	1440.68	1549.44
	1M Bytes	1438.04	1554.10



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	**I/O Size**		
Four Channel	128K Bytes	1439.62	1699.70
	256K Bytes	1440.12	1741.67
	512K Bytes	1439.95	1754.15
	1M Bytes	1436.42	1762.03


2000
1800
1600
1400
1200
1000
800
600
400
200
0
MBps
512 Bytes
4K Bytes
512K Bytes
1M Bytes
Four Channel
I/O Size
Sustained Read (MBps)
WB (MBps)

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	987.12	987.12	208.76	208.76

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	2068.37	16.16	196.91	1.54

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
Dual Channel	8K Bytes	450.60	3.52

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	777.90	777.90	698.26	698.26

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	5977.59	46.70	2524.07	19.72

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	3735.69	29.19

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	777.69	777.69	230.24	230.24

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	5978.84	46.71	973.67	7.61

I/O Parameters		OLTP : 60 % Read / 40 % Write	
Host Channels	**I/O Size**	**IOPS**	**MB/sec**
One Channel	8K Bytes	1862.30	14.55

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

Subsystem	**1 Raid**
Parameters	1 Source to 1 Target
Finish Time	4 Min