10Gb iSCSI Initiators

June 2009

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iSCSI 10Gb Broadcom HBA vs. 10Gb Intel Software Initiator with I/OAT enabled

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Key findings

In large block tests…

- The 10Gb Broadcom host bus adapter (HBA) maintained CPU usage **below 2 percent**.
- The 10Gb Intel Software Initiator with I/O Acceleration Technology (I/OAT) enabled maintained CPU usage **above 14 percent**.
- Both configurations produced comparable throughput results.

iSCSI 10Gb Broadcom HBA vs. 10Gb Intel Software Initiator with I/OAT enabled

In small block tests…

- **The 10Gb Broadcom HBA maintained CPU usage below 9 percent on all 10 access specifications.**
- **The 10Gb Intel Software Initiator with I/OAT enabled maintained CPU usage between 10 and 25 percent.**
- **Both configurations produced comparable throughput results.**

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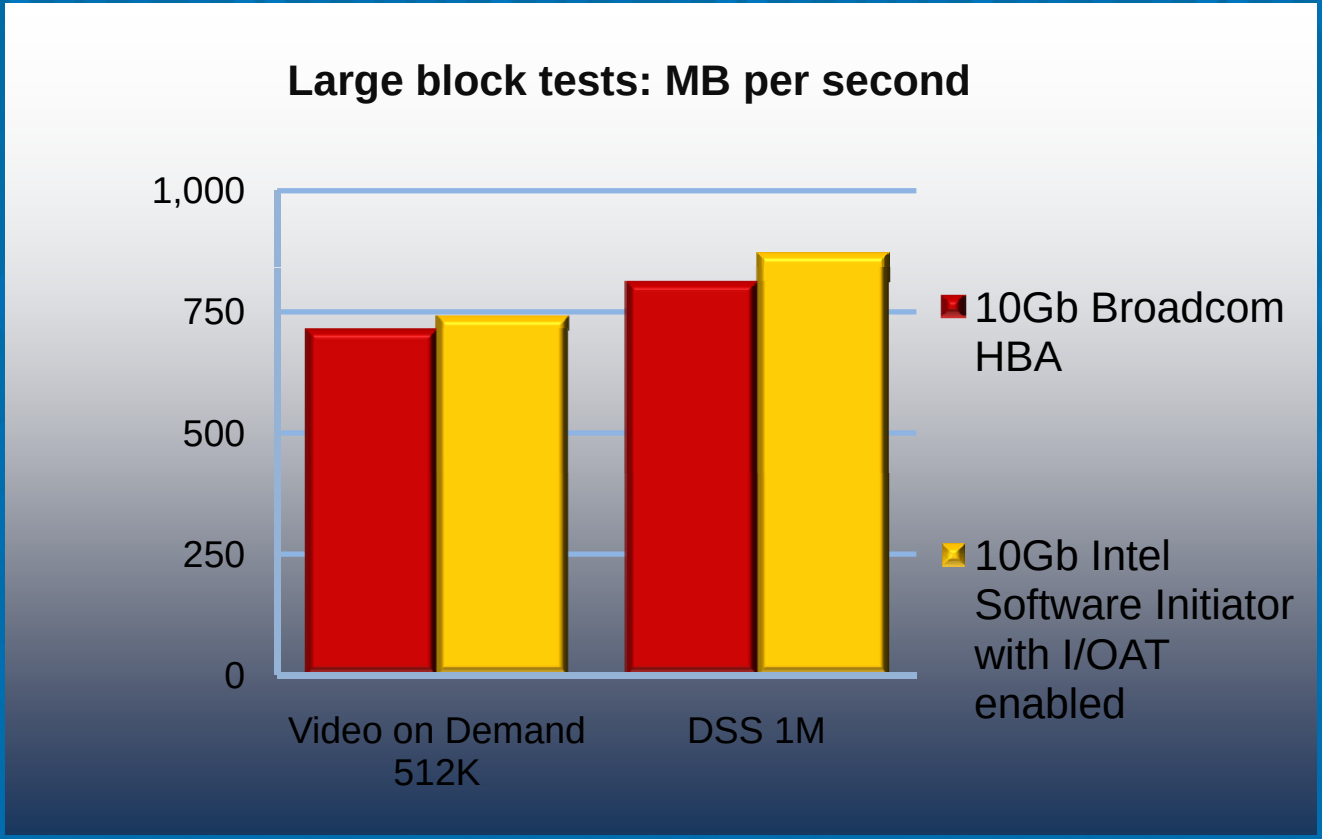
When using 10Gb Ethernet

- Due to their low level of CPU utilization, in our tests HBA iSCSI initiators proved to be a good choice for use with 10Gb Ethernet.

- Due to their high level of CPU utilization, in our tests software iSCSI initiators proved not to be a good choice for use with 10Gb Ethernet.

iSCSI 10Gb Broadcom HBA vs. 10Gb Intel Software Initiator with I/OAT enabled



In large block tests, the 10Gb Broadcom HBA and the 10Gb Intel Software Initiator with I/OAT enabled delivered comparable throughput.

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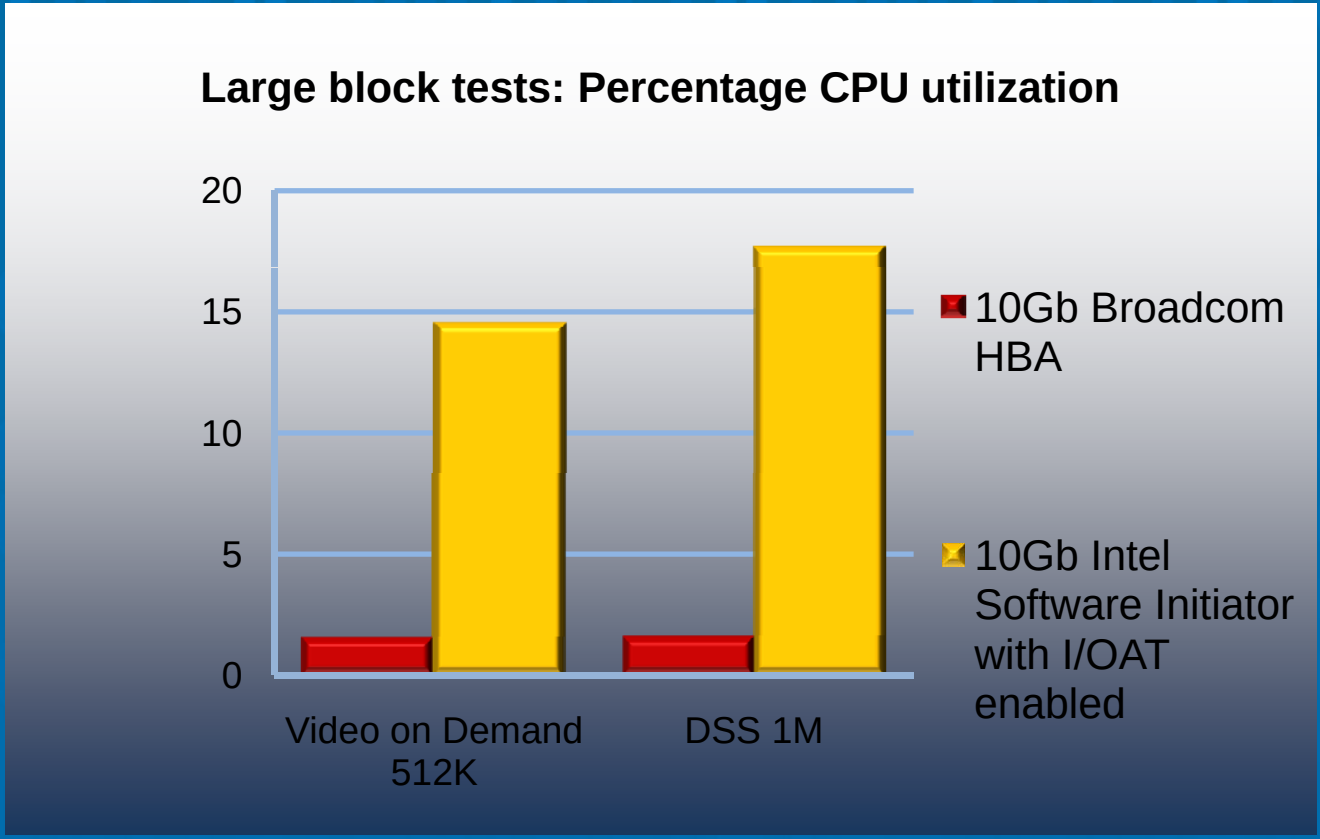
iSCSI 10Gb Broadcom HBA vs. 10Gb Intel Software Initiator with I/OAT enabled



In large block tests, the 10Gb Broadcom HBA dramatically reduced CPU utilization.

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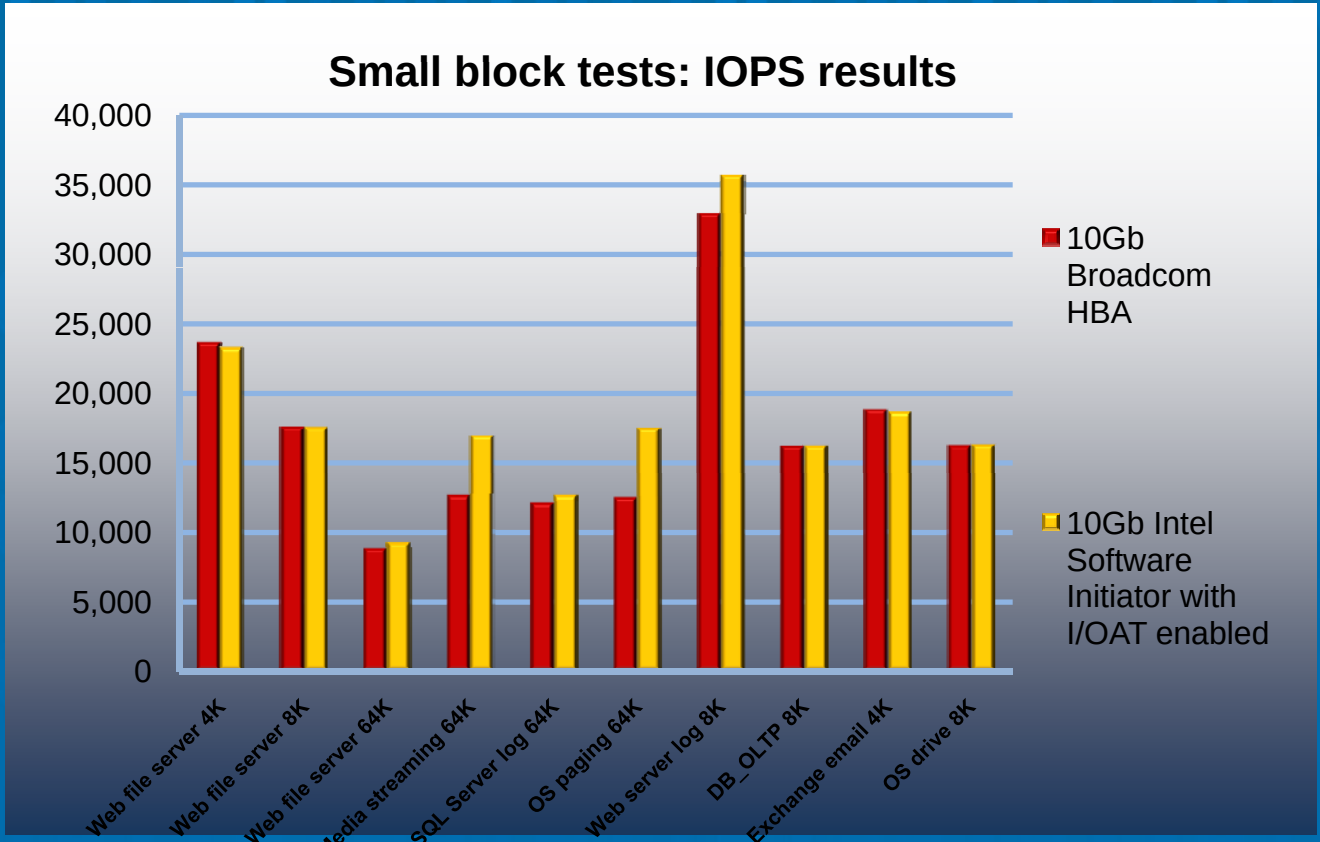
Large block tests: Detailed results

MB per second (higher is better)		
Iometer test	**10Gb Broadcom HBA**	**10Gb Intel Software Initiator with I/OAT enabled**
Video on Demand 512K	710.65	739.35
DSS 1M	809.35	871.82
CPU utilization (lower is better)		
Iometer test	**10Gb Broadcom HBA**	**10Gb Intel Software Initiator with I/OAT enabled**
Video on Demand 512K	1.52%	14.51%
DSS 1M	1.56%	17.68%

Test results represent the median score of three test runs.

iSCSI 10Gb Broadcom HBA vs. 10Gb Intel Software Initiator with I/OAT enabled



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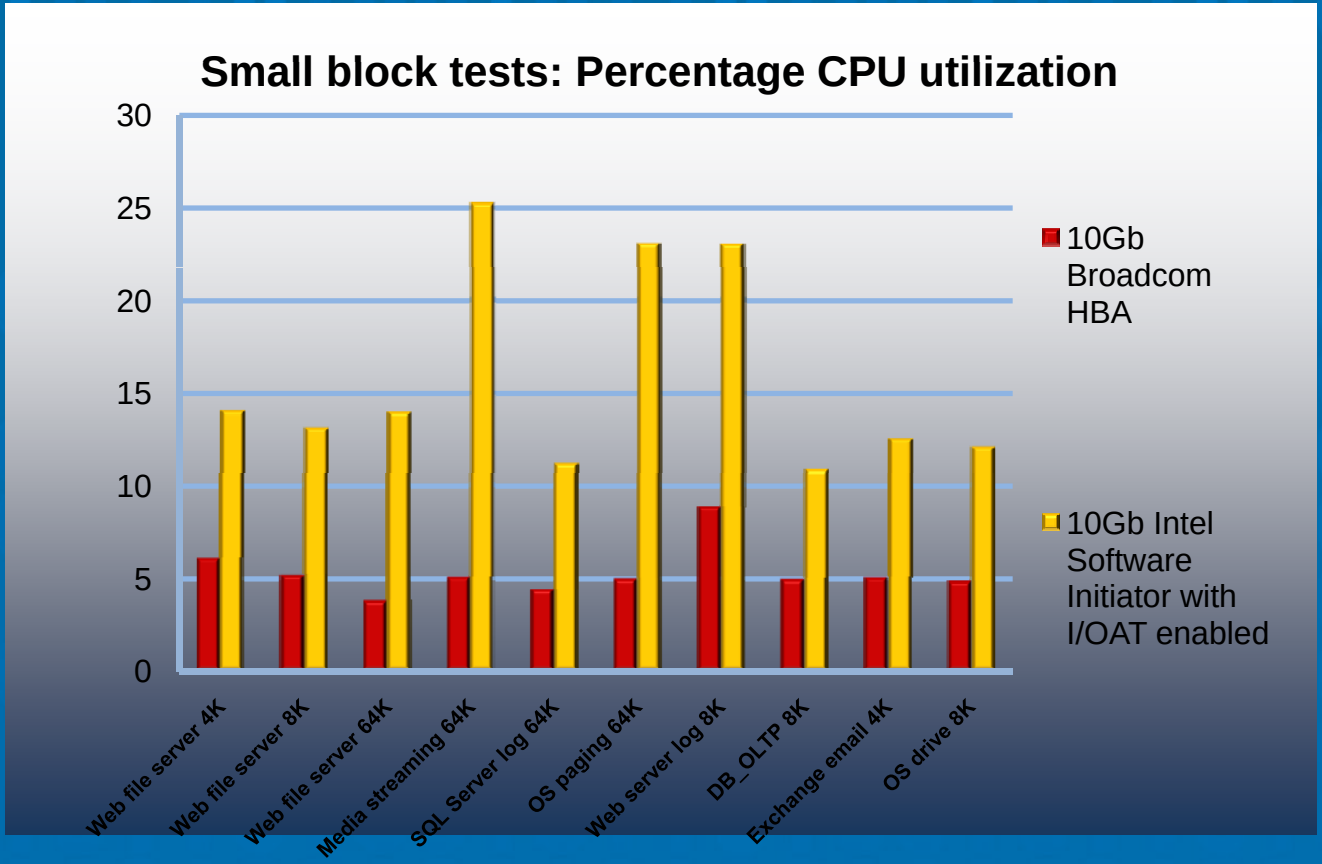

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iSCSI 10Gb Broadcom HBA vs. 10Gb Intel Software Initiator with I/OAT enabled

Small block tests: Detailed results

10Gb Broadcom HBA IOPS	10Gb Intel Software Initiator with I/OAT Enabled IOPS	Custom Iometer tests	10Gb Broadcom HBA IOPS	10Gb Intel Software Initiator with I/OAT Enabled IOPS
Total IOPS		Small block	Percentage CPU utilization	
23,579.47	23,222.59	Web file server 4K	6.09%	14.01%
17,492.03	17,466.39	Web file server 8K	5.18%	13.09%
8,849.25	9,245.78	Web file server 64K	3.79%	13.92%
12,668.42	16,919.43	Media streaming 64K	5.07%	25.25%
12,112.43	12,672.80	SQL Server log 64K	4.40%	11.18%
12,501.17	17,419.78	OS paging 64K	4.96%	23.06%
32,907.58	35,662.69	Web server log 8K	8.88%	23.02%
16,125.20	16,182.18	DB_OLTP 8K	4.95%	10.86%
18,770.52	18,587.52	Exchange email 4K	5.05%	12.50%
16,202.75	16,236.98	OS drive 8K	4.84%	12.06%
17,120.88	**18,361.61**	**Small block average**	**5.32%**	**15.90%**

Test results represent the median score of three test runs.

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Detailed settings for each access specification we used in our tests

Test pattern	Payload size (KB)	Percentage read	Percentage write	Percentage random	Percentage sequential
Web file server 4K	4	95	5	75	25
Web file server 8K	8	95	5	75	25
Web file server 64K	64	95	5	75	25
DSS	1,024	100	0	100	0
Media streaming	64	98	2	0	100
SQL Server log	64	0	100	0	100
OS paging	64	90	10	0	100
Web server log	8	0	100	0	100
DB-OLTP	8	70	30	100	0
Exchange email	4	67	33	100	0
OS drive	8	70	30	100	0
Video on Demand	512	100	0	100	0

iSCSI 10Gb Broadcom HBA vs. 10Gb Intel Software Initiator with I/OAT enabled

Test system configuration information

Server	Dell PowerEdge 2950
Processors	Dual Quad-Core Intel Xeon E5405 2.0 GHz
RAM	16GB PC2-5300 DDR2 RAM (8 x 2 GB)
Operating system	Windows Server 2008 Enterprise x64 Service Pack 1
Storage arrays	Four Dell EqualLogic PS5000XV iSCSI arrays
Total drives	32 SAS drives, 146 GB,15K RPM
Network cards	Broadcom BCM57710 NetXtreme II 10 GigE and Intel 10 Gigabit AT Server Adapter

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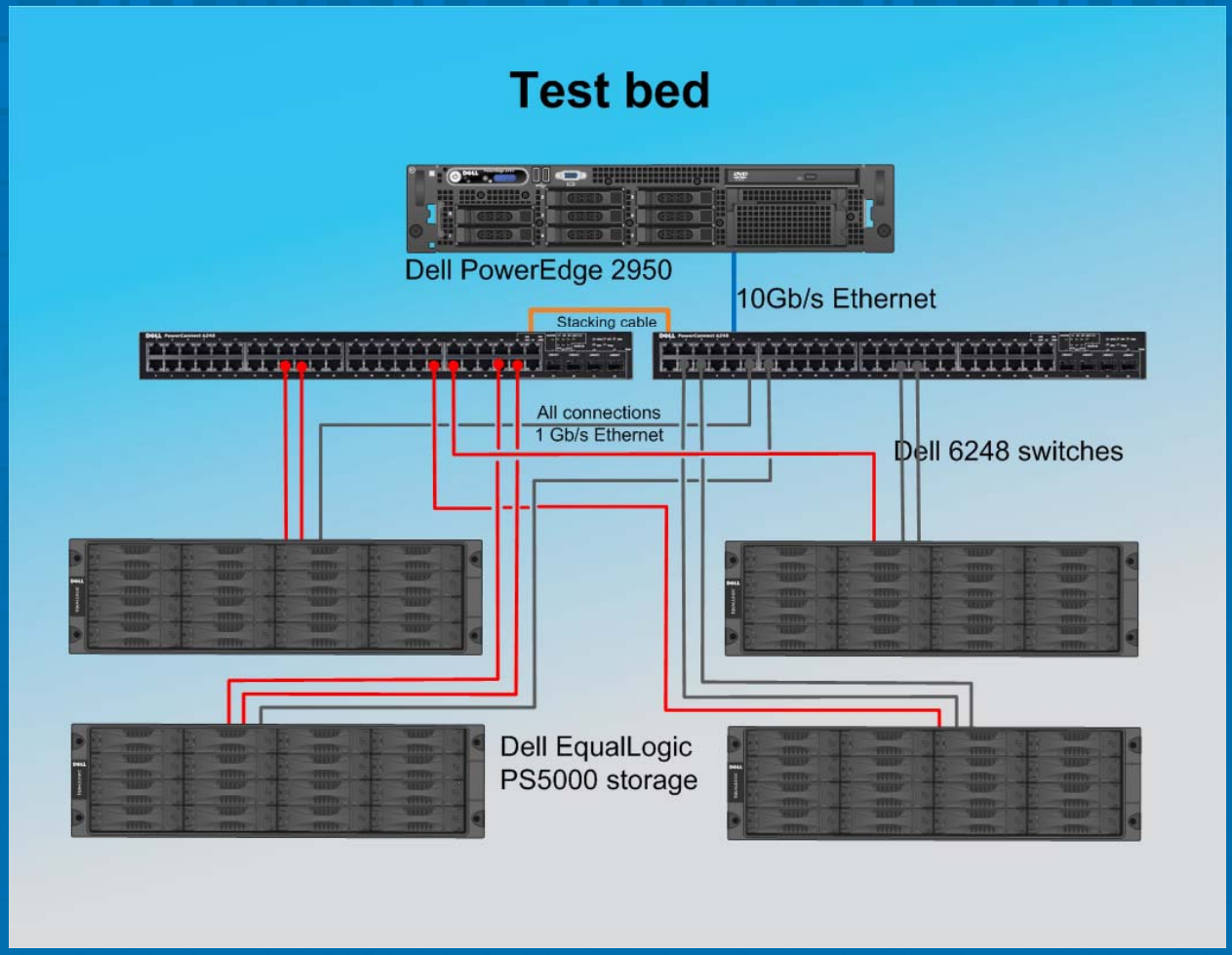

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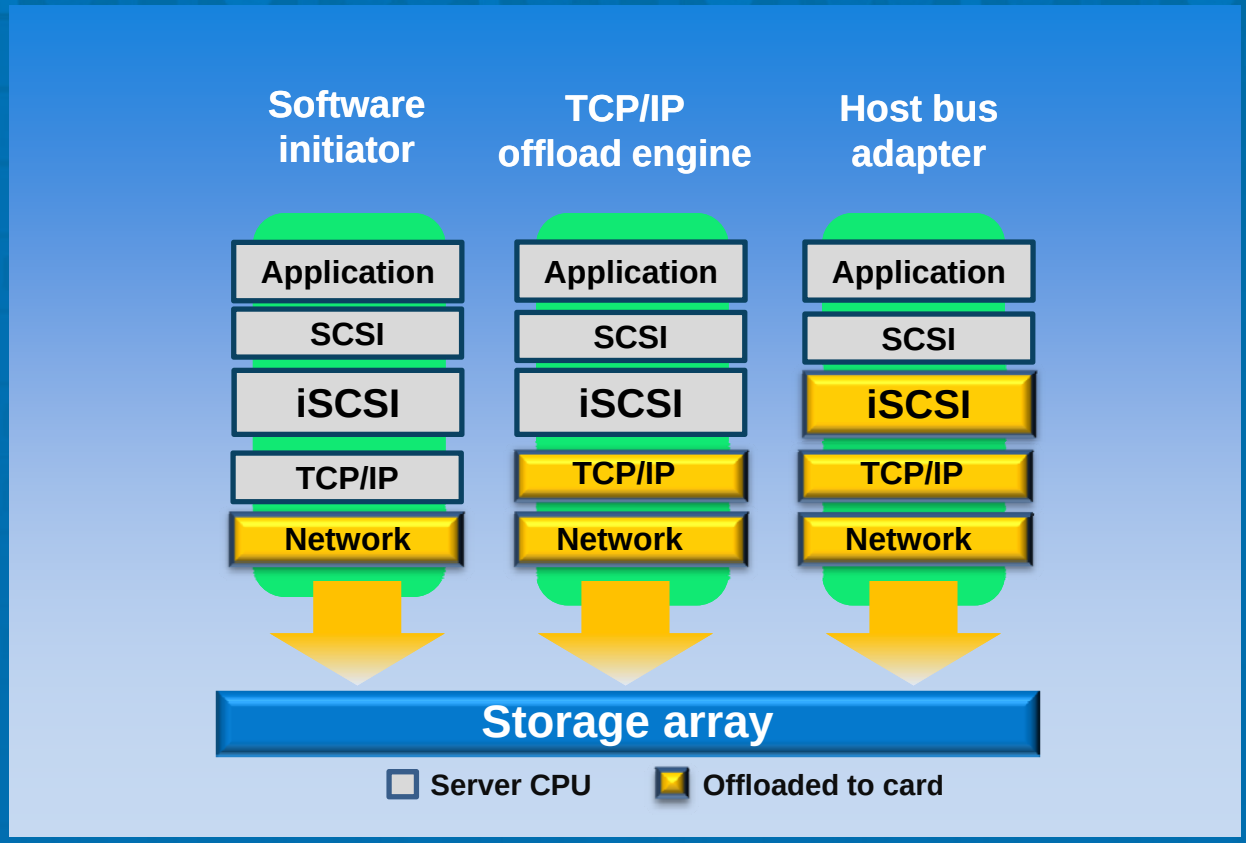
iSCSI initiator implementations



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10Gb Broadcom iSCSI HBA (constrained to four 1Gb connections) vs. 4Gb QLogic FC HBA

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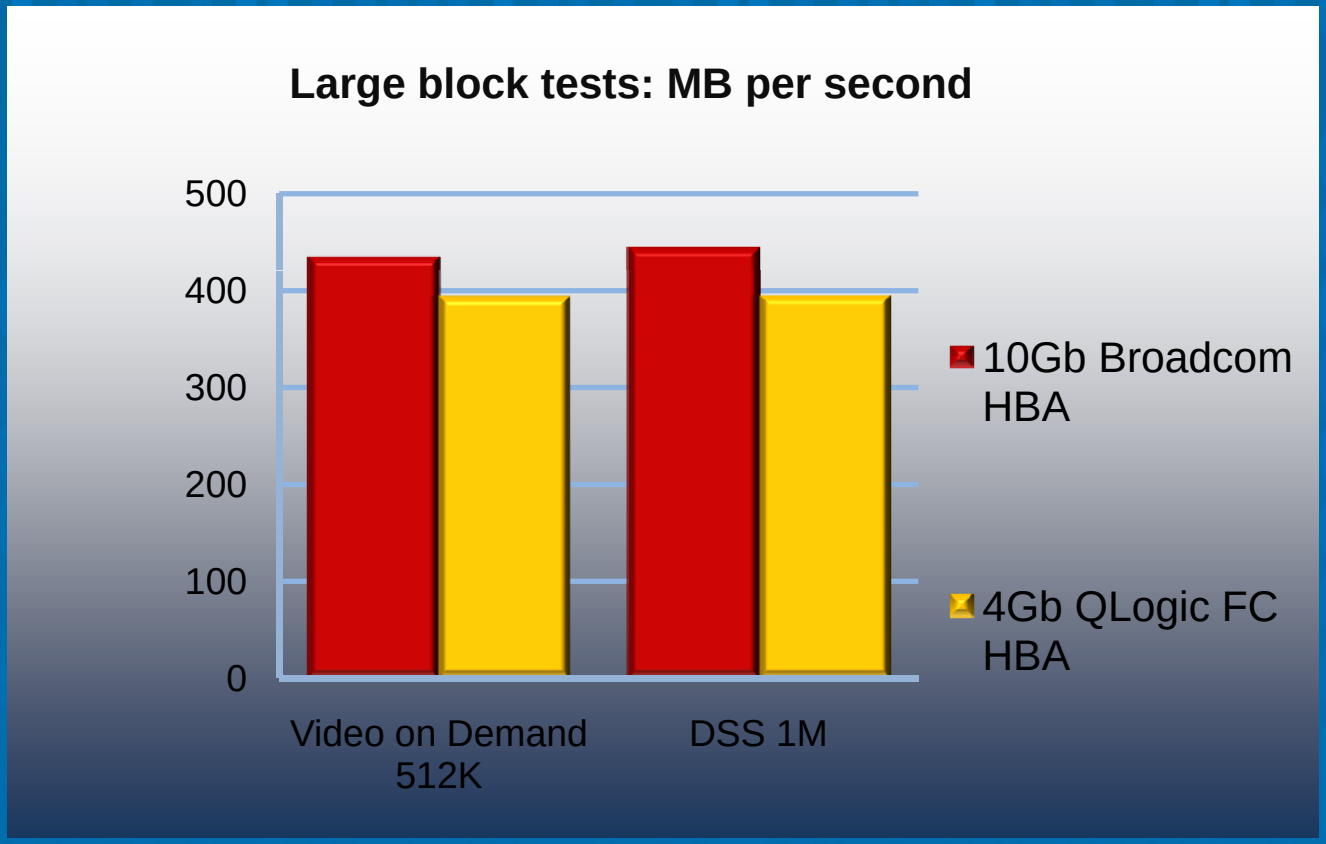

In large block tests, the 10Gb Broadcom iSCSI HBA (constrained to 4Gb) and 4Gb QLogic FC HBA delivered comparable throughput.

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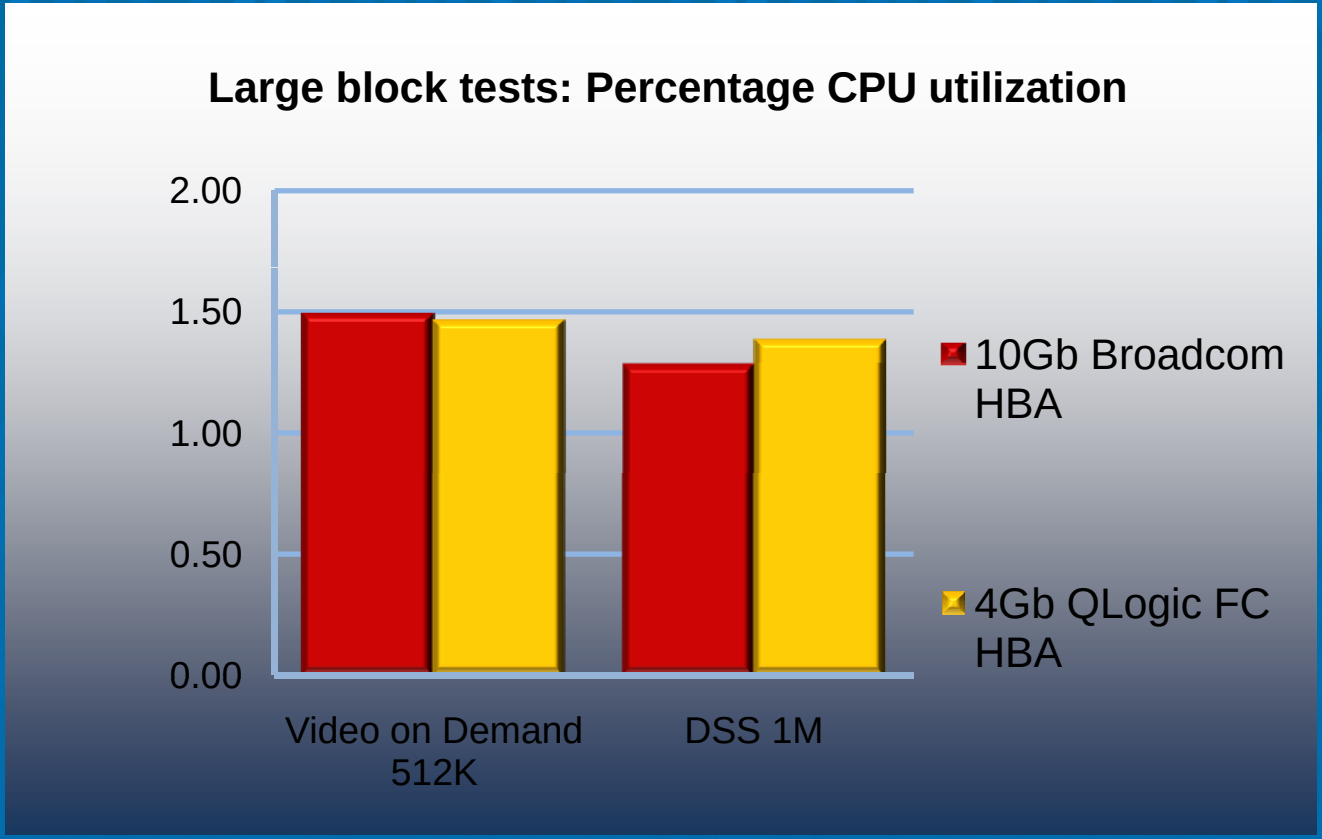
10Gb Broadcom iSCSI HBA (constrained to four 1Gb connections) vs. 4Gb QLogic FC HBA



In large block tests, the 10Gb Broadcom iSCSI HBA (constrained to 4Gb) and 4Gb QLogic FC HBA showed comparable CPU utilization.

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10Gb Broadcom iSCSI HBA (constrained to four 1Gb connections) vs. 4Gb QLogic FC HBA

Large block tests: Detailed results

MB per second (higher is better)		
Iometer test	**10Gb Broadcom iSCSI HBA (constrained to 4Gb)**	**4Gb QLogic FC HBA**
Video on Demand 512K	433.69	392.78
DSS 1M	443.50	393.99
Average MB per second	438.59	393.38
CPU utilization (lower is better)		
Iometer test	**10Gb Broadcom iSCSI HBA (constrained to 4Gb)**	**4Gb QLogic FC HBA**
Video on Demand 512K	1.49%	1.46%
DSS 1M	1.28%	1.38%
Average CPU utilization	1.39%	1.42%

Test results represent the median score of three test runs.

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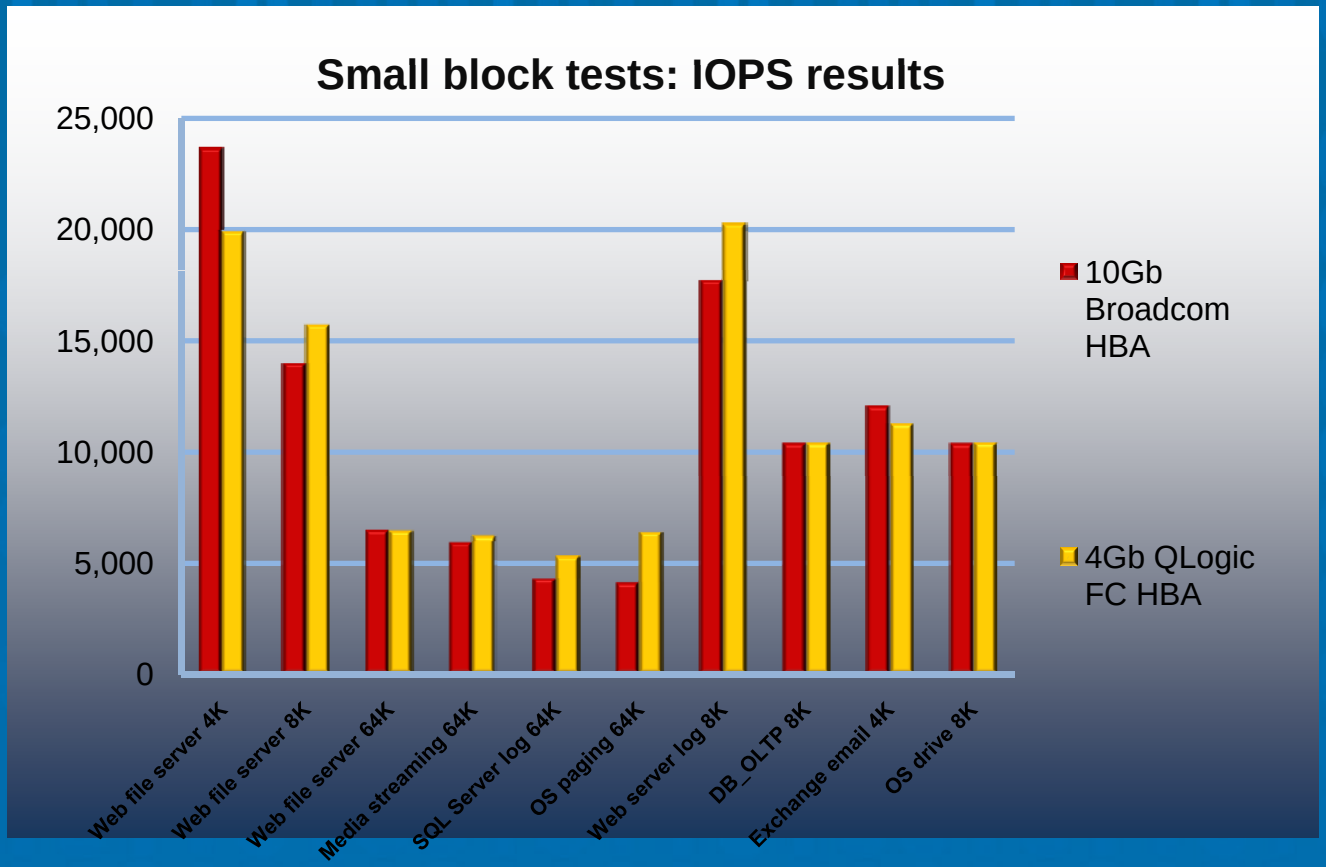
10Gb Broadcom iSCSI HBA (constrained to four 1Gb connections) vs. 4Gb QLogic FC HBA



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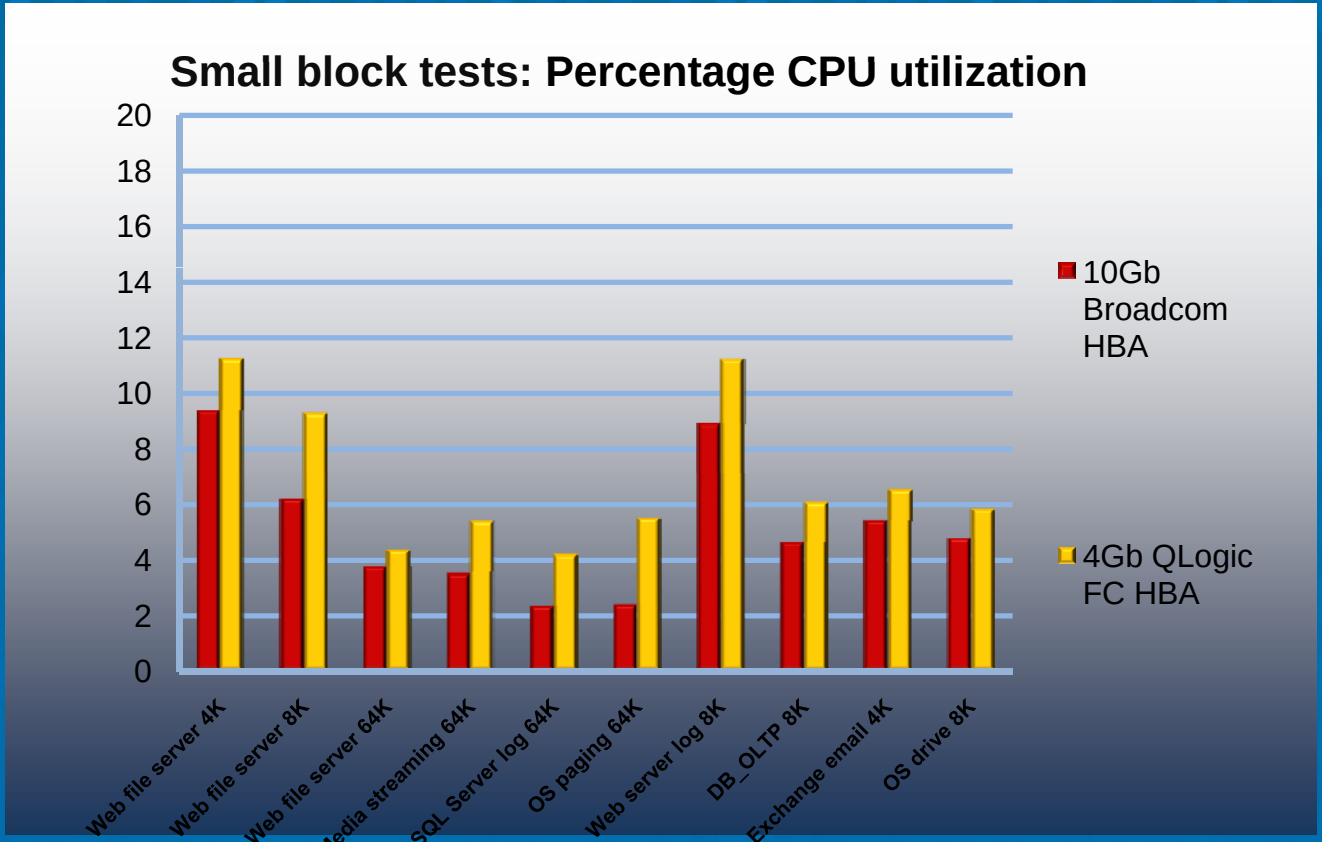

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10Gb Broadcom iSCSI HBA (constrained to four 1Gb connections) vs. 4Gb QLogic FC HBA

Detailed results: Small block tests

10Gb Broadcom iSCSI HBA	4Gb QLogic FC HBA	EMC CX4: FC vs. iSCSI custom Iometer tests	10Gb Broadcom iSCSI HBA	4Gb QLogic FC HBA
Total IOPS		Small block	Percentage CPU utilization	
23,654.52	19,856.53	Web file server 4K	9.33%	11.21%
13,962.01	15,669.93	Web file server 8K	6.20%	9.25%
6,491.69	6,437.41	Web file server 64K	3.76%	4.35%
5,933.00	6,207.80	Media streaming 64K	3.51%	5.39%
4,300.32	5,287.31	SQL Server log 64K	2.33%	4.20%
4,112.61	6,388.26	OS paging 64K	2.39%	5.51%
17,687.67	20,196.73	Web server log 8K	8.88%	11.19%
10,349.84	10,335.63	DB_OLTP 8K	4.63%	6.07%
12,040.77	11,207.84	Exchange email 4K	5.42%	6.53%
10,347.27	10,350.13	OS drive 8K	4.79%	5.83%
10,887.97	**11,193.76**	**Small block average IOPS/processor utilization**	**5.12%**	**6.95%**

Test results represent the median score of three test runs.

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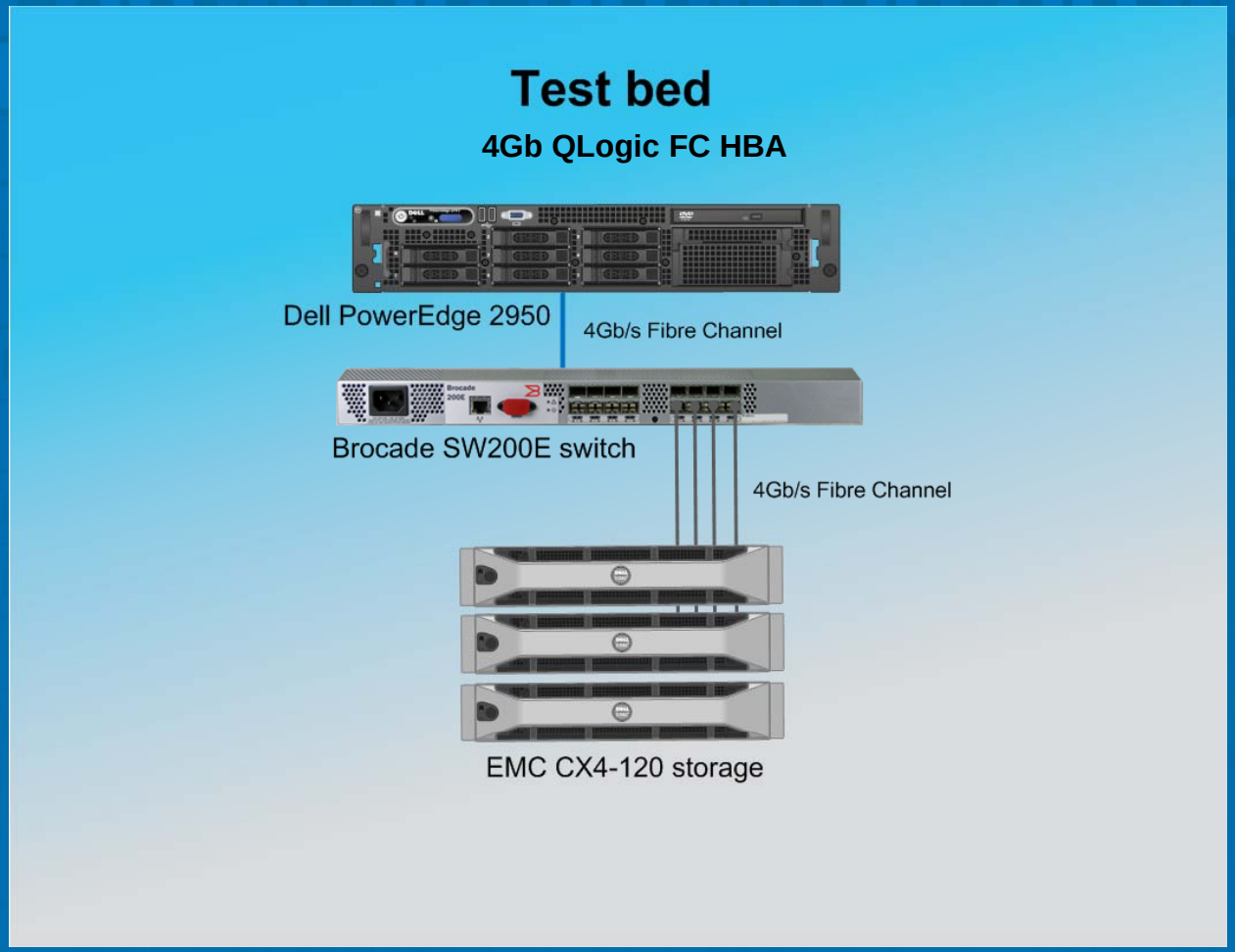

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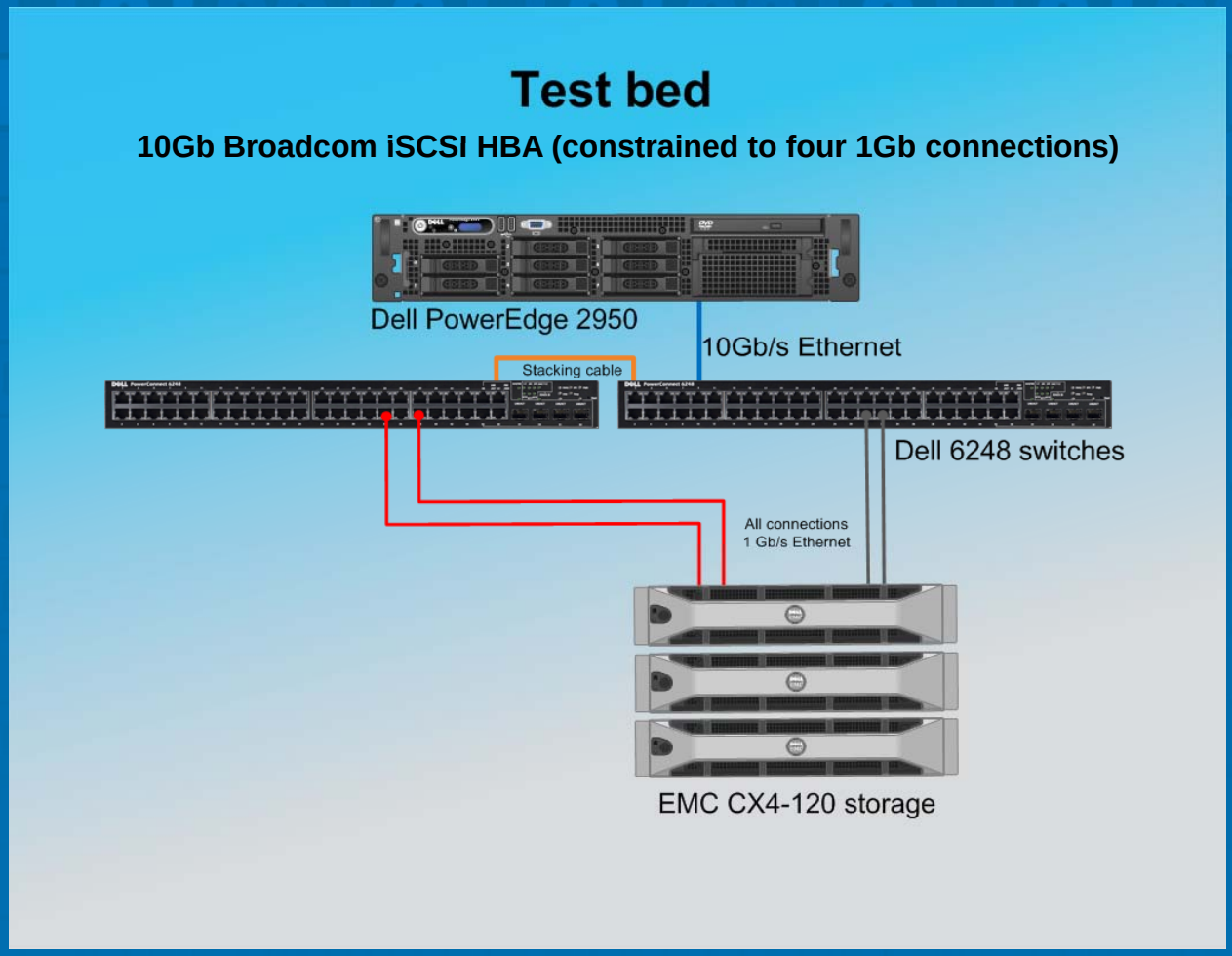

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RAM	16GB PC2-5300 DDR2 RAM (8 x 2 GB)
Operating system	Windows Server 2008 Enterprise x64 Service Pack 1
Storage arrays	One EMC CX4-120 with two drive shelves
Total drives	30 FC drives, 146 GB, 15K RPM
Network cards	Broadcom BCM57710 NetXtreme II 10 GigE and QLogic QLE2460 Fibre Channel HBA

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