open-e

Lenovo RD240
storage system

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Test description and environment

Copy data between Lenovo RD240 with Open-E DSS V6 and Workstation with MS Windows Server 2008 R2.

Test topology
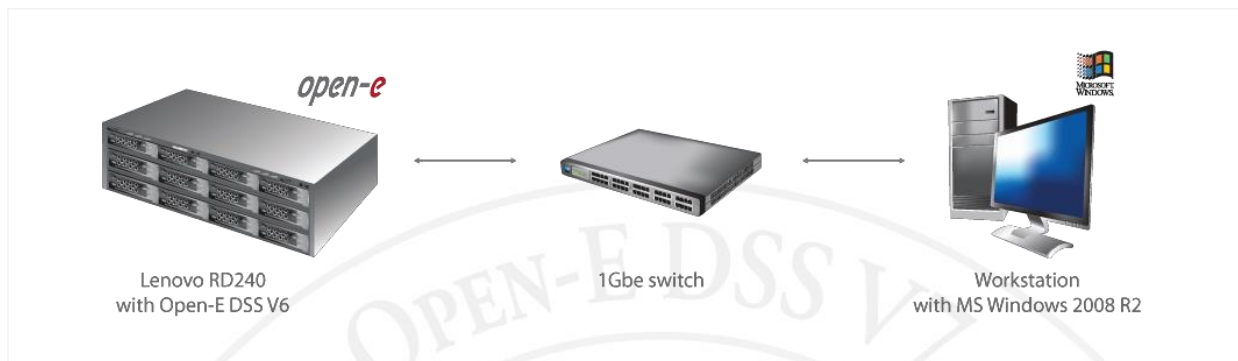

FIGURE 1: Connection between Lenovo RD240 and Workstation

1. Lenovo RD240 with Open-E DSS V6

Model	Lenovo RD240
Operating system	Open-E DSS V6 build 4452
Motherboard	Tyan S7007
CPU	2x Intel Xeon Quad-core E5620 2.40GHz[1]
Memory	8GB DDR3 ECC-REG
Network controller	Intel PRO/1000 dual (i82574L) [vid:8086, did:10d3][2]
HW RAID controller	LSI MegaRAID SAS 8708ELP [vid:1000, did:0060][3]
Hard disks set	8x 750GB Hitachi HUA721075KLA330 SATAII Drives[4]

TABLE 1: Lenovo RD240 details

2. 1GbE switch

Model	Planet GSW-2401
Operating system	24 port Gigabit managed switch

TABLE 2: 1GbE switch details

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1 12MB cache, 2.40 GHz, 5.86 GT/s Intel® QPI, 4 Cores-HT, FCLGA1366 http://ark.intel.com/Product.aspx?id=47925
2 vid, did - vendor id, device id
3 Internal SAS +SATA, PCI-E
   http://www.lsi.com/storage_home/products_home/internal_raid/megaraid_sas/megaraid_sas_8708elp/
4 Drives mounted inside Lenovo's enclosure attached to LSI MegaRAID SAS 8708ELP

3. Workstation with MS Windows 2008 R2

Model	Custom system
Operating System	MS Windows Server 2008 R2
Motherboard	Tyan S2892[5]
CPU	AMD Opteron 244 1,81GHz
Memory	4GB DDR ECC-REG
Network controller	Broadcom NetXtreme dual (BCM5704) [vid:14E4, did:1648]
Network controller	Intel PRO/100 (i82559) [vid:8086, did:1229]
Hard disks set	1x 250GB Western Digital WD2500AAKS SATAII Drive[6]
Additional software	Bart's Stuff Test 5 (bst5) v.5.1.4

TABLE 3: Workstation details

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[5] http://www.tyan.com/(A(uzgFKh0
s51Dyw6iddw7l5ft1XGuPjzmWTuRQKMXS01S1pg5SVBZl3doyjbTm0Qt8GjOrq3QnQ7tYEgdGUv98KCz
1TGZb92dVB7w9tR9Sgs1))/product_board_detail.aspx?pid=145
[6] Drive attached to on-board SATA controller

Test execution

Functionality test results

1. Hardware monitoring and Intel I/O AT functionality

Hardware monitoring (IPMI)	OK
Intel I/O AT	OK

TABLE 4: Hardware monitoring functionality details

2. Recognized controllers

Network controllers	Intel Corporation 82574L Gigabit Network Connection Intel Corporation 82574L Gigabit Network Connection	OK
RAID/SCSI controllers	LSI Logic / Symbios Logic MegaRAID SAS 8708ELP LSI Logic / Symbios Logic SAS1068E PCI-Express Fusion-MPT SAS (rev 08)	OK

TABLE 5: Recognized controllers details

3. Used drivers

Network drivers	Ethernet Channel Bonding Driver, v3.3.0 Intel(R) PRO/1000 Network Driver	OK
RAID/SCSI drivers	SCSI disk (type 0) and CDROM (type 5) dev handler for SCST using files on file systems or block devices SCSI target core iSCSI/TCP data-path iSCSI library functions iSCSI Transport Interface SCSI generic (sg) driver SAS Transport Attributes LSI MegaRAID SAS Driver	OK

TABLE 6: Used drivers details

4. Front panel LEDs

Network LED1	OK
Network LED2	OK
HDD LED	OK
Warning LED	OK

TABLE 7: Front panel LEDs details

Performance test results for RAID0

1. Write and read test on locally attached disk devices

Write to/read from 4 SATA disks attached to LSI RAID controller using dd with block size between 4KB and 4MB. All disk drives are configured into RAID0. This test shows how fast is connection between disks drives and the RAID controller.

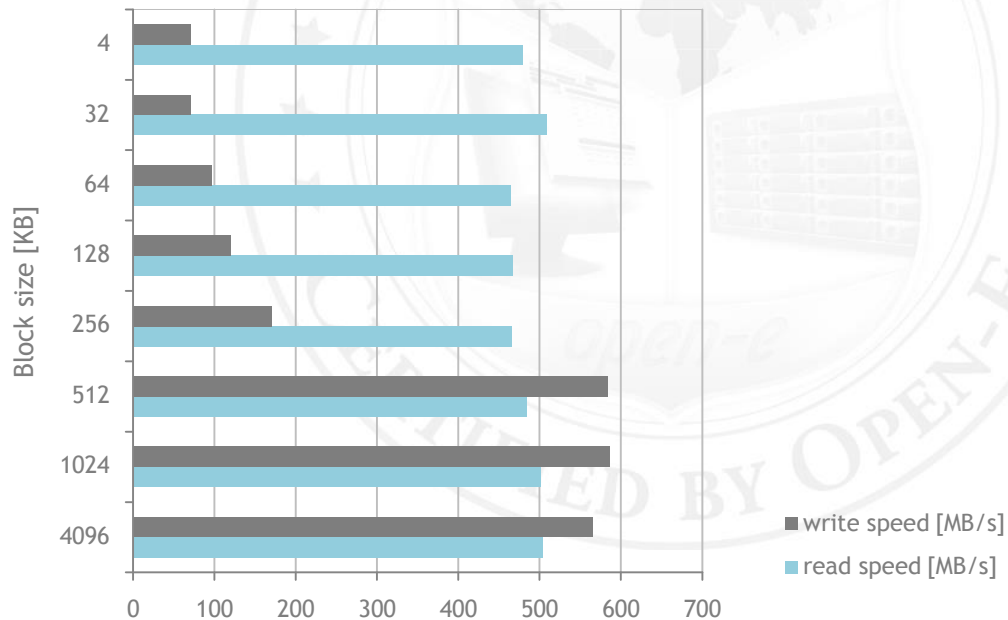| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	70	479
32	71	509
64	96	464
128	119	467
256	170	466
512	584	484
1024	586	501
4096	565	503

FIGURE 2: Table and chart with write and read speed results for locally attached disk devices (RAID0)

2. Write and read test on Block I/O Write-through iSCSI device connected to *Workstation* via1GbE controller.

Write to/read from disk device exported by *Lenovo RD240 with Open-E DSS V6* and connected via iSCSI to the *Workstation with MS Windows Server 2008 R2* using bst5 benchmark with block size between 4KB and 4MB. All disk drives on target side (certified *Lenovo RD240 with Open-E DSS V6* running on it) Exported via iSCSI are configured into RAID0. Exported lun size is 100GB and type is Block I/O. The mtu parameter is set to 1500. The target side is connected by Intel PRO/1000 dual (i82574L) GbE network controller and the initiator side is connected by Broadcom NetXtreme dual (BCM5704) GbE network controller. Network connection topology is shown on **Test topology: FIGURE 1**.

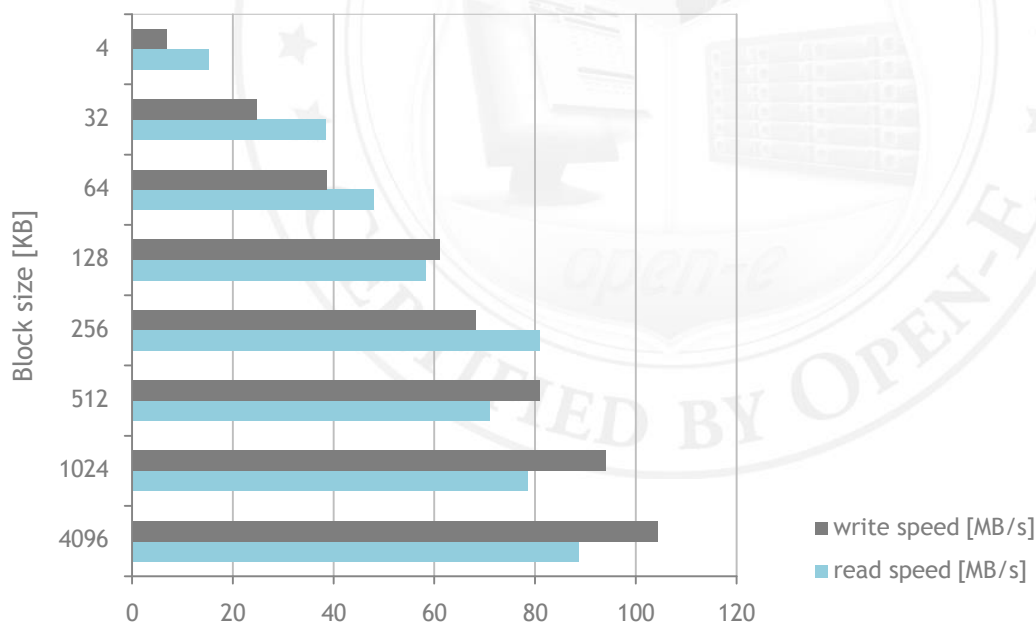| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	6.8	15.2
32	24.7	38.5
64	38.7	48
128	61	58.2
256	68.3	81
512	81	71
1024	94	78.5
4096	104.3	88.7

FIGURE 3: Table and chart with write and read speed results for Block I/O iSCSI device (RAID0)

3. Write and read test on Block I/O Write-back iSCSI device connected to *Workstation* via 1GbE controller.

Write to/read from disk device exported by *Lenovo RD240 with Open-E DSS V6* and connected via iSCSI to the *Workstation with MS Windows Server 2008 R2* using bst5 benchmark with block size between 4KB and 4MB. All disk drives on target side (certified *Lenovo RD240 with Open-E DSS V6* running on it) exported via iSCSI are configured into RAID0. Exported lun size is 100GB and type is Block I/O Write-back. The mtu parameter is set to 1500. The target side is connected by Intel PRO/1000 dual (i82574L) GbE network controller and the initiator side is connected by Broadcom NetXtreme dual (BCM5704) GbE network controller. Network connection topology is shown on **Test topology: FIGURE 1.**

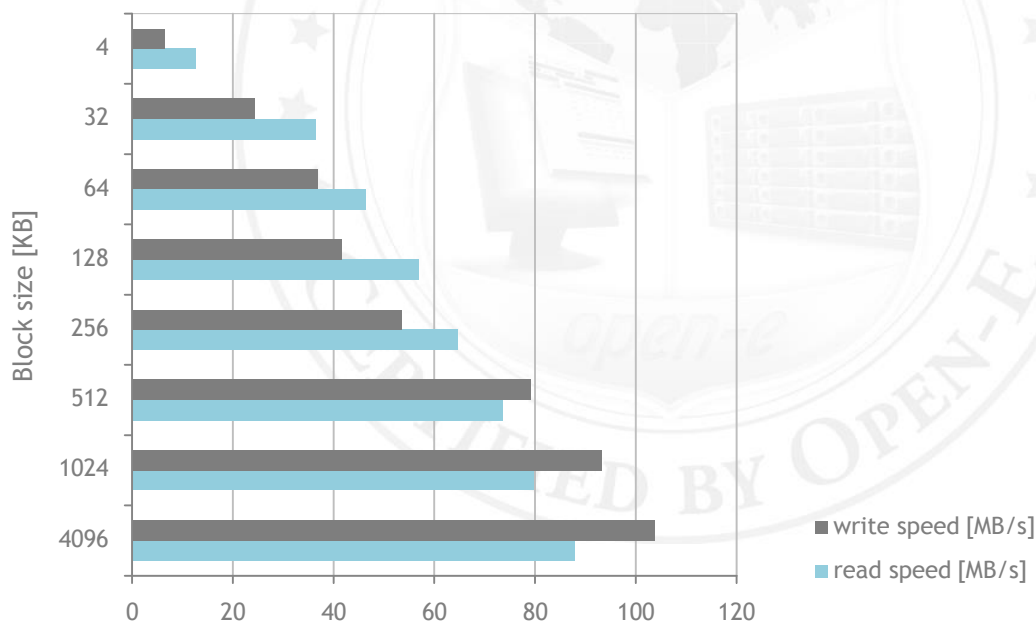| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	6.4	12.7
32	24.4	36.5
64	36.9	46.3
128	41.7	56.8
256	53.5	64.7
512	79.1	73.5
1024	93.3	79.8
4096	103.7	87.9

FIGURE 4: Table and chart with write and read speed results for Block I/O Write-back iSCSI device (RAID0)

4. Write and read test on File I/O Write-through iSCSI device connected to *Workstation* via 1GbE controller.

Write to/read from disk device exported by *Lenovo RD240 with Open-E DSS V6* and connected via iSCSI to the *Workstation with MS Windows Server 2008 R2* using bst5 benchmark with block size between 4KB and 4MB. All disk drives on target side (certified *Lenovo RD240 with Open-E DSS V6* running on it) exported via iSCSI are configured into RAID0. Exported lun size is 100GB and type is File I/O Write-through. The mtu parameter is set to 1500. The target side is connected by Intel PRO/1000 dual (i82574L) GbE network controller and the initiator side is connected by Broadcom NetXtreme dual (BCM5704) GbE network controller. Network connection topology is shown on **Test topology: FIGURE 1.**

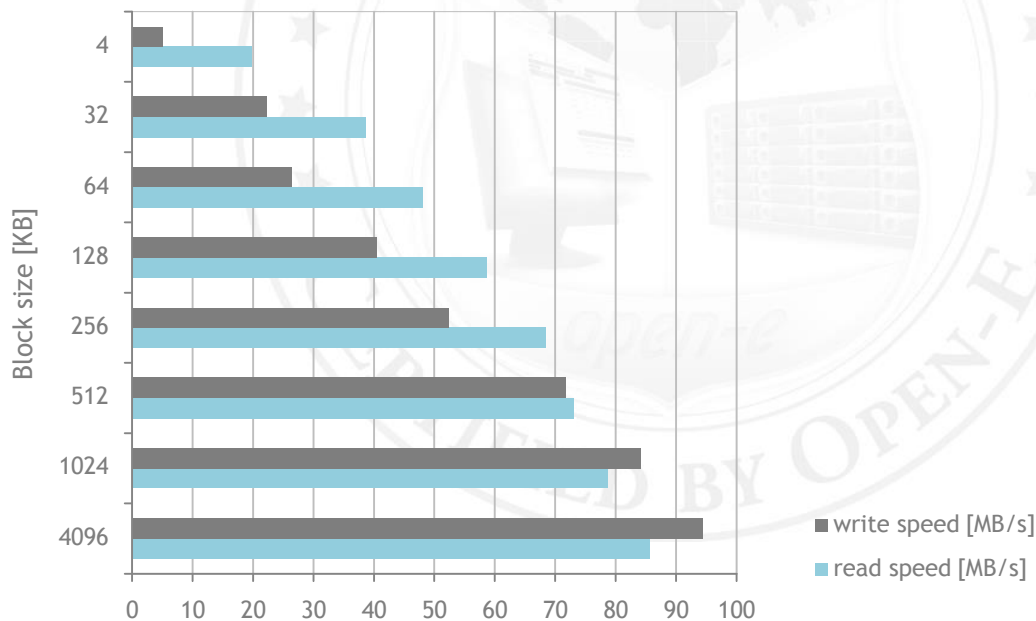| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	5	19.8
32	22.2	38.7
64	26.4	48
128	40.5	58.7
256	52.4	68.4
512	71.8	73
1024	84.1	78.7
4096	94.4	85.6

FIGURE 5: Table and chart with write and read speed results for File I/O Write-through iSCSI device (RAID0)

5. Write and read test on File I/O Write-back iSCSI device connected to *Workstation* via 1GbE controller.

Write to/read from disk device exported by *Lenovo RD240 with Open-E DSS V6* and connected via iSCSI to the *Workstation with MS Windows Server 2008 R2* using bst5 benchmark with block size between 4KB and 4MB. All disk drives on target side (certified *Lenovo RD240 with Open-E DSS V6* running on it) exported via iSCSI are configured into RAID0. Exported lun size is 100GB and type is File I/O Write-back. The mtu parameter is set to 1500. The target side is connected by Intel PRO/1000 dual (i82574L) GbE network controller and the initiator side is connected by Broadcom NetXtreme dual (BCM5704) GbE network controller. Network connection topology is shown on **Test topology: FIGURE 1.**

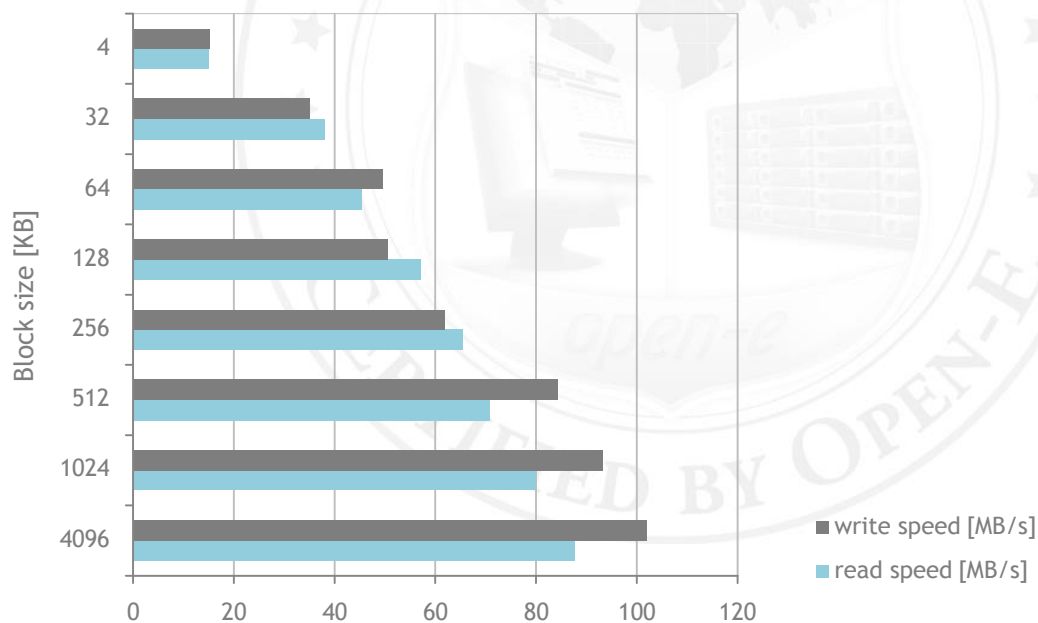| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	11.4	16.1
32	44.3	43.8
64	51.5	50.7
128	60.9	60.6
256	72.9	62.9
512	86.7	71.8
1024	94.3	77.8
4096	96.7	85.2

FIGURE 6: Table and chart with write and read speed results for File I/O Write-back iSCSI device (RAID0)

6. Write and read test on SMB share connected to *Workstation* via 1GbE controller

Write to/read from SMB share exported by *Lenovo RD240 with Open-E DSS V6* and mapped via SMB to the *Workstation with MS Windows Server 2008 R2* using bst5 benchmark with block size between 4KB and 4MB. All disk drives on server side (certified *Lenovo RD240 with Open-E DSS V6* running on it) exported via SMB are configured into RAID0. Exported SMB share size is 100GB. The mtu parameter is set to 1500. The server side is connected by Intel PRO/1000 dual (i82574L) GbE network controller and the client side is connected by Broadcom NetXtreme dual (BCM5704) GbE network controller. Network connection topology is shown on **Test topology: FIGURE 1.**

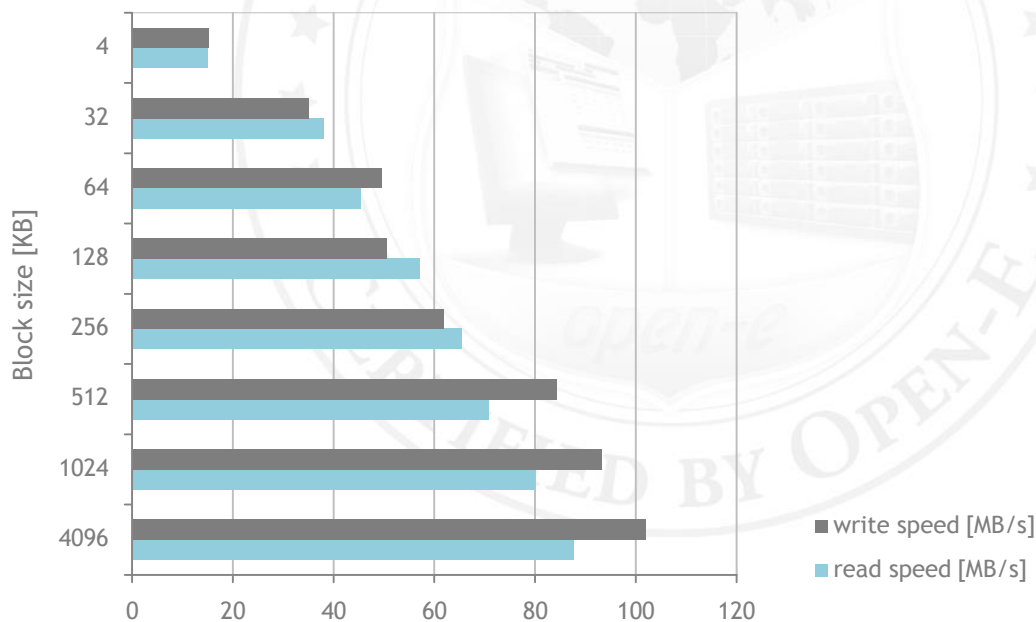| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	18.3	15.7
32	55	50
64	55.5	51.3
128	77.5	48.5
256	89	52.2
512	96.2	51.1
1024	103.6	52.1
4096	105.7	53

FIGURE 7: Table and chart with write and read speed results for SMB share (RAID0)

Performance test results for RAID5

1. Write and read test on locally attached disk devices

Write to/read from 4 SATA disks attached to LSI RAID controller using dd with block size between 4KB and 4MB. All disk drives are configured into RAID5.
This test shows how fast is connection between disks drives and the RAID controller.

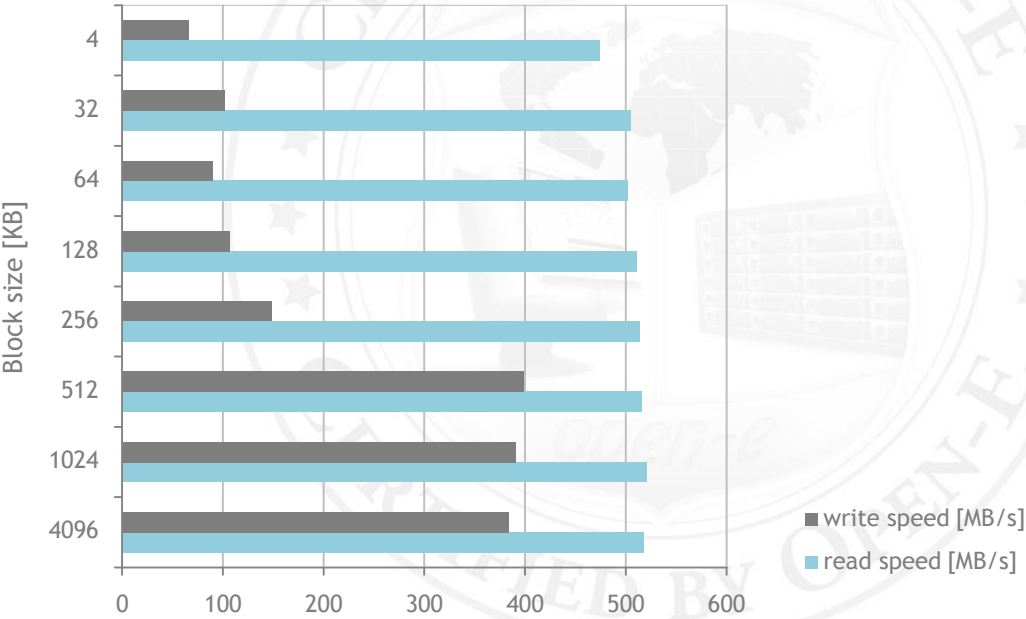| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	66.3	474
32	102	505
64	89.7	502
128	107	511
256	148	514
512	398	516
1024	390	521
4096	384	518

FIGURE 8: Table and chart with write and read speed results for locally attached disk devices (RAID5)

2. Write and read test on Block I/O Write-trough iSCSI device connected to *Workstation* via 1GbE controller.

Write to/read from disk device exported by *Lenovo RD240 with Open-E DSS V6* and connected via iSCSI to the *Workstation with MS Windows Server 2008 R2* using bst5 benchmark with block size between 4KB and 4MB. All disk drives on target side (certified *Lenovo RD240 with Open-E DSS V6* running on it) exported via iSCSI are configured into RAID5. Exported lun size is 100GB and type is Block I/O Write-trough. The mtu parameter is set to 1500. The target side is connected by Intel PRO/1000 dual (i82574L) GbE network controller and the initiator side is connected by Broadcom NetXtreme dual (BCM5704) GbE network controller. Network connection topology is shown on **Test topology: FIGURE 1**.

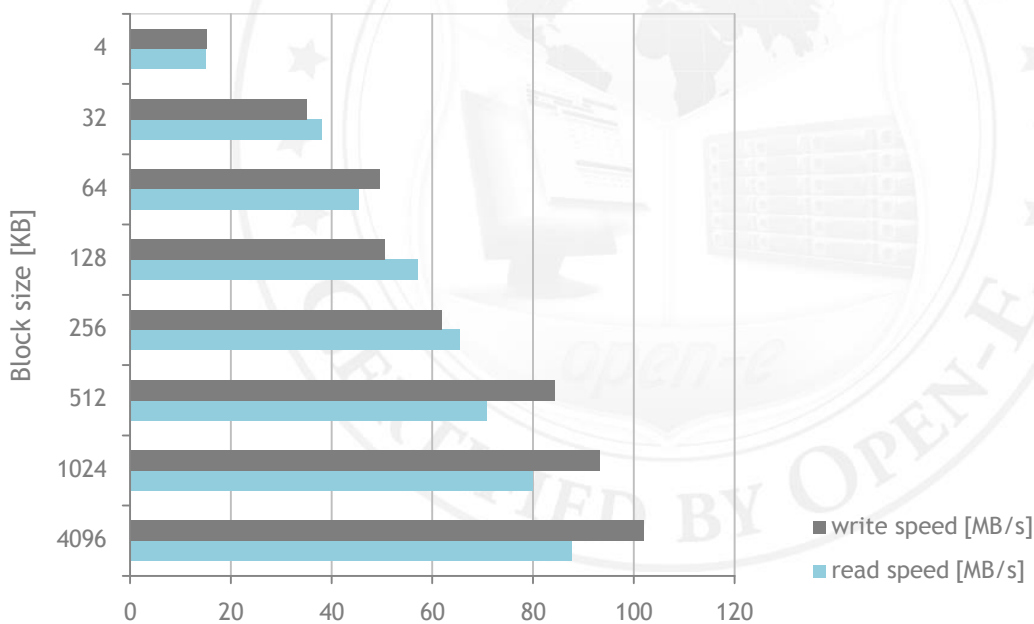| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	15.2	14.9
32	35	38
64	49.6	45.4
128	50.6	57
256	61.8	65.3
512	84.3	70.8
1024	93.3	80
4096	102	87.6

FIGURE 9: Table and chart with write and read speed results for Block I/O Write-trough iSCSI device (RAID5)

3. Write and read test on Block I/O Write-back iSCSI device connected to *Workstation* via 1GbE controller.

Write to/read from disk device exported by *Lenovo RD240 with Open-E DSS V6* and connected via iSCSI to the *Workstation with MS Windows Server 2008 R2* using bst5 benchmark with block size between 4KB and 4MB. All disk drives on target side (certified *Lenovo RD240 with Open-E DSS V6* running on it) exported via iSCSI are configured into RAID5. Exported lun size is 100GB and type is Block I/O Write-back. The mtu parameter is set to 1500. The target side is connected by Intel PRO/1000 dual (i82574L) GbE network controller and the initiator side is connected by Broadcom NetXtreme dual (BCM5704) GbE network controller. Network connection topology is shown on *Test topology: FIGURE 1.*

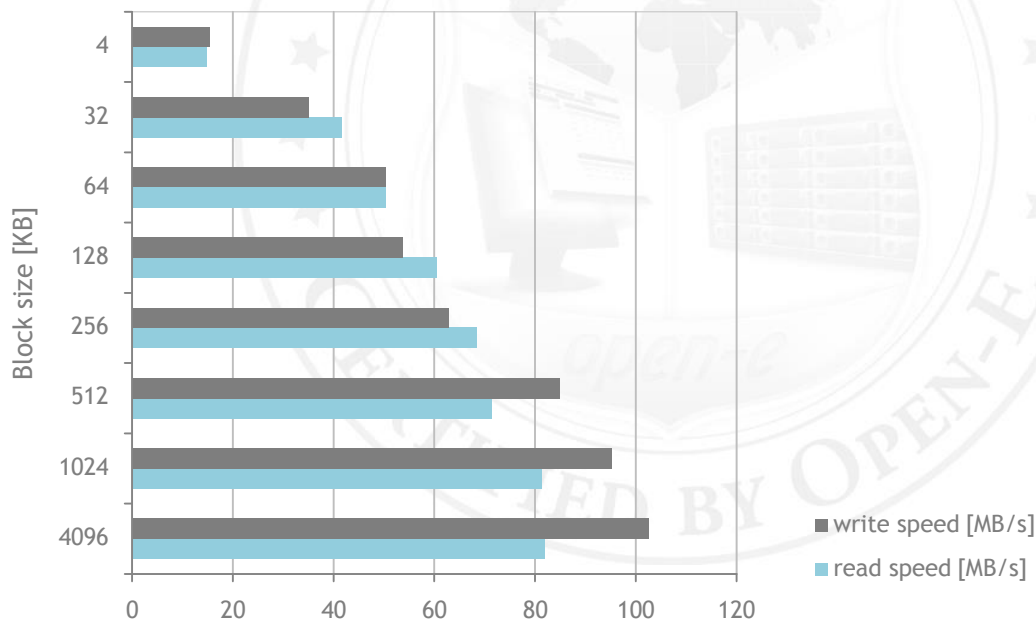| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	15.3	14.8
32	35	41.6
64	50.4	50.4
128	53.7	60.5
256	62.9	68.4
512	84.8	71.3
1024	95.1	81.2
4096	102.5	81.9

FIGURE 10: Table and chart with write and read speed results for Block I/O Write-back iSCSI device (RAID5)

4. Write and read test on File I/O Write-through iSCSI device connected to *Workstation* via 1GbE controller.

Write to/read from disk device exported by Lenovo RD240 with Open-E DSS V6 and connected via iSCSI to the Workstation with MS Windows Server 2008 R2 using bst5 benchmark with block size between 4KB and 4MB. All disk drives on target side (certified Lenovo RD240 with Open-E DSS V6 running on it) exported via iSCSI are configured into RAID5. Exported lun size is 100GB and type is File I/O Write-through. The mtu parameter is set to 1500. The target side is connected by Intel PRO/1000 dual (i82574L) GbE network controller and the initiator side is connected by Broadcom NetXtreme dual (BCM5704) GbE network controller. Network connection topology is shown on **Test topology: FIGURE 1.**

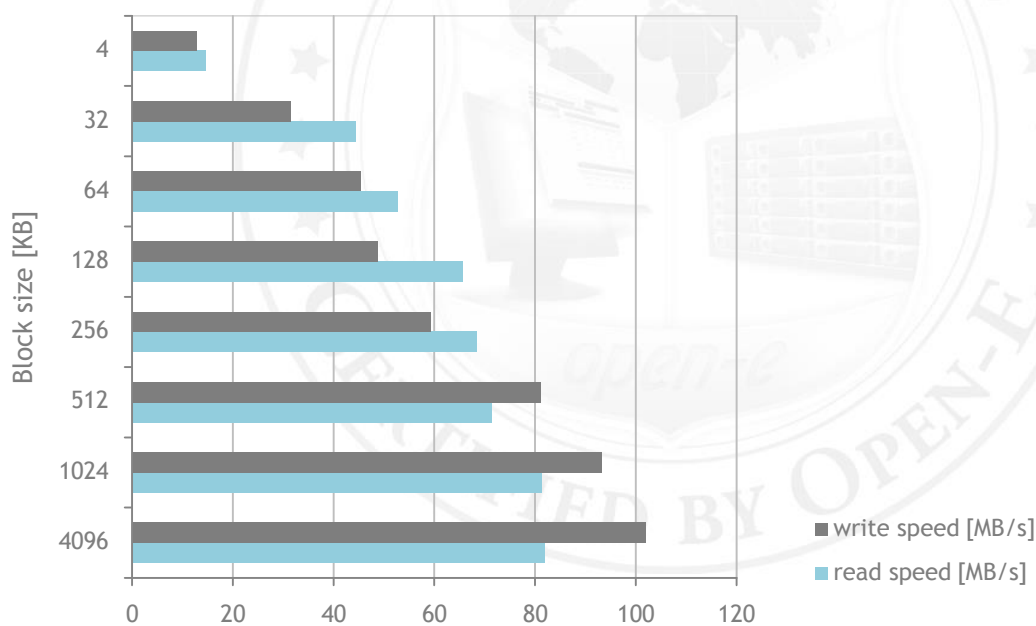| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	12.8	14.5
32	31.4	44.4
64	45.3	52.6
128	48.7	65.6
256	59.2	69.1
512	81.1	73.5
1024	93.2	80.7
4096	102	89.5

FIGURE 11: Table and chart with write and read speed results for File I/O Write-through iSCSI device (RAID5)

5. Write and read test on File I/O Write-back iSCSI device connected to *Workstation* via 1GbE controller.

Write to/read from disk device exported by Lenovo RD240 with Open-E DSS V6 and connected via iSCSI to the Workstation with MS Windows Server 2008 R2 using bst5 benchmark with block size between 4KB and 4MB. All disk drives on target side (certified Lenovo RD240 with Open-E DSS V6 running on it) exported via iSCSI are configured into RAID5. Exported lun size is 100GB and type is File I/O Write-back. The mtu parameter is set to 1500. The target side is connected by Intel PRO/1000 dual (i82574L) GbE network controller and the initiator side is connected by Broadcom NetXtreme dual (BCM5704) GbE network controller. Network connection topology is shown on **Test topology: FIGURE 1**.

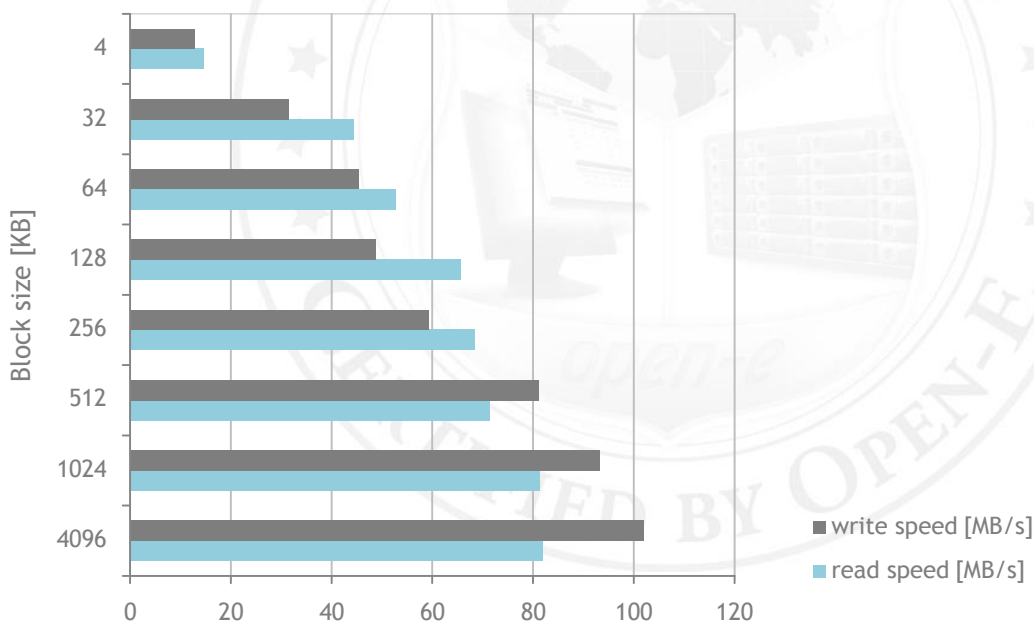| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	12.8	14.5
32	31.4	44.4
64	45.3	52.6
128	48.7	65.6
256	59.2	69.1
512	81.1	73.5
1024	93.2	80.7
4096	102	89.5

FIGURE 12: Table and chart with write and read speed results for File I/O Write-back iSCSI device (RAID5)

6. Write and read test on SMB share connected to *Workstation* via 1GbE controller.

Write to/read from SMB share exported by *Lenovo RD240 with Open-E DSS V6* and mapped via SMB to the *Workstation with MS Windows Server 2008 R2* using bst5 benchmark with block size between 4KB and 4MB. All disk drives on server side (certified *Lenovo RD240 with Open-E DSS V6* running on it) exported via SMB are configured into RAID5. Exported SMB share size is 100GB. The mtu parameter is set to 1500. The server side is connected by Intel PRO/1000 dual (i82574L) GbE network controller and the client side is connected by Broadcom NetXtreme dual (BCM5704) GbE network controller. Network connection topology is shown on *Test topology: FIGURE 1*.

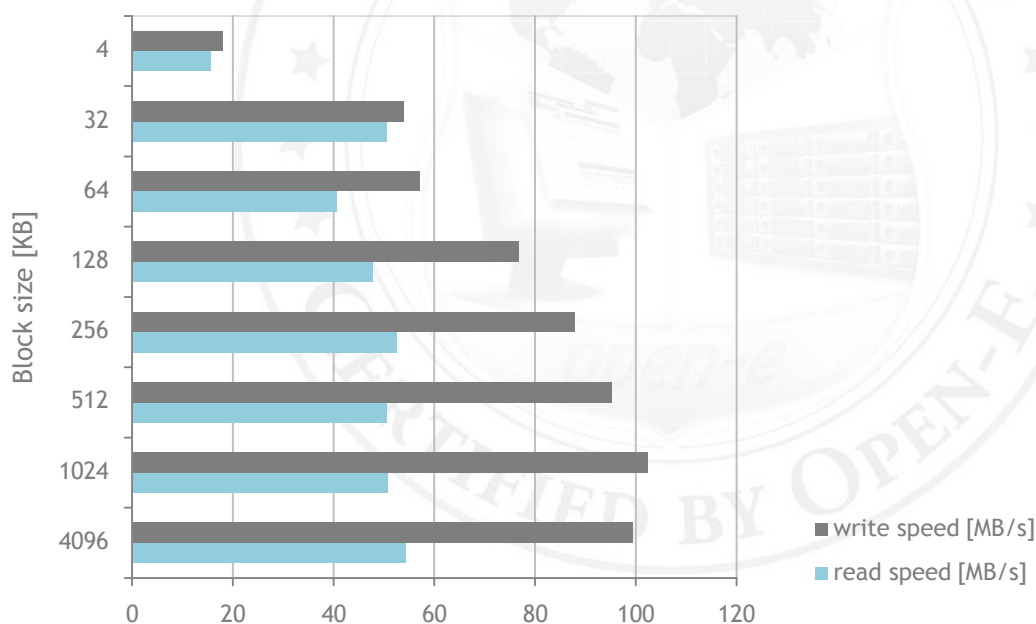| Block size [KB]	Write data [MB/s]	Read data [MB/s]
4	17.9	15.5
32	54	50.6
64	57	40.5
128	76.7	47.7
256	87.8	52.5
512	95.2	50.5
1024	102.3	50.8
4096	99.3	54.4

FIGURE 13: Table and chart with write and read speed results for SMB share (RAID5)

Stability test results

1. Writing and reading data on lun and share exported by Lenovo RD240 to Workstation

Writing and reading data on lun and share using bst5 with sequential read/write operations performed by 3 days. Bst5 block size is set to 64KB. All disk drives and shares on server side (certified *Lenovo RD240 with Open-E DSS V6* running on it) exported via iSCSI and SMB are configured into software RAID5.

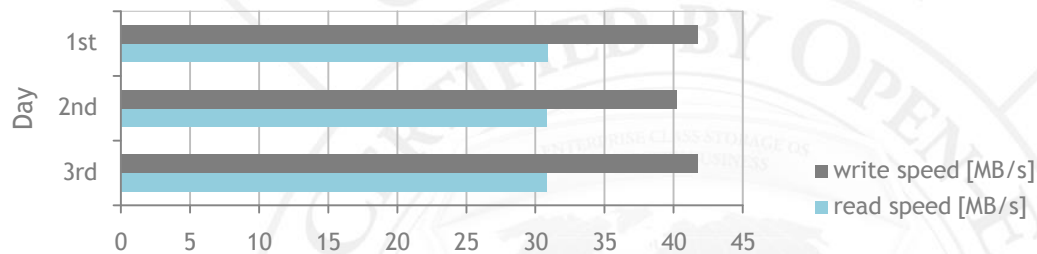| Day	Write speed [MB/s]	Read speed [MB/s]
1st	41.6	30.9
2nd	40.2	30.8
3rd	41.7	30.8

FIGURE 14: Table and chart with stability test result