

Dell PowerEdge R510 storage system



Executive summary

After performing all tests, the Dell PowerEdge R510 system has been officially certified according to the [Open-E](#) Hardware Certification Program.

During the tests, it was found that the system is functional and efficient.

With the Open-E DSS V6 operating system installed, the Dell PowerEdge R510 is stable and performs well.

In general, the system can be used for many different applications, but the following are recommended:

✓ HA cluster

For this setup, two identical systems are required. The following features make Dell PowerEdge R510 suitable for an HA cluster:

- Hardware RAID5, RAID6, RAID10, RAID50, RAID60 for greater node availability and increased performance.
- Two 1GbE interfaces allow node replication and data access simultaneously.
- Twelve enterprise class SATA drives.
- Redundant power supply for system reliability.

✓ iSCSI Storage

The following features make Dell PowerEdge R510 great iSCSI storage:

- Two 1GbE interfaces for fast MPIO connection.
- Hardware RAID5, RAID50, RAID6, RAID60 and RAID10 for high performance and data safety.
- Twelve enterprise class SATA drives provides plenty of space for stored data.

✓ NAS filer

The following features make Dell PowerEdge R510 a good NAS filer solution:

- Twelve high class SATA hard drives provide plenty of space for user files.
- Hardware RAID5, RAID50, RAID6 and RAID60 for fault tolerance and the most efficient use of available disk space.
- Two 1GbE interfaces for independent connection to different networks or link aggregation for improved throughput.

Certification notes

We recommend using Balance-alb or Balance-rr bonding modes for link aggregation.

Dell PowerEdge R510 hardware components	4
Dell PowerEdge R510 photos	5
Auxiliary systems hardware components	6
Administration functionality	7
Network functionality	8
Network test topology	8
802.3ad bonding mode test	9
Balance-alb bonding mode test	10
Balance-rr bonding mode test	11
RAID functionality	12
RAID test topology.....	12
Hardware RAID0 test	13
Hardware RAID5 test	14
Hardware RAID6 test	15
Hardware RAID10 test.....	16
Hardware RAID50 test.....	17
Hardware RAID60 test.....	18
NAS functionality	19
NAS test topology.....	19
SMB test	20
iSCSI functionality	21
iSCSI Initiator test topology.....	21
iSCSI Target test topology	21
iSCSI Initiator test	22
iSCSI Target test	23

Dell PowerEdge R510 hardware components

Technical specifications about the certified system are listed below:

Model	Dell PowerEdge R510
Operating system	Open-E DSS V6 build 5845
Enclosure/chassis	Dell PowerEdge R510
CPU	Intel Xeon E5606 2.13GHz
Motherboard	Dell PowerEdge R510
Memory	2x 2GB DDR3 1333MHz RDIMM Hynix HMT325R7BFR8A-H9
Network	1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)
HW RAID	Dell PERC H700 Integrated
Hard disk drives	12x 3TB Hitachi Ultrastar 7K3000 HUA723030ALA640

TABLE 1: Hardware components list of Certified System with Open-E DSS V6

All components were detected and properly recognized.



Dell PowerEdge R510 photos



FIGURE 1: Front photo



FIGURE 2: Rear photo

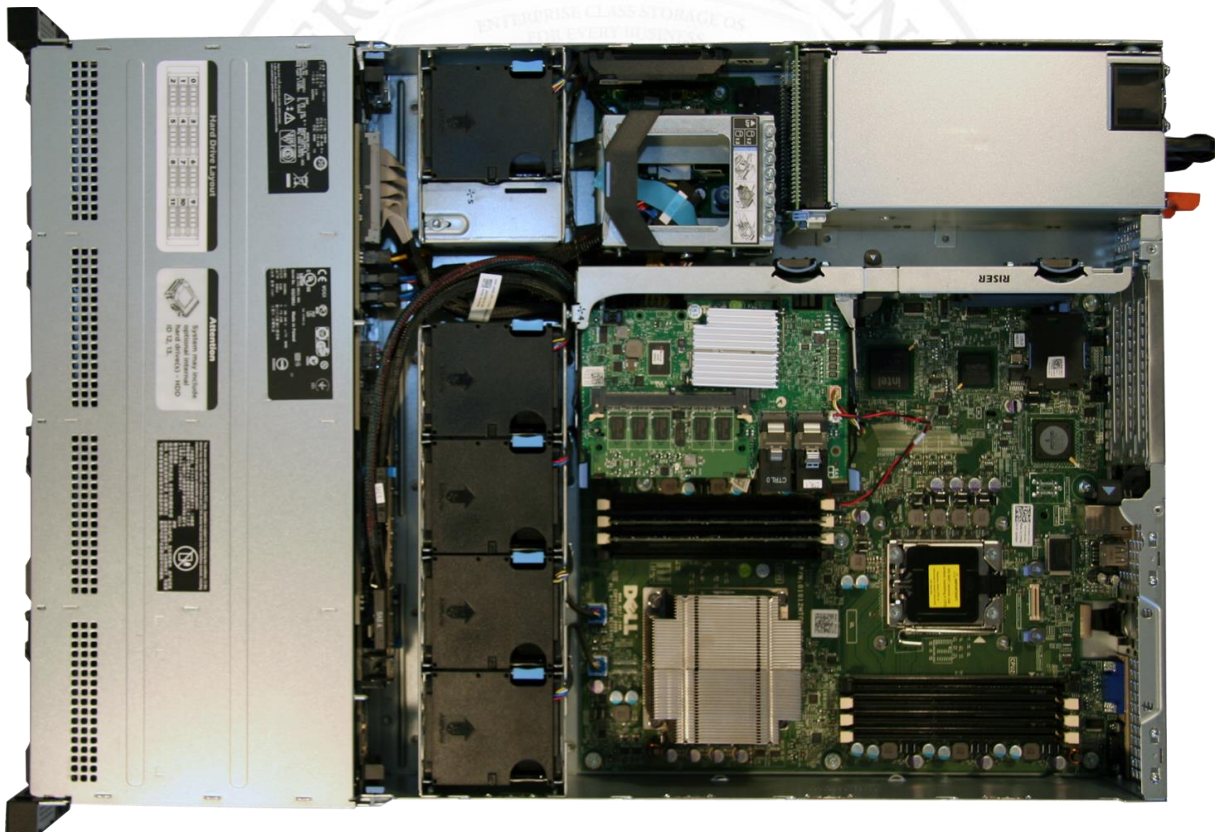


FIGURE 3: Top photo

Auxiliary systems hardware components

Auxiliary system with MS Windows or Open-E DSS V6 installed, used in Open-E Hardware Certification Process.

Model	Custom
Operating system	MS Windows Server 2008 R2
Enclosure/chassis	lpc-4u-600
Motherboard	Supermicro X7DVL-E
CPU	Intel Xeon E5405 2.0GHz
Memory	8x 1GB DDR2 667 ECC FB-DIMM Kingston KVR667D2D8F5K2/2G
Network	1GbE Intel PRO/1000PT Dual Port Adapter (i82571EB)
Network	1GbE Broadcom NetXtreme II BCM5716 Gigabit Ethernet
Hard disk drives	1x 2TB Samsung SpinPoint F4EG HD204UI

TABLE 2: Hardware components of first Workstation with MS Windows

Model	Custom
Operating system	MS Windows Server 2008 R2
Enclosure/chassis	lpc-4u-600
Motherboard	Tyan Tempest i5400PW (S5397)
CPU	Intel Xeon E5405 2.0GHz
Memory	8x 1GB DDR2 667 ECC FB-DIMM Kingston KVR667D2D8F5K2/2G
Network	1GbE Intel PRO/1000PT Dual Port Adapter (i82571EB)
Network	1GbE Broadcom NetXtreme II BCM5716 Gigabit Ethernet
Hard disk drives	1x 2TB Samsung SpinPoint F4EG HD204UI

TABLE 3: Hardware components of second Workstation with MS Windows

Model	Custom
Operating system	Open-E DSS V6 build 5845
Enclosure/chassis	lpc-4u-600
Motherboard	Supermicro X8DTH-IF
CPU	Intel Xeon E5630 2.53GHz
Memory	3x 4GB DDR3 ECC-REG Samsung M393B5270CH0-CH9
Network	1GbE Intel PRO/1000 PT Quad LP Server Adapter (i82571GB)
Network	1GbE Broadcom NetXtreme II BCM5716 Gigabit Ethernet
HW RAID controller	Areca ARC-1680ix-12
Hard disk drives	12x 2TB Hitachi Ultrastar 7K3000 HUS723020ALS640

TABLE 4: Hardware components of Workstation with Open-E DSS V6

Model	Supermicro SSE-G24-TF4
Description	24-ports 1GbE and 4-ports 10GbE switch

TABLE 5: Network switch details

Administration functionality

The following functionality has been tested.

Drive identifier	OK
Power button	OK
Front and rear LEDs	OK

TABLE 6: Administration functionality test results

In order to monitor the server please use external IPMI client.



Network functionality

Tests performed in this section check the functionality, performance and stability of the network solutions available in the Open-E DSS V6 product on the certified system.

The tests rely on configuring the iSCSI targets and copying the data from many *Workstations with MS Windows* through various network connections with big block size using appropriate testing tools.

Network test topology

Network topology for Network testing is shown below.

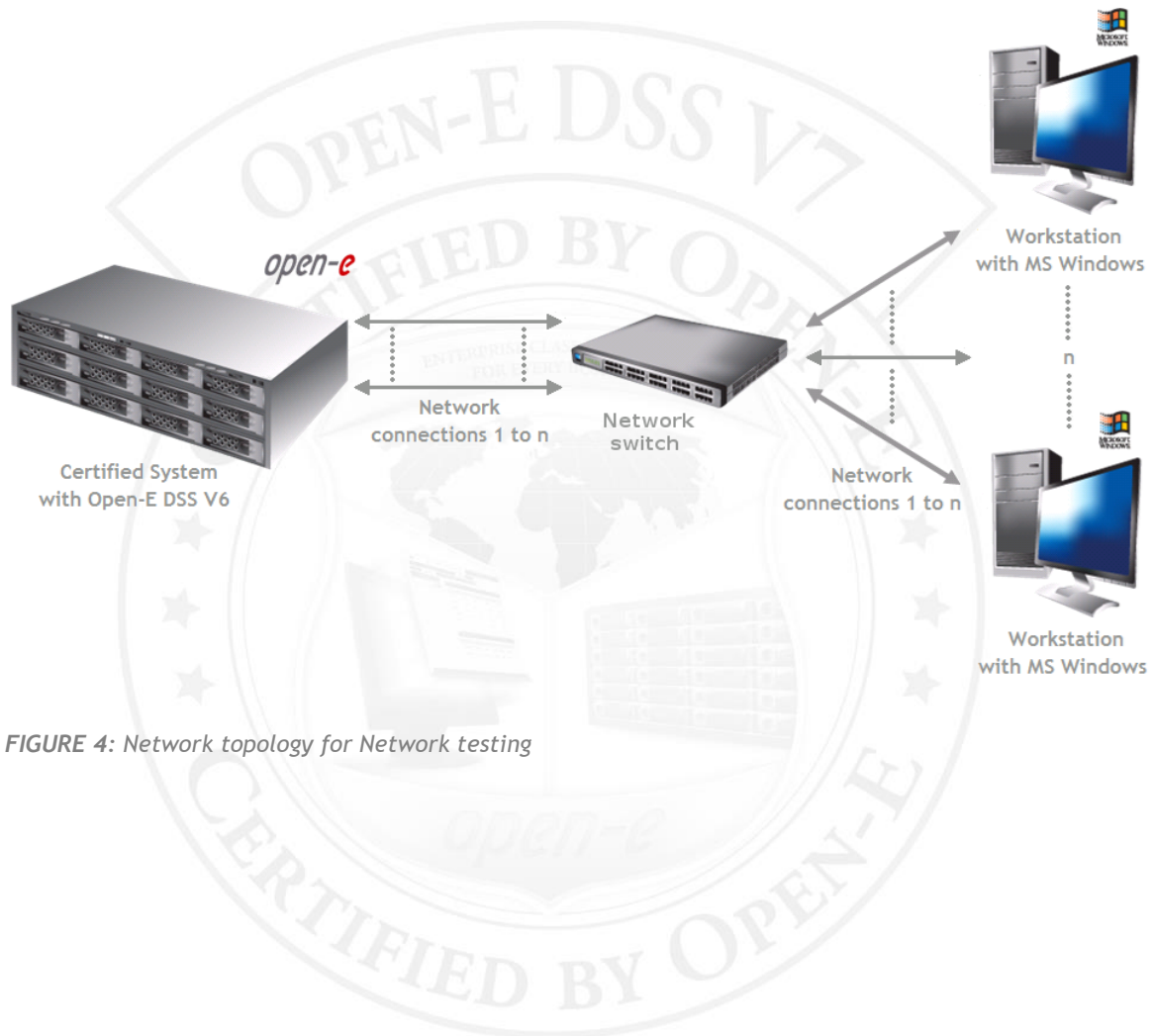


FIGURE 4: Network topology for Network testing

802.3ad bonding mode test

1. Test description

The test relies on configuring the iSCSI targets and copying the data from many *Workstations with MS Windows* through an 802.3ad bonding mode network connection with a 4MB block size using the Iometer testing tool.

2. Test results for 802.3ad bonding mode test performed on 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

802.3ad bonding mode performance test results			
NIC model	1GbE Broadcom NetXtreme II dual port		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1 st Workstation	111.41	88.39	passed
2 nd Workstation	89.83	61.68	passed

TABLE 7: 802.3ad bonding mode performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

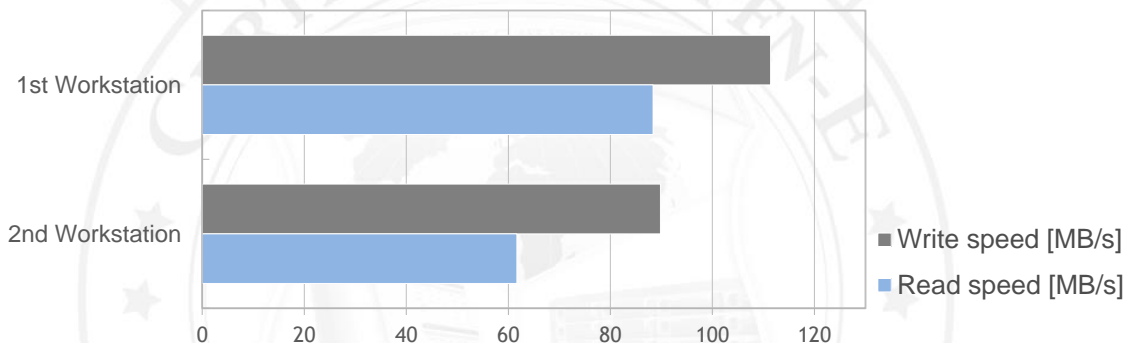


FIGURE 5: 802.3ad bonding mode performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Balance-alb bonding mode test

1. Test description

The test relies on configuring the iSCSI targets and copying the data from many *Workstations with MS Windows* through a Balance-alb bonding mode network connection with a 4MB block size using the Iometer testing tool.

2. Test results for Balance-alb bonding mode test performed on 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Balance-alb bonding mode performance test results			
NIC model	1GbE Broadcom NetXtreme II dual port		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1 st Workstation	112.88	111.14	passed
2 nd Workstation	112.93	111.42	passed

TABLE 8: Balance-alb bonding mode performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

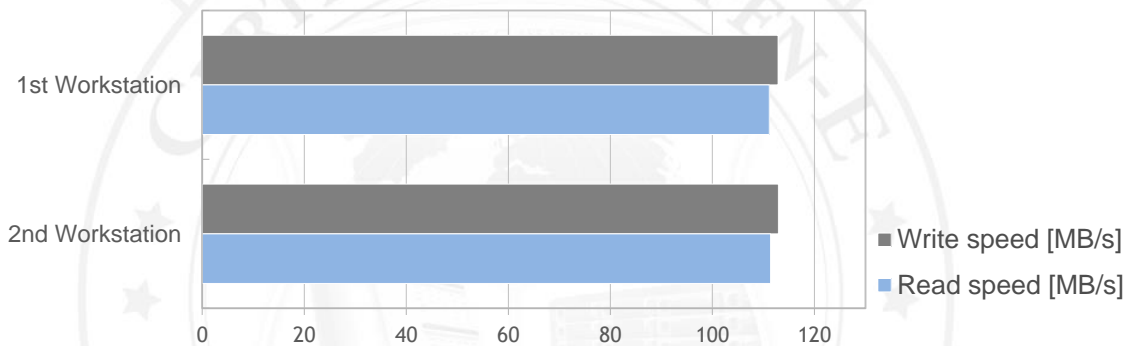


FIGURE 6: Balance-alb bonding mode performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Balance-rr bonding mode test

1. Test description

The test relies on configuring the iSCSI targets and copying the data from many *Workstations with MS Windows* through a Balance-rr bonding mode network connection with a 4MB block size using the Iometer testing tool.

2. Test results for Balance-rr bonding mode test performed on 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Balance-rr bonding mode performance test results			
NIC model	1GbE Broadcom NetXtreme II dual port		
Workstations with MS Windows	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
1 st Workstation	113.04	111.68	passed
2 nd Workstation	113.31	107.19	passed

TABLE 9: Balance-rr bonding mode performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

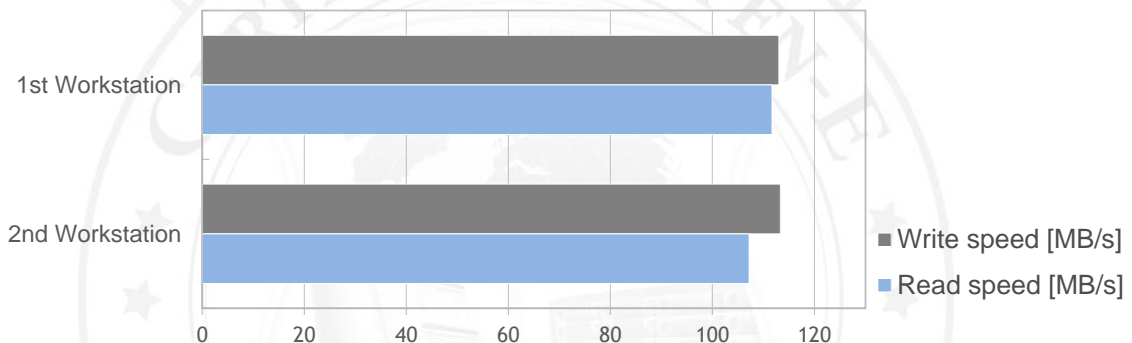


FIGURE 7: Balance-rr bonding mode performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

RAID functionality

Tests performed in this section check the functionality, performance and stability of Open-E DSS V6 storage devices on the certified system.

Tests in this section rely on the creation of the RAID units on 0, 5, 6, 10, 50 and 60 levels, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the lometer testing tool.

RAID test topology

Network test topology for RAID testing is shown below

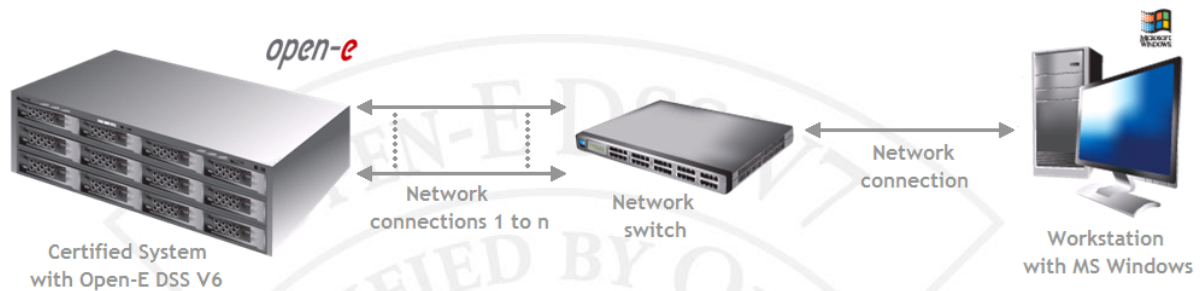


FIGURE 8: Network test topology for RAID testing

Hardware RAID0 test

1. Test description

The test relies on creation of the RAID0 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the lometer testing tool.

2. Test results for RAID0 and 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

RAID0 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	43.87	46.72	passed
32	102.88	102.98	passed
64	107.80	108.06	passed
128	109.03	109.85	passed
256	112.21	112.80	passed
512	112.33	112.40	passed
1024	112.42	112.71	passed
4096	112.35	112.60	passed

TABLE 10: RAID0 performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

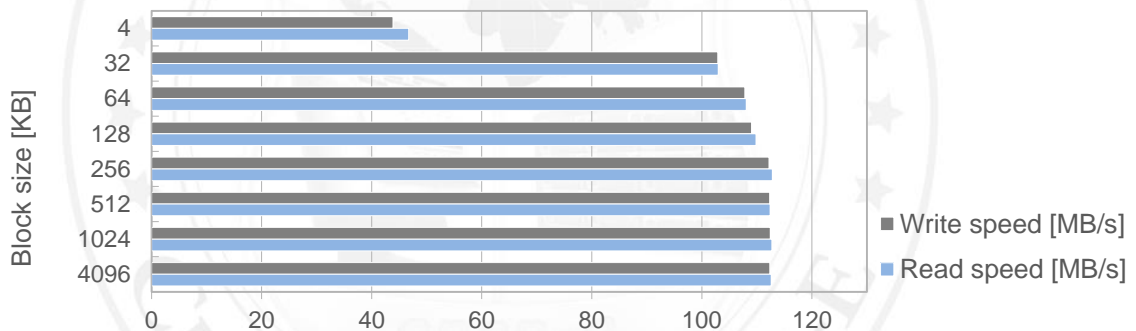


FIGURE 9: RAID0 performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Hardware RAID5 test

1. Test description

The test relies on creation of the RAID5 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the lometer testing tool.

2. Test results for RAID5 and 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

RAID5 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	40.01	47.62	passed
32	102.95	103.46	passed
64	108.07	108.58	passed
128	109.11	110.55	passed
256	112.45	112.83	passed
512	112.75	112.88	passed
1024	112.70	112.83	passed
4096	112.57	112.37	passed

TABLE 11: RAID5 performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

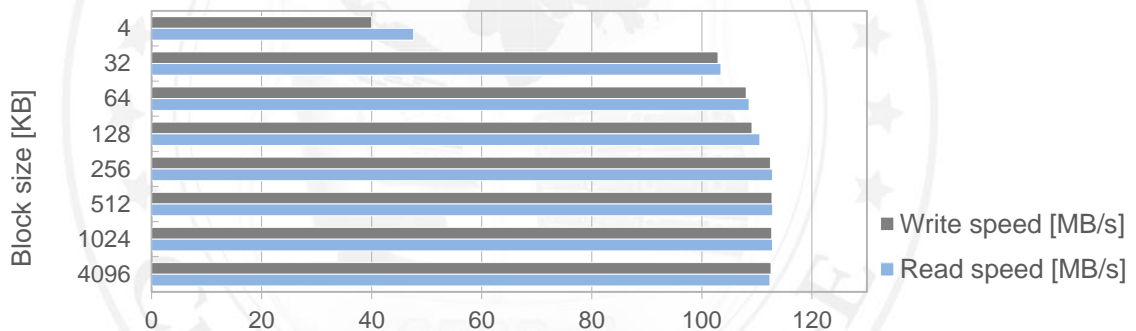


FIGURE 10: RAID5 performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Hardware RAID6 test

1. Test description

The test relies on creation of the RAID6 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the lometer testing tool.

2. Test results for RAID6 and 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

RAID6 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	41.90	45.18	passed
32	103.26	103.25	passed
64	108.19	108.65	passed
128	109.50	110.48	passed
256	112.51	112.81	passed
512	112.88	112.47	passed
1024	112.77	112.83	passed
4096	112.81	112.74	passed

TABLE 12: RAID6 performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

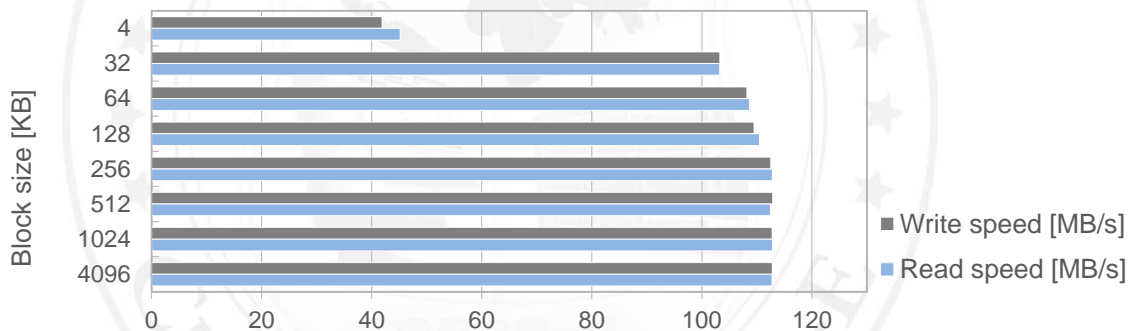


FIGURE 11: RAID6 performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Hardware RAID10 test

1. Test description

The test relies on creation of the RAID10 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the lometer testing tool.

2. Test results for RAID10 and 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

RAID10 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	42.59	51.82	passed
32	111.21	112.12	passed
64	111.89	112.58	passed
128	109.45	112.78	passed
256	112.70	112.88	passed
512	112.73	112.87	passed
1024	112.86	112.85	passed
4096	112.69	112.37	passed

TABLE 13: RAID10 performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

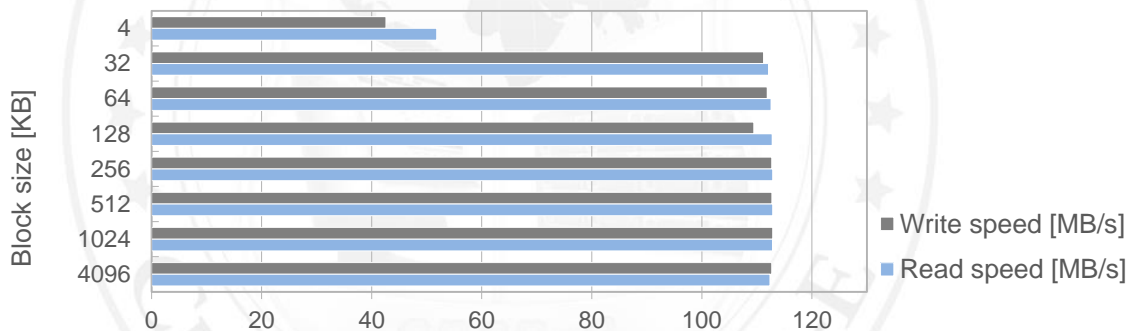


FIGURE 12: RAID10 performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Hardware RAID50 test

1. Test description

The test relies on creation of the RAID50 unit on all hard disk drives, configuring the [iSCSI target](#) and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the lometer testing tool.

2. Test results for RAID50 and 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

RAID50 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	42.35	51.61	passed
32	111.43	112.23	passed
64	111.87	112.62	passed
128	109.48	112.64	passed
256	112.68	112.86	passed
512	112.77	112.87	passed
1024	112.85	112.85	passed
4096	112.71	112.37	passed

TABLE 14: RAID50 performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

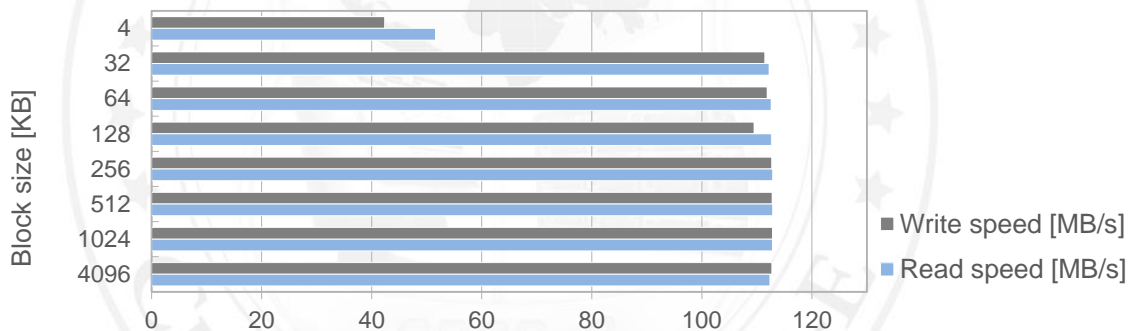


FIGURE 13: RAID50 performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

Hardware RAID60 test

1. Test description

The test relies on creation of the RAID60 unit on all hard disk drives, configuring the iSCSI target and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the lometer testing tool.

2. Test results for RAID60 and 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

RAID60 performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	49.66	75.33	passed
32	112.07	112.74	passed
64	112.57	112.97	passed
128	112.47	113.00	passed
256	112.79	113.01	passed
512	112.91	113.00	passed
1024	112.86	112.62	passed
4096	112.82	112.86	passed

TABLE 15: RAID60 performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

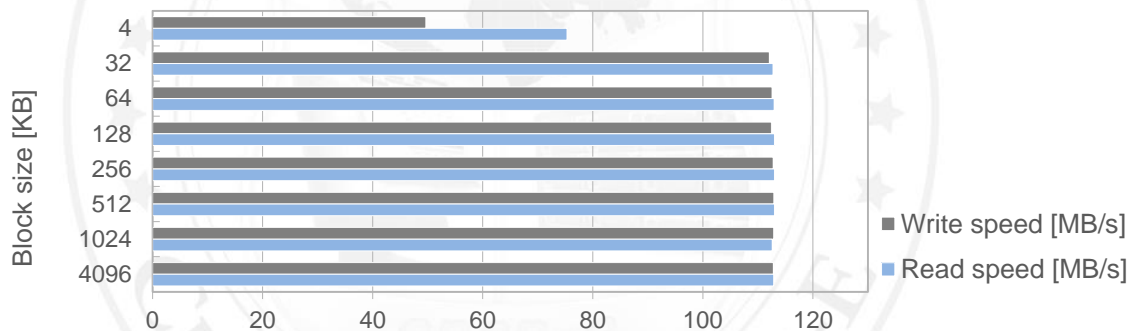


FIGURE 14: RAID60 performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

NAS functionality

Tests performed in this section check the functionality, performance and stability of the NAS protocols in the Open-E DSS V6 product on the certified system.

The tests rely on creating NAS shares and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the lometer testing tool.

NAS test topology

Network topology for NAS testing is shown below.

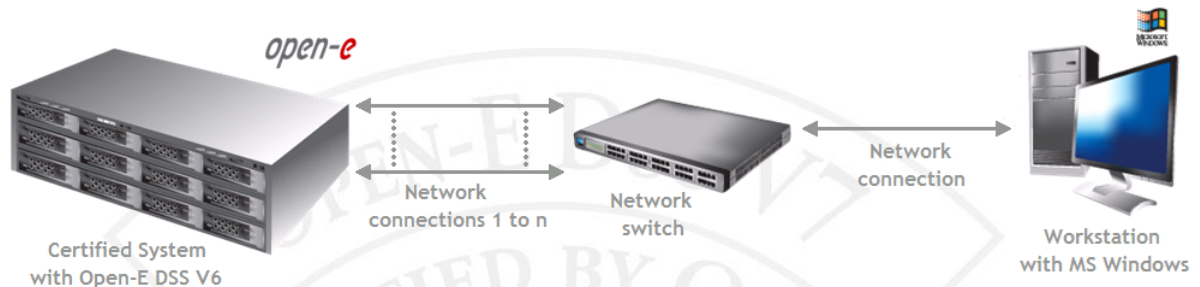


FIGURE 15: Network topology for NAS testing

SMB test

1. Test description

The tests rely on creating NAS shares and copying the data from a *Workstation with MS Windows* via network connection with various block sizes using the Iometer testing tool.

2. Test results for SMB and 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

SMB performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	56.28	69.98	passed
32	112.41	112.51	passed
64	112.72	112.57	passed
128	112.70	112.14	passed
256	112.78	112.24	passed
512	112.84	112.25	passed
1024	112.83	112.20	passed
4096	112.67	112.20	passed

TABLE 16: SMB performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

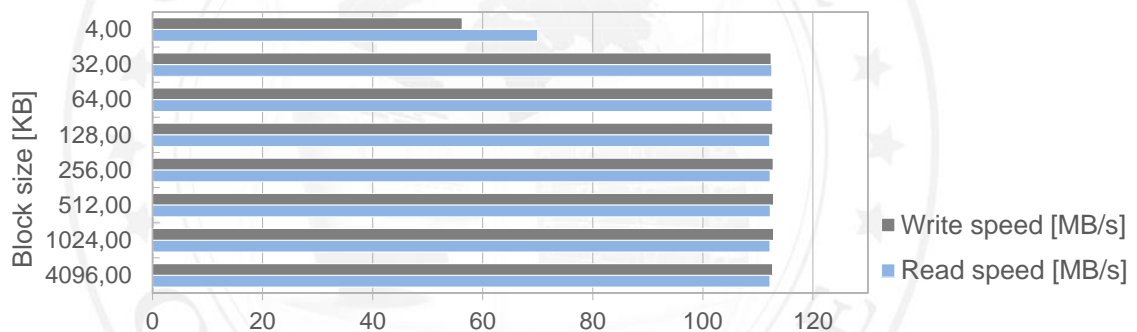


FIGURE 16: SMB performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

iSCSI functionality

Tests performed in this section check the functionality, performance, and stability of the iSCSI protocol in the Open-E DSS V6 product on the certified system.

iSCSI Initiator test topology

Network topology for iSCSI Initiator testing is shown below.

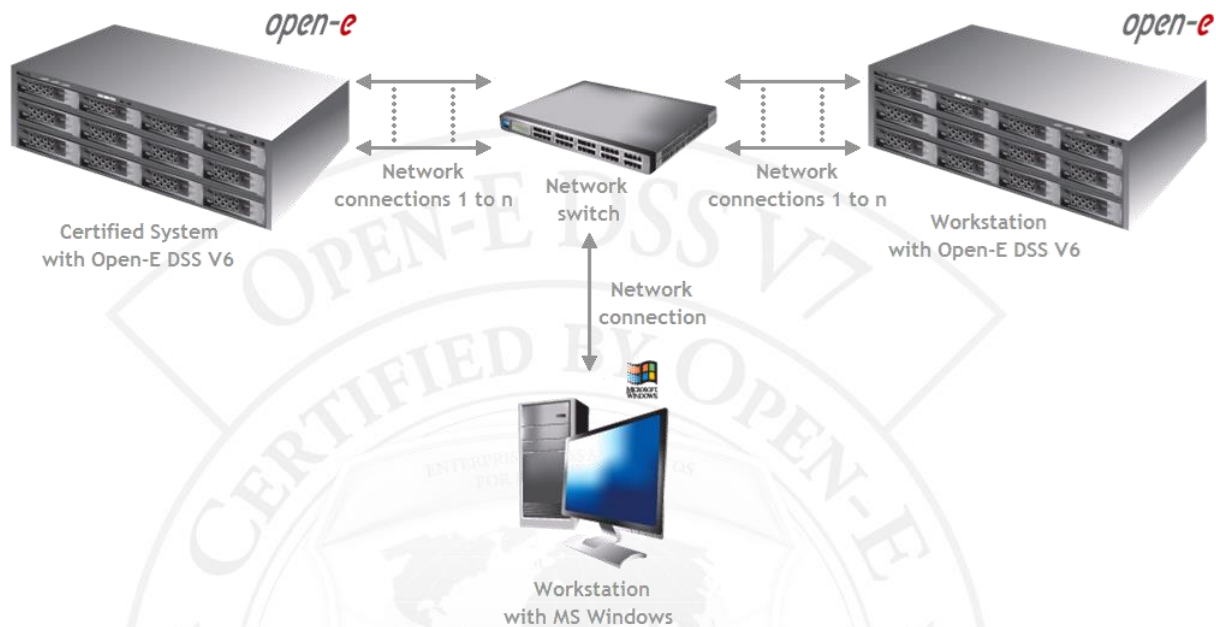


FIGURE 17: Network topology for iSCSI Initiator testing

iSCSI Target test topology

Network topology for iSCSI Target testing is shown below.

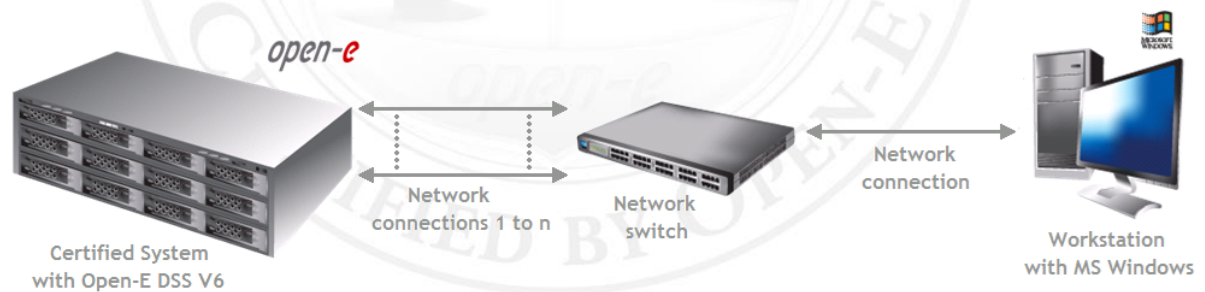


FIGURE 18: Network topology for iSCSI Target testing

iSCSI Initiator test

1. Test description

The test relies on using the storage connected via the built-in iSCSI Initiator for NAS volumes, creating SMB shares on these NAS volumes and copying data from a *Workstation with MS Windows* to them with various block sizes using the Iometer testing tool. Tests were performed using network connection.

2. Test results for iSCSI Initiator and 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

iSCSI Initiator performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	50.66	68.21	passed
32	109.34	112.18	passed
64	108.39	110.77	passed
128	108.43	112.10	passed
256	108.25	112.09	passed
512	108.32	112.16	passed
1024	108.38	110.78	passed
4096	108.30	110.77	passed

TABLE 17: iSCSI Initiator performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

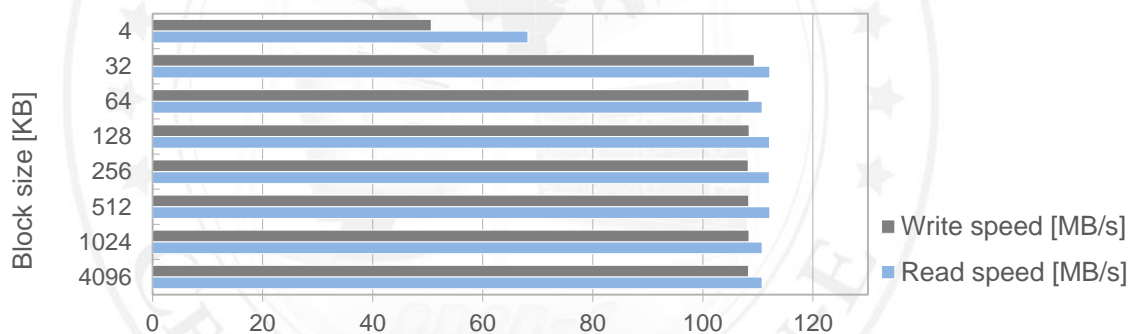


FIGURE 19: iSCSI Initiator performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

iSCSI Target test

1. Test description

The test relies on creating the iSCSI target on the certified system and copying the data from a *Workstation with MS Windows* to it with various block sizes using the Iometer tool. Tests were performed using network connection.

2. Test results for iSCSI Target and 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

iSCSI Target performance test results			
Block size [KB]	Write speed [MB/s]	Read speed [MB/s]	Performance [passed/failed]
4	51.10	67.26	passed
32	109.51	111.90	passed
64	108.60	110.40	passed
128	108.72	111.84	passed
256	108.37	113.41	passed
512	108.21	112.22	passed
1024	108.72	110.49	passed
4096	107.95	110.87	passed

TABLE 18: iSCSI Target performance test results table for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)

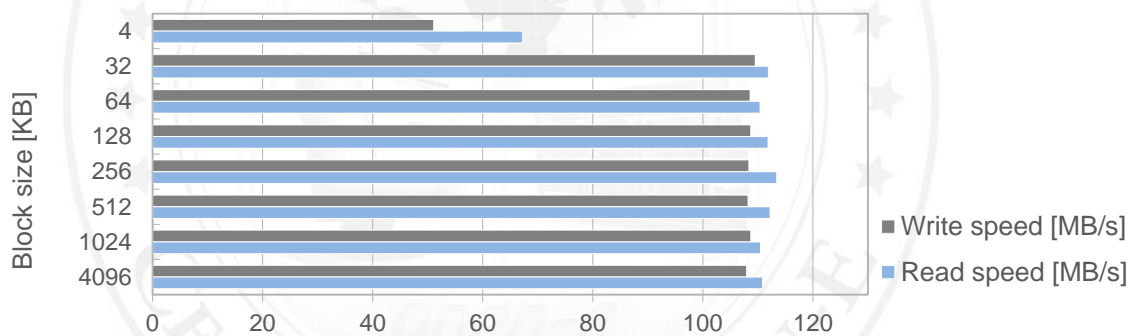


FIGURE 20: iSCSI Target performance test results chart for 1GbE Broadcom NetXtreme II dual port (BCM5716)(on-board)