

## HGST 4U60 Storage Enclosure. Software-defined JBOD Architecture

Performance and compatibility tests  
by RAIDIX Testing Lab



### About HGST JBOD

HGST 4U60 Storage Enclosure is a high-density, scalable, and cost-effective solution. The storage includes 60 Ultrastar® 3.5-inch drive modules in a 4U enclosure and offers 2x2x4-lane SAS 12GB/s performance, high availability (HA), and hot-swappable components. 4U60 Storage Enclosure is optimized to provide a dense solution with HA capabilities, while maintaining a low power profile.

## Abstract

JBOD (“just a bunch of disks”) is a type of architecture involving multiple hard disk drives and making them accessible either as independent HDDs or a combined (spanned) single logical volume with no actual RAID functionality.

Connected to the host server via SAS, JBODs store data without managing it. They are a perfect choice for software-defined storage (SDS) infrastructures based on commodity-of-the-shelf hardware. Provider of a flexible SDS, RAIDIX ensures full support of the JBOD technology to deliver reliable cost-effective solutions to a wide range of data-intensive verticals.

In this paper, RAIDIX suggests an overview of in-house tests performed on the new 4U60 Storage Enclosure (Model G460-J-12, P/N 1ES0054) hardware by HGST, a Western Digital Brand. This JBOD model was tested for functional characteristics and compatibility with RAIDIX 4.4 software.

Besides, the document focuses on the benefits of software RAID bundled with the JBOD technology.

## Introduction

RAIDIX provides software-defined storage solutions spanning universal hardware compatibility and easy integration into existing customer infrastructures. In combination with HGST JBOD products, RAIDIX targets HPC enterprises and data centers looking for a dense, high availability and low footprint storage solution.

RAIDIX outpaces hardware RAID products delivering:

### High Performance

- ▶ Optimized paralleling of RAID algorithm calculations
- ▶ No performance decline even in degraded mode or at peak system load
- ▶ Consistently high throughput limited by hardware restrictions only

### Reliability

- ▶ Due to in-house RAID algorithms, data remains intact even if multiple disks fail
- ▶ Detection and remediation of silent data corruption incidents

### Flexibility

- ▶ Full support of SAN (Fibre Channel, InfiniBand, iSCSI, 12G SAS) and NAS (NFS, SMB, AFP, FTP)
- ▶ A patented user-friendly GUI to facilitate data management

### Optimal price-to-performance ratio

- ▶ Compatible with commodity hardware, RAIDIX helps to cut down infrastructure costs
- ▶ RAIDIX allows installation of third party applications right on the storage node

RAIDIX hereby shares the tests results for the new 4U60 Storage Enclosure by HGST, a Western Digital Brand, one of the world leaders in production of data storage equipment.

RAIDIX was tested within an architecture involving 60 hard disk drives (with 4 TB, 6 TB, 8 TB or 10 TB capacity).

The key purpose of the test was to measure the RAIDIX 4.4 performance with HGST 4U60 JBOD and identify possible issues.

## Tests Performed

The RAIDIX testing methodology included a series of tests:

#### RAIDIX drive availability

Test scenarios	Result:
<ul style="list-style-type: none"><li>- RAIDIX connection to the drive bin through the HBA</li><li>- System configuration with the connected drive bin</li><li>- Correct system drive detection check-up</li></ul>	RAIDIX connection to the drive bin through the HBA System configuration with the connected drive bin Correct system drive detection check-up

#### LED indicators check-up

Test scenarios	Result:
<ul style="list-style-type: none"><li>- Switching all LED indicators on and off through the UI and CLI</li><li>- Switching LED indicators on and off in succession the through the UI and CLI</li></ul>	All LED indicators of the slots could power on/off correctly through the UI and CLI

#### RAID creation

Test scenarios	Result:
<ul style="list-style-type: none"><li>- Creation of RAID arrays of all levels on the drives connected through the HBA</li><li>- Processing local read/write operations</li></ul>	<ul style="list-style-type: none"><li>- All levels of RAID arrays were created successfully</li><li>- All operations were completed successfully</li></ul>

#### HBA check-up after drive removal

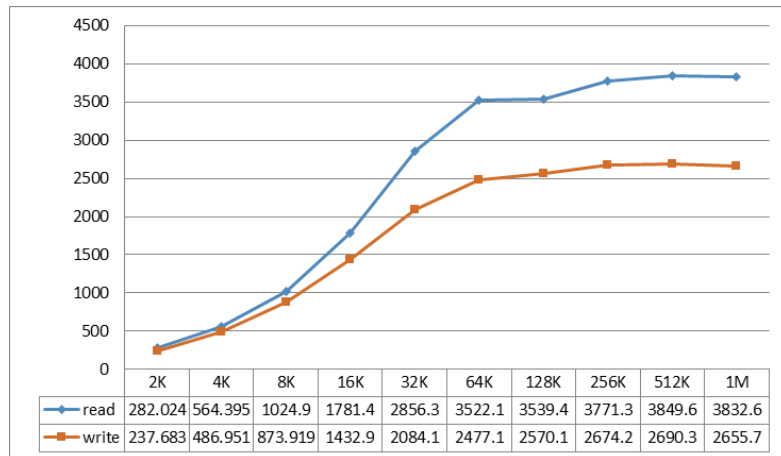
Test scenarios	Result:
<ul style="list-style-type: none"><li>- Drive removal/insertion of from/into the RAID array</li><li>- Removal/insertion of drives unassociated with the RAID array</li><li>- Removal of all drives connected through the HBA</li><li>- Reconfiguration of the system without drives</li><li>- Detection of drives with the rdcli dlot detect command</li></ul>	<ul style="list-style-type: none"><li>- The system revealed valid reaction to the drives removal</li><li>- The system registered the fact of lacking drives after reconfiguration</li><li>- All drives were successfully detected by using the corresponding command</li></ul>

#### Performance validation

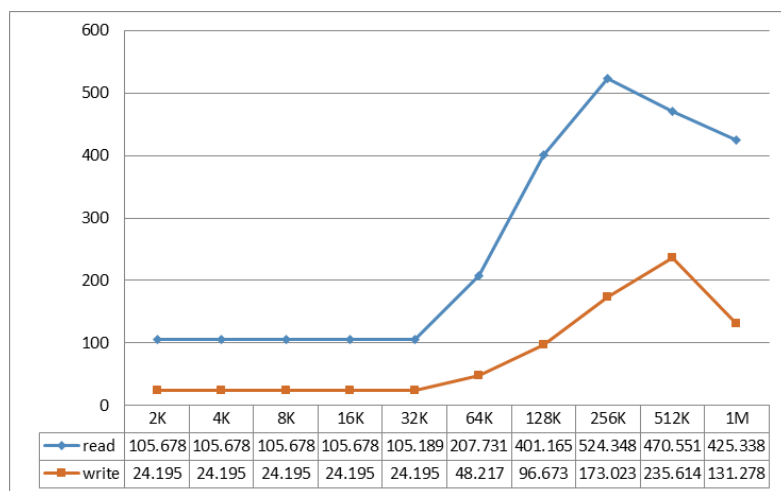
See the performance measurement results below

### Performance Measurement Results

The speed of RAIDIX 4.4 sequential read and write (MBps):



The speed of RAIDIX 4.4 random read and write (MBps):



### Test Summary and Conclusions

As a result, HGST JBOD successfully passed the compatibility test with RAIDIX 4.4 and was added to the RAIDIX compatibility matrix. The JBOD revealed stable operation with no major issues detected.

Performance results for the disk system tests were up to the highest standards. The throughput was close to the theoretical maximum in all configurations: 4.15 GB/s with a single channel and 8.5 GB/s with two channels.

RAIDIX and HGST, a Western Digital Brand, have verified and formulated the joined offering based on RAIDIX 4.4 and HGST 4U60 Storage Enclosure, for data-intensive industries and data centers.



**RAIDIX** is a leading solution provider and developer of high performance storage systems. RAIDIX Global Partner Network encompasses system integrators, storage vendors and IT solution providers. RAIDIX delivers storage solutions to Media & Entertainment, Video Surveillance, Enterprise, High-Performance Computing (HPC) and other data-rich industries. The company partners with industry leaders such as Intel, Panasonic, Mellanox, QLogic, ATTO, Broadcom, HGST, and others.

✉ sales@acnc.com