

Lab Report

GreenBoost™ 2.0 Power Optimisation with PROMISE VTrak J5960 and Toshiba MG11 24TB HDDs

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Introduction

Energy efficiency has become a key requirement in modern data centres. While HDD-based storage remains the most cost-effective solution for storing petabytes of data, operators are increasingly seeking ways to reduce power consumption without compromising performance or availability.

PROMISE Technology has introduced **GreenBoost™ 2.0**, a power optimisation technology for its VTrak J5960 JBOD platform. The software applies intelligent drive power-saving policies to reduce energy consumption during idle periods while maintaining full performance when storage activity increases.

This lab report evaluates the effectiveness of GreenBoost™ 2.0 in a fully populated 60-bay storage configuration equipped with Toshiba MG11 24TB SATA Enterprise Capacity HDDs. The goal was to quantify potential energy savings and determine whether performance or cooling characteristics were affected.

The system was tested in the Toshiba HDD Innovation Lab under both idle and active workload conditions, comparing configurations with GreenBoost™ enabled and disabled.

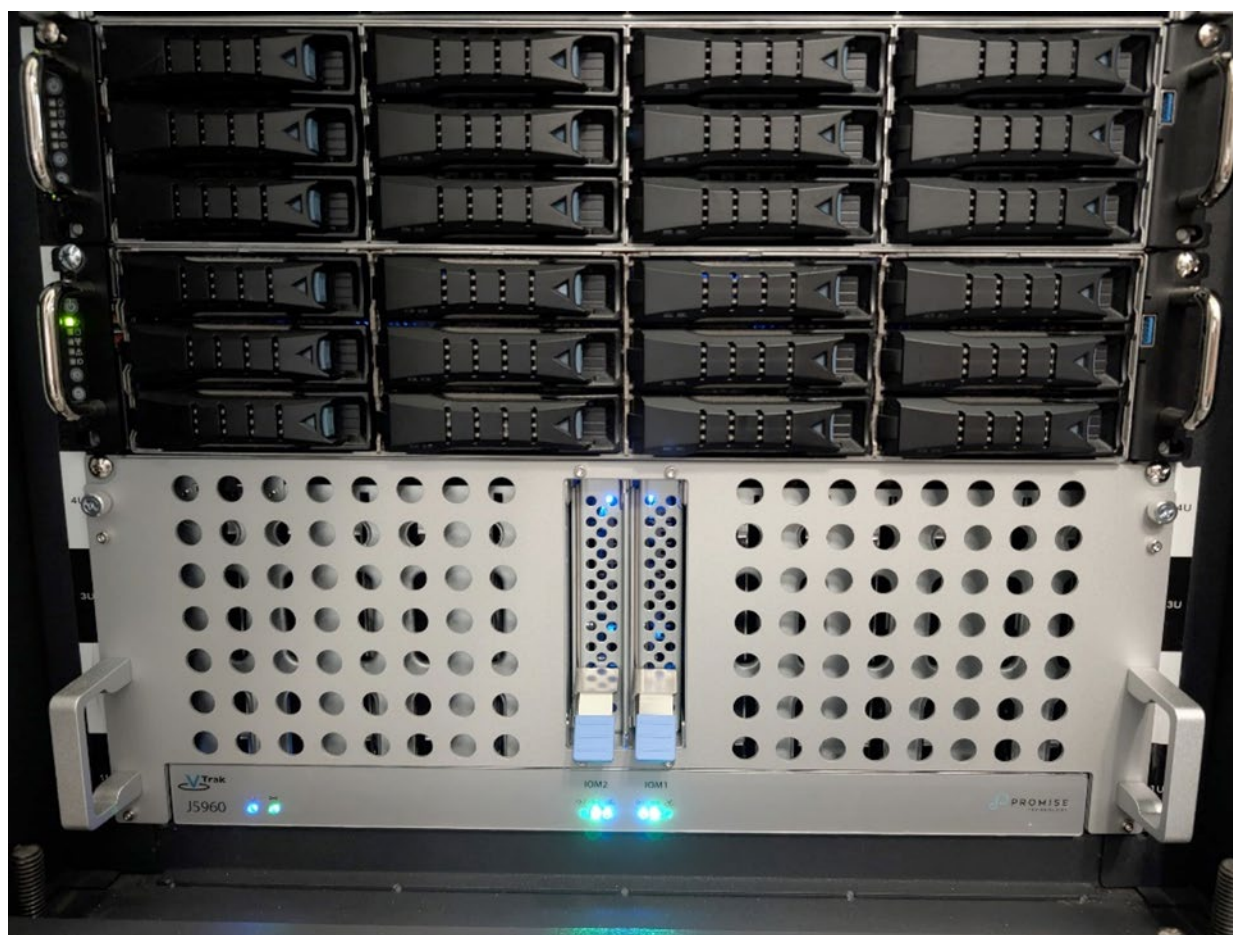


Figure 1:
PROMISE
VTrak
J5960
and AIC
SB202-TU
storage
head
node
server.

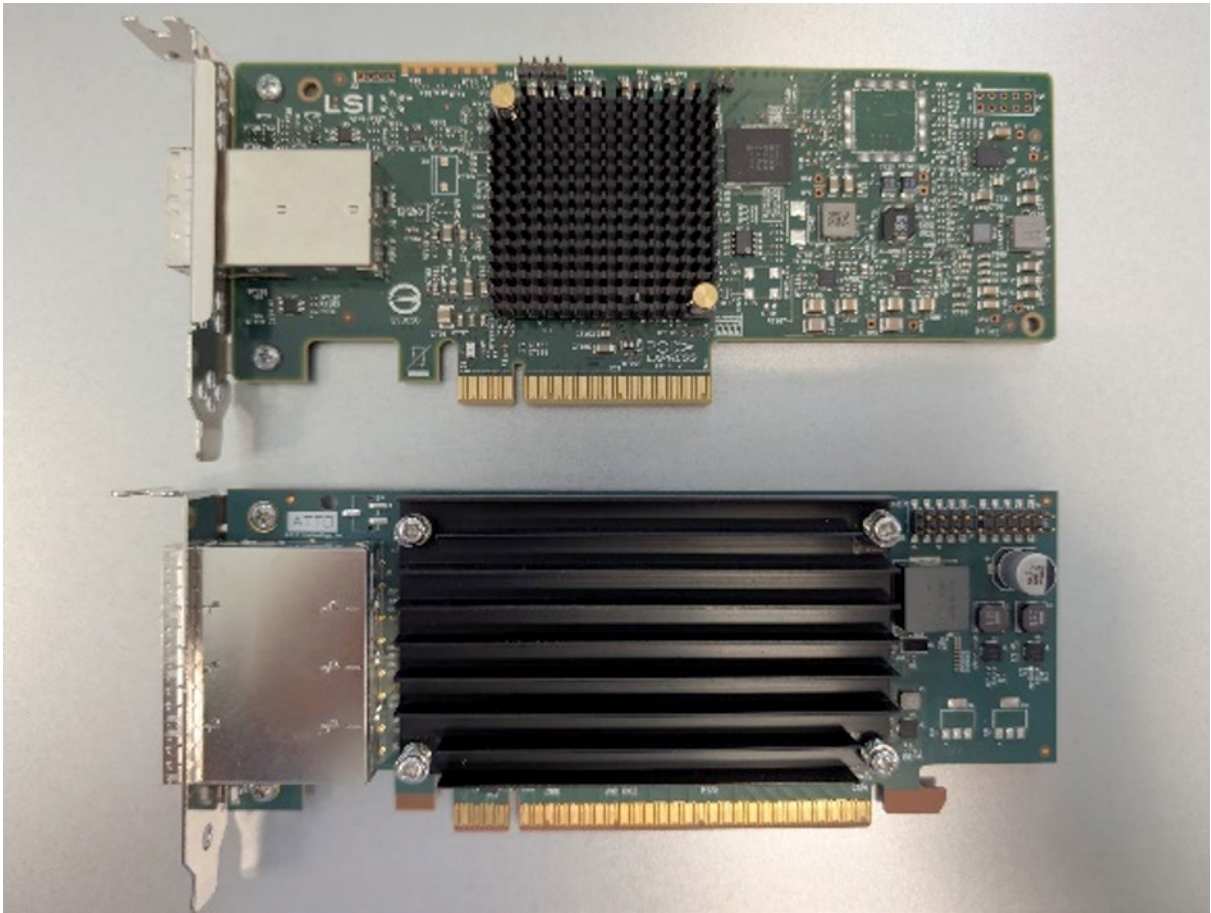


Figure 2:
ATTO H24F0
(bottom) and
Broadcom /
LSI 9300-8e
HBA control-
lers

Setup in the Toshiba HDD Lab

Component	Configuration
JBOD	PROMISE VTrak J5960
Firmware	exp.v37fw.26.01.01.0000
Power Optimisation	GreenBoost™ 2.0-v1
Policy	Independent Drive Power Saving
HDDs	60 × Toshiba MG11ACA24TE
Capacity	1.44 PB Raw
Server	AIC SB202-TU
CPU	Intel Xeon Silver 4309Y
Memory	128 GB DDR4
Operating System	Ubuntu 24.04.4 LTS
HBA	ATTO H24F0
Verification HBA	Broadcom / LSI 9300-8e

Component	Configuration
Connectivity	Two SAS-3 links to a single IOM
Power Meter	Rohde & Schwarz HMC8015
Measurement Method	Socket-level measurement with both PSUs connected

Table 1: System setup

The GreenBoost™ policy used during testing was:

Policy 1 – Independent Drive Power Saving

Treat each drive independently and move qualifying idle drives to Idle_C.

This policy was applied in accordance with the PROMISE GreenBoost™ 2.0 documentation and successfully verified on both the ATTO H24F0 and LSI 9300-8e platforms.

Test Methodology

Power consumption was measured using a Rohde & Schwarz HMC8015 power analyser connected to the system's AC power input. Measurements represent the complete storage subsystem, including the JBOD power supplies, I/O modules, backplanes and expanders, as well as all 60 installed HDDs.

All workload testing was performed using the Flexible I/O Tester (fio). Drives were accessed directly as individual block devices without a file system layer.

The benchmark configuration consisted of:

- Direct I/O enabled
- io_uring I/O engine
- 1 MB block size for sequential and random read/write (r/w) workloads
- 20-minute runtime per workload
- All 60 drives accessed in parallel

Sequential read, sequential write and random read/write tests were performed to verify that GreenBoost™ did not adversely affect throughput under active workloads.

FIO scripts

```
fio --direct=1 --ioengine=io_uring
--iodepth=16 --rw=write --bs=1M
--time_based --runtime=1200
--group_reporting --name=/dev/sd{d..z}
--name=/dev/sda{a..z} --name=/dev/sdb{a..k}
```

```
fio --direct=1 --ioengine=io_uring
--iodepth=16 --rw=read --bs=1M
--time_based --runtime=1200
--group_reporting --name=/dev/sd{d..z}
--name=/dev/sda{a..z} --name=/dev/sdb{a..k}
```

```
fio --direct=1 --ioengine=io_uring
--iodepth=32 --rw=randrw --rwmixread=70
--bssplit=4k/20:64k/50:256k/20:1m/10
--norandommap=1 --time_based --runtime=1200
--group_reporting --name=/dev/sd{d..z}
--name=/dev/sda{a..z} --name=/dev/sdb{a..k}
```

Power Consumption Measurements



Figure 3: Rohde & Schwarz HMC8015 Power Meter

Operating Mode	Power Draw
GreenBoost™ Disabled – Idle	537 W
GreenBoost™ Enabled – Idle	283 W
GreenBoost™ Disabled – Mixed Workload	578 W
GreenBoost™ Enabled – Mixed Workload	578 W

Table 2: Power consumption results

Idle Power Reduction

Metric	Result
Absolute Saving	254 W
Relative Saving	47.3%

Table 3: Power reduction results

The most significant finding was observed during idle operation.

With GreenBoost™ 2.0 enabled, system power consumption decreased **from 537 W to 283 W**, representing a reduction of approximately **47%** while the storage system remained fully available.

Such a reduction can provide significant operational savings in storage infrastructures where systems spend extended periods in standby or low-activity states, including:

- Archive storage
- Backup repositories
- Surveillance retention systems
- Nearline storage
- Data lakes
- AI data repositories

Performance Measurements

Workload	Throughput
Sequential Read	6856 MiB/s
Sequential Write	5882 MiB/s
Random R/W	1235 MiB/s

Table 4: Benchmark results

Testing confirmed that GreenBoost™ 2.0 does not affect performance under active workloads.

Sequential throughput remained unchanged whether Green-Boost™ was enabled or disabled.

Likewise, power consumption under active workloads remained constant at approximately 578 W in both configurations.

These results indicate that GreenBoost™ primarily targets idle energy consumption while automatically returning drives to full performance operation when required.

Temperature Measurements

Parameter	Value
Ambient Temperature	25°C
HDD Minimum Temperature	32°C
HDD Maximum Temperature	42°C

Table 5: Temperatures

The J5960 cooling system maintained all drives within the recommended operating temperature range during testing.

The measured temperature spread of only 10°C across all 60 drives demonstrates balanced airflow throughout the enclosure. The maximum HDD temperature remained below 45°C, supporting long-term drive reliability and efficient operation.

Estimated Annual Energy Savings

Assuming continuous operation, the measured idle power of 254 W translates into substantial annual energy savings.

Idle Duration	Energy Saving per Year
8 hours/day	~742 kWh
12 hours/day	~1,113 kWh
16 hours/day	~1,484 kWh
24 hours/day	~2,225 kWh

Table 6: Estimated annual energy savings

In deployments with multiple JBODs, the cumulative savings become increasingly significant and can contribute directly to lower operating costs and reduced carbon emissions.

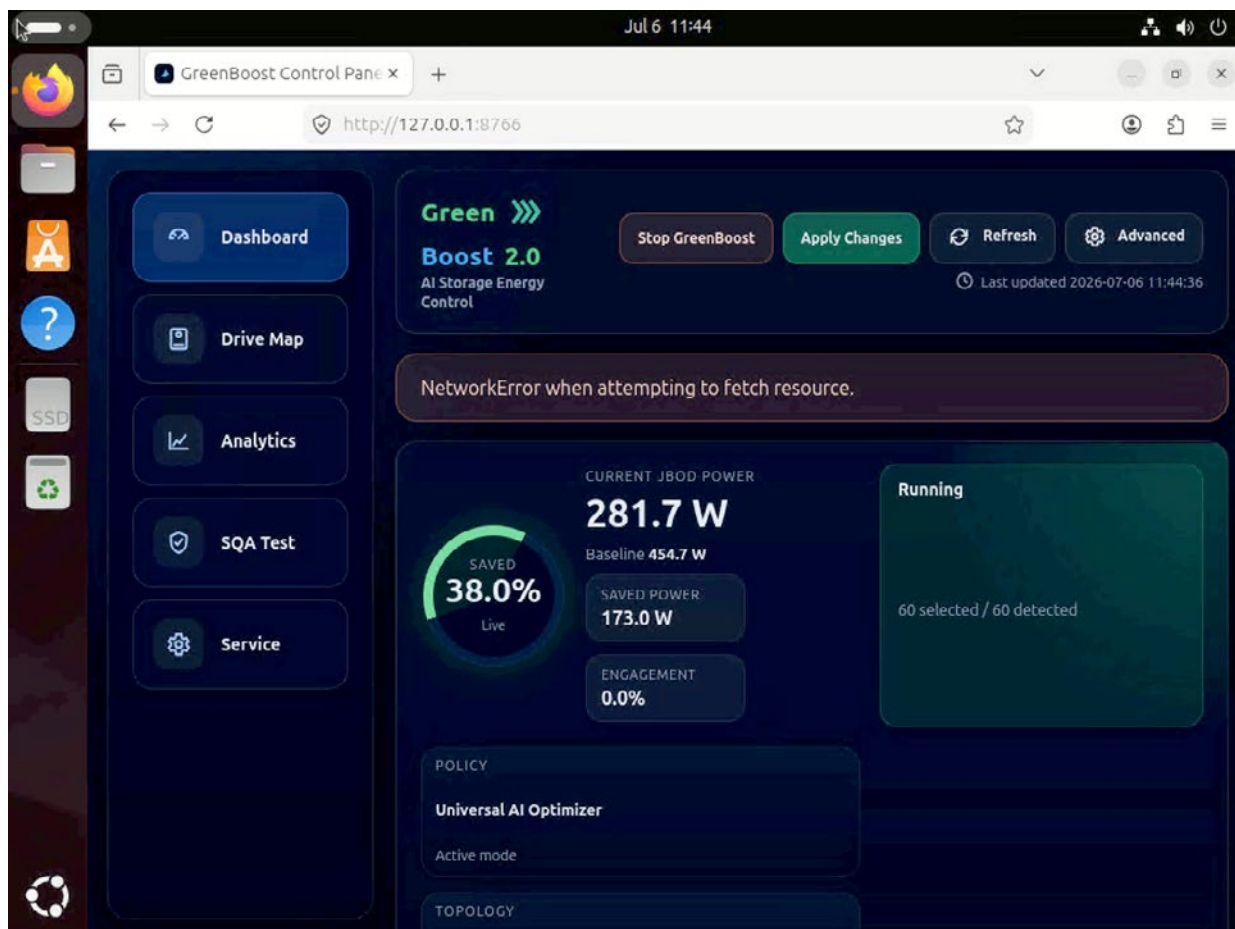


Figure 4:
Green-
Boost™
2.0 Web
UI

System Considerations

The test results show that GreenBoost™ 2.0 is particularly beneficial for capacity-oriented storage environments where systems must remain online but are not continuously active.

Unlike traditional power-saving approaches that may reduce performance, GreenBoost™ lowers energy consumption during idle operation while preserving full storage throughput under active workloads.

For organisations seeking to improve storage sustainability metrics without modifying hardware platforms, GreenBoost™ provides an effective software-based optimisation mechanism.

Summary

The Toshiba HDD Innovation Lab evaluated PROMISE Green-Boost™ 2.0 using a fully populated PROMISE VTrak J5960 equipped with 60 Toshiba MG11ACA24TE SATA 24TB Enterprise Capacity HDDs, providing a total raw capacity of 1.44 PB.

The results demonstrated a **47% reduction in idle power consumption**, reducing system power draw from **537 W to 283 W** through the use of the *Independent Drive Power Saving* policy.

At the same time, active workload performance remained unchanged, delivering approximately 7 GB/s sequential read and 6 GB/s sequential write throughput, with identical power consumption under load.

GreenBoost™ 2.0 therefore provides an effective method of reducing operational energy consumption and improving sustainability without compromising storage performance, making it particularly attractive for large-scale archive, backup, surveillance, nearline storage and AI data repository deployments.

Note of thanks to our partners

“I would like to thank PROMISE for providing the VTrak J5960 JBOD platform and giving us the opportunity to evaluate its new GreenBoost™ 2.0 technology. By combining this solution with Toshiba’s industry-leading MG11 24TB SATA Enterprise Capacity HDDs, we were able to build a comprehensive test environment in the Toshiba HDD Innovation Lab and accurately evaluate the impact of advanced power optimisation technologies on real-world enterprise storage deployments.

This collaboration has demonstrated that significant reductions in idle power consumption can be achieved without compromising performance, reliability or system availability, providing valuable insights for organisations looking to improve the energy efficiency and sustainability of large-scale storage infrastructures.”

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Interested in performing a test in
our HDD Innovation Lab yourself
or planning a visit?
We’d be happy to support you.



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