



CONTENTS

- 2 NEW CHALLENGES
- 2 DATA ARCHIVE WITHOUT COMPROMISE
- 3 OBJECT STORAGE FOR DATA ARCHIVE
- 4 SSG-5018D8-AR12L AND OPENIO
 - Power Efficiency at its Core
 - Extreme Storage Density
 - Robust Networking
- 5 OPENIO, AN OPEN SOURCE OBJECT STORAGE SOLUTION
- 6 SUPERMICRO SSG-5018D8-AR12L AND OPENIO COMBINED SOLUTION
- 7 TEST RESULTS
- 11 CONCLUSIONS

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AN OBJECT STORAGE SOLUTION FOR DATA ARCHIVE USING SUPERMICRO SSG-5018D8-AR12L AND OPENIO SDS

White Paper
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Rodolfo Campos
Sr. Product Marketing Specialist

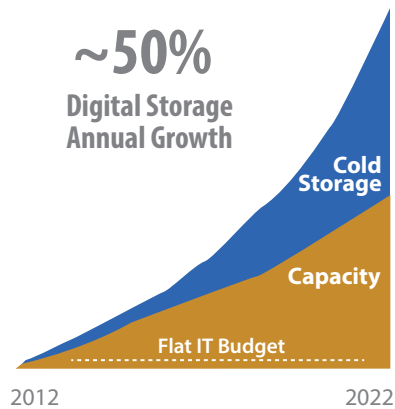
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San Jose, CA 95131 USA
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NEW CHALLENGES

Every minute - 2.5 million messages on Facebook are sent, nearly 430K tweets are posted, 67K photos on Instagram and over 5 million YouTube videos are uploaded. These are a few examples of how the Big Data market is growing 9 times faster than the traditional IT market. According to IDC reports, in 2012 the World created 4.4 zettabytes of digital data and is estimated to create 44 zettabytes of data by 2020.

These large volumes of digital data are being created, shared, and stored on the cloud. As a result, data storage demands are reaching new limits and are in need of new requirements. Thus, data storage, data movement, and data analytics applications need a new storage platform to keep up with the greater capacity and scaling demands it brings.

Although data is being created at an unbelievable rate, not all data will be frequently accessed. It is estimated that 50% of digital data will be rarely accessed. To address the exploding demand for warm (infrequently accessed) and cold (rarely accessed), but still critical data, Supermicro is presenting a new class of storage server solutions that offer a better approach - without compromising capacity nor creating throughput bottlenecks.

DATA ARCHIVE WITHOUT COMPROMISE

As data stores grow into the petabytes and beyond, new storage architectures are needed to handle the rapid scaling and need for high availability. Unstructured data like pictures, music, and videos are being created and uploaded to the cloud at an exponential rate, and current infrastructures cannot keep up with this influx of data.

Object storage is the perfect solution. Unlike other storage technologies such as file storage or block storage that structure and manage data in a hierarchal system, object storage provides the end user with greater scalability, increased resiliency, superior manageability and an overall better ROI.



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OBJECT STORAGE FOR DATA ARCHIVE

- Supermicro SSG-5018D8-AR12L
- HPE Apollo 4510 Gen9

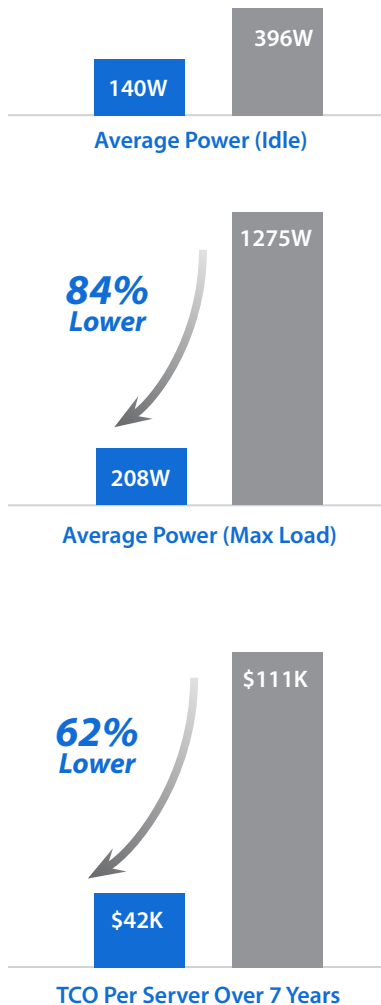


Figure 1. Dramatically Reduced TCO with Supermicro SSG-5018D8-AR12L

Cloud and web-scale companies quickly hit the limits of block and file storage. Lack of scalability and high cost become a major pain-point, so they turn to object-based storage solutions to remove these limitations. Object storage solutions have become a popular option for both private and public cloud deployments because of its ability to scale without limitations. Unlike other storage architectures where scaling out becomes complex and costly due to hierarchical approach, object storage solutions can scale to petabytes of data, simply by adding nodes.

Traditional storage systems struggle to keep replicated files or blocks in-sync across several instances or nodes. This challenge is complex to overcome, leading to an increased management needs, as well as degraded performance. Because of its flat structure, object-storage solutions overcome this by allowing IT administrators to replicate their data across multiple nodes and across multiple geographically distributed datacenters.

Storing large amounts of data in a traditional storage system could be daunting and expensive. By utilizing the scalability of object-based storage solutions, IT admins are no longer handcuffed to deploying large monolithic storage systems like NAS and SANs. This leads to a much lower CAPEX by deploying what you need, when you need it. Operating costs are also drastically lower, leading to an overall better return on investment.

Compared to other traditional platforms built for cold storage and active archive using object storage, e.g. HPE Apollo 4510, the Supermicro solution lowers the end-user total cost of ownership by an astonishing 62% through superior energy efficiency and performance per watt advantages. This allows organizations to build out cold storage and active archive solutions as needed at a fraction of the conventional cost.

There are many advantages to an object-based storage architecture, but deploying the right solution is key.



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SSG-5018D8-AR12L AND OPENIO

The Supermicro SSG-5018D8-AR12L brings massive storage density, high-performance networking, and power-efficient computing to a compact 1U form factor. Because of this, the SSG-5018D8-AR12L is the ideal platform for object storage data archival.

POWER EFFICIENCY AT ITS CORE

The Supermicro SSG-5018D8-AR12L comes equipped with an Intel® Xeon® processor D-1537, delivering high-performance computing with a fraction of the power consumption. The SSG-5018D8-AR12L comes equipped with a powerful 8-core Xeon® processor D-1537, yet at 35W, a system loaded with twelve 3.5" HDDs and 64GB of memory needs only 20W for standby, 140W at idle, and 207W under full load. This makes the SSG-5018D8-AR12L one of the most power efficient servers on the market, and a perfect platform for a multi-node object storage cluster.

Figure 1 on page 3 illustrates the difference in power consumption between the Supermicro SSG-5018D8-AR12L and a HPE Apollo 4510 Gen9 server. By cutting power consumption by 84%, companies could save upwards of \$14,841 per 7 year per server.

EXTREME STORAGE DENSITY

When it comes to data archive, storage density is key. The Supermicro SSG-5018D8-AR12L supports up to twelve 3.5" SAS2/SATA3 hot-swappable drives, one M.2 NVMe PCI-E 3.0 x4, and one PCI-E 3.0 x8 for added storage expandability. When equipped with HGST He10 SATA HDDs, the SSG-5018D8-AR12L has a total capacity of 120 Terabytes per 1U. This allows for ultimate flexibility and scalability, allowing users to expand their storage one node at a time.

ROBUST NETWORKING

Being able to store large amounts of data is very important, but allowing the data to reach the storage is often overlooked. By having dual 10GbE SFP+ LAN ports onboard, the SSG-5018D8-AR12L removes any bottlenecks created by slower networking options – without having to purchase additional network interface controllers.



Figure 2. Supermicro SSG-5018D8-AR12L



Figure 3. Back View of SSG-5018D8-AR12L

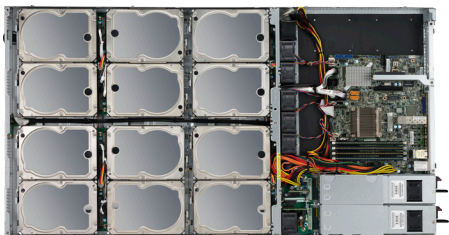


Figure 4. Top View of SSG-5018D8-AR12L



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OpenIO supports legacy and modern applications with:

- File access methods, such as NFS, SMB, FTP or local FUSE mountpoint
- Object access APIs, such as Amazon S3, OpenStack Swift

Multiple data protection mechanisms are also available:

- Replication supporting multiple copies, local or remote
- Erasure coding protection with configurable number of redundant pieces of data
- Geo-distribution, mirrored or stretch mode between datacenters
- Self-healing to prevent silent corruptions and access loss of older data

OPENIO, AN OPEN SOURCE OBJECT STORAGE SOLUTION

OpenIO provides an enterprise-class object storage solution offering high capacity, scalability and performance for high-demanding applications. It is the perfect choice to build long-term data storage platforms with no compromise on data access, data protection, TCO efficiency and overall performance.

OpenIO is based on open source software that anyone can download and contribute to. Even though it is able to reach a massive scale at hundreds of petabytes, it is flexible enough to allow any business to build an object storage platform, even with a few terabytes of capacity. Its unique design offers the simplest storage scalability on the market with flexible and fine-grained increments, without the burden of rebalancing data before the new capacity becomes available.

OpenIO can scale close to the actual production needs, without planning and financing capacity growth months in advance. The benefit of adding capacity is immediate, and also brings more performance to the system. On the long run, OpenIO is designed to handle hardware heterogeneity and is able to distribute load and capacity according to the performance of each hardware piece. In addition, OpenIO offers a state-of-the-art data accessibility and data protection mechanisms.

Thanks to its loosely coupled architecture and the several data protection mechanisms, OpenIO can guarantee zero downtime operation.

OpenIO also features a complete toolkit and an efficient web user interface to simplify the daily life of the administrator, with near human-free automation features.

All these characteristics make OpenIO the most production-friendly object storage solution available today, to deal with the diversity of the many specific use cases that are found in the IT world.



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SUPERMICRO SSG-5018D8-AR12L AND OPENIO COMBINED SOLUTION

The Supermicro SSG-5018D8-AR12L is the perfect fit to build an OpenIO platform. The networking capabilities enabled by the dual 10GBase-T Ethernet ports brings the required throughput performance and resiliency for modern data platforms with no compromise on data accessibility. The Xeon D processor is offering hardware acceleration for erasure coding algorithms with the ISA-L libraries developed by Intel in an optimized cost package. The 12 disks in a 1U form-factor optimize the maximum number of drives per rack and the overall density of the platform. It offers:

- High density to cope with long term datacenter efficiency expectations
- Reduced failure domain on the long-term duration, less impactful on 12 drives (120TB with 10TB drives) than 68 drives (544TB from a 4U counterpart server with 8TB drives)
- Fine-grained scalability, being of smaller capacity, adding a super micro node allows to stay closer to actual needs, instead of adding 544TB at a time, no need to pay hardware and software for empty space
- Low entry barrier, easier and cheaper to start with 1U storage nodes of 120TB each than a 4U server of 544TB. Not all the platforms can afford starting above 1PB of initial capacity with 3 nodes (OpenIO SDS recommends a minimum of 3 nodes for deployment)

Supermicro's hardware has been throughoutly **tested** in OpenIO's lab, and has been **certified** on OpenIO SDS 16.04. It guarantees smooth operations and very high efficiency on real life production systems.

The M.2 connector available on the Supermicro SSG-5018D8-AR12L, which supports up to a 1TB NVMe SSD, is also very convenient to host metadata services if superior performance is required. OpenIO is able to tier its metadata on the NVMe media, with a two benefits:

- To decrease the overall latency of metadata handling
- To offload random read and writes operations from the SATA LFF drives optimizing their throughput performance

Once combined, Supermicro and OpenIO build and run hyper-scalable data archiving system at the best price point on the market.



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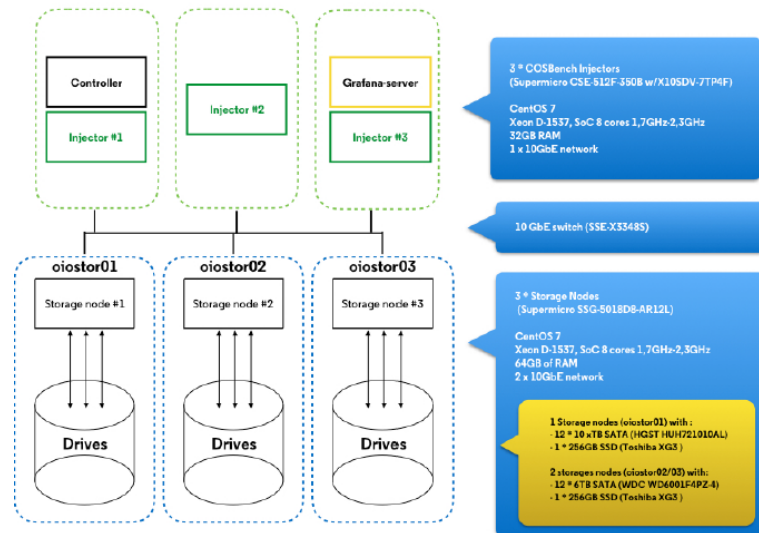
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SOLUTION CONFIGURATION	
System	Supermicro SSG-5018D8-AR12L
Processor	Single Intel® Xeon® processor D-1537 8 cores
Memory	64GB ECC DDR4
Storage	12x HGST Ultrastar He10 10TB SATA3 HDD
	1x Toshiba XG3 256GB NVMe SSD
Networking	1x SanDisk X300DC 960GB SATA3 SSD
	Dual SFP+ 10 Gigabit Ethernet
Power Supply	Redundant 400W high-efficiency power supplies
Software	OpenIO SDS
Operating System	CentOS 7
Benchmark	Cosbench ver. 0.4.2

Table 1. Solution Configuration

TEST RESULTS



OpenIO-SDS architecture is based on replicated x3 configuration template.

Each node affords one meta0, one meta1 and 1 meta2 on SSD.

DATA are stored on SATA disk.

The data loadbalancing is settled by default on WRAND (Weighted Random) in the **conscience** (which is on the first storage node)

Figure 5. Test System Topology



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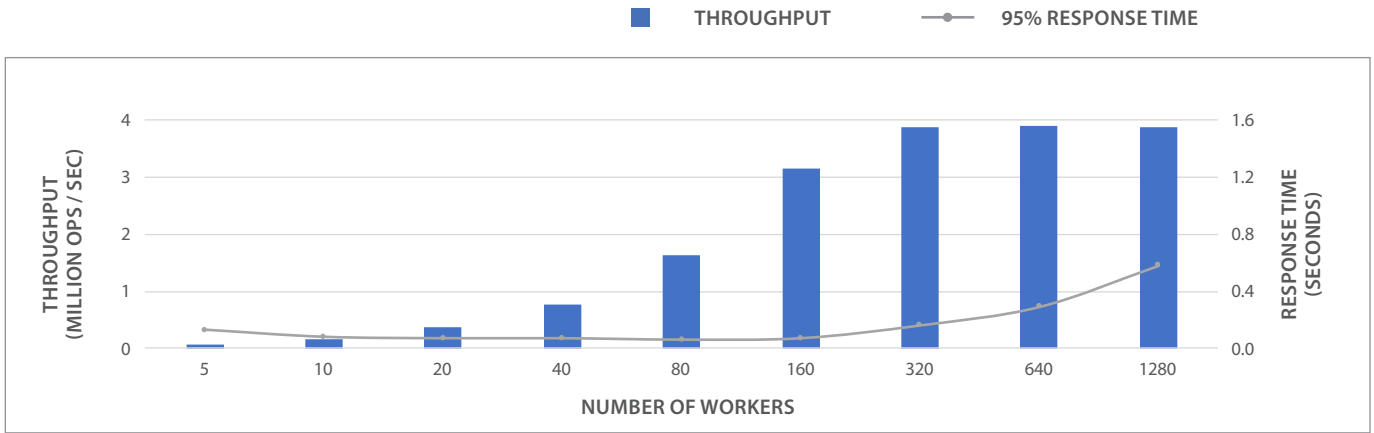


Figure 6. 128KB Objects, 100% Read Operations

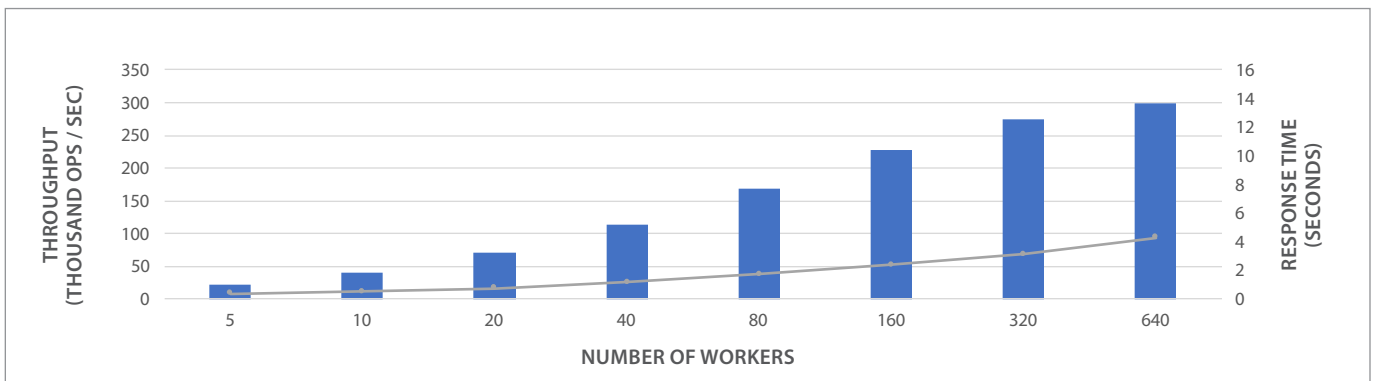


Figure 7. 128KB Objects, 100% Write Operations

WORKERS	95%RT (MS)	THROUGHPUT (OPS/SEC)
5	130	68,650
10	80	169,330
20	70	364,550
40	70	779,680
80	60	1,631,990
160	70	3,132,680
320	160	3,856,760
640	290	3,895,940
1280	580	3,873,690

Table 2. 128KB Objects, 100% Read Operations

WORKERS	95%RT (MS)	THROUGHPUT (OPS/SEC)
5	370	21,110
10	500	40,530
20	720	69,880
40	1140	113,020
80	1700	168,060
160	2360	227,480
320	3130	274,090
640	4270	298,300
-	-	-

Table 3. 128KB Objects, 100% Write Operations



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■ THROUGHPUT —●— 95% RESPONSE TIME

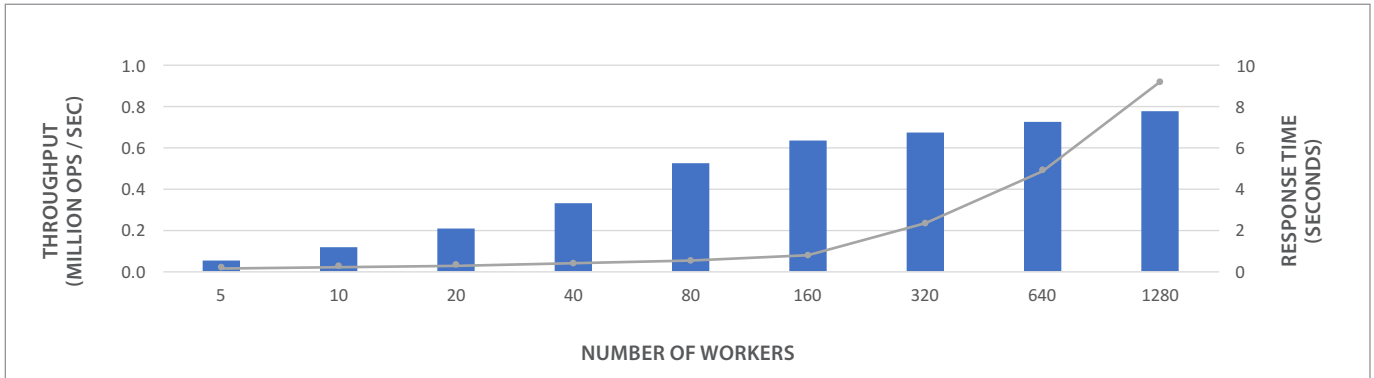


Figure 8. 1MB Objects, 100% Read Operations

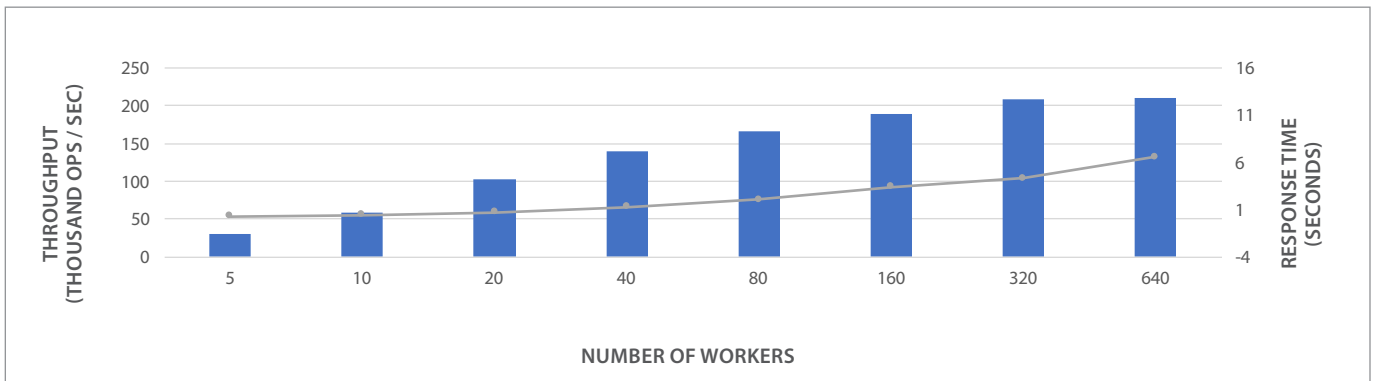


Figure 9. 1MB Objects, 100% Write Operations

WORKERS	95%RT (MS)	THROUGHPUT (OPS/SEC)
5	160	54,960
10	220	117,980
20	310	208,140
40	400	332,100
80	520	528,590
160	800	638,580
320	2330	676,660
640	4900	730,290
1280	9190	777,390

Table 4. 1MB Objects, 100% Read Operations

WORKERS	95%RT (MS)	THROUGHPUT (OPS/SEC)
5	310	30,950
10	470	59,520
20	740	102,900
40	1270	139,680
80	2060	166,490
160	3410	188,540
320	4330	207,900
640	6610	210,870
-	-	-

Table 5. 1MB Objects, 100% Write Operations



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■ THROUGHPUT —●— 95% RESPONSE TIME

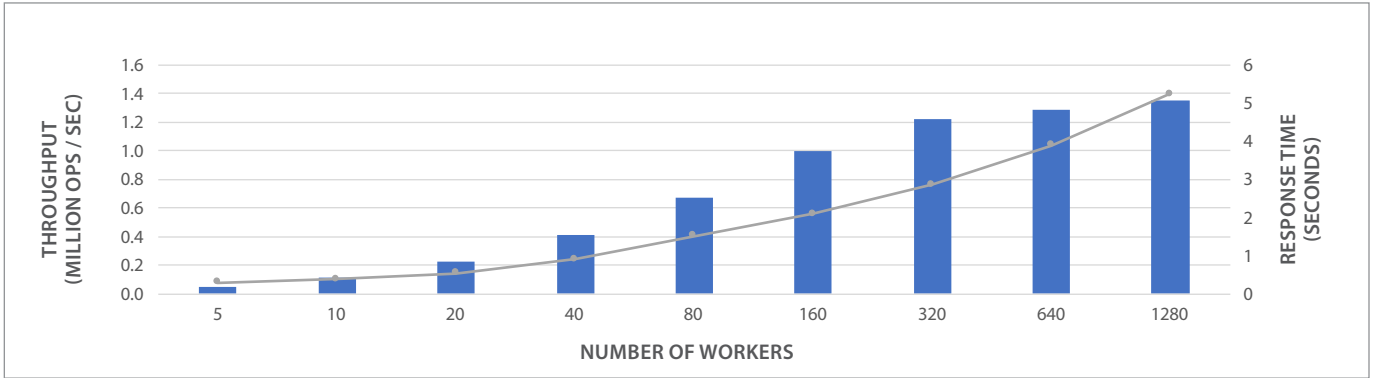


Figure 10. 128KB Objects, 80% Read + 20% Write Operations

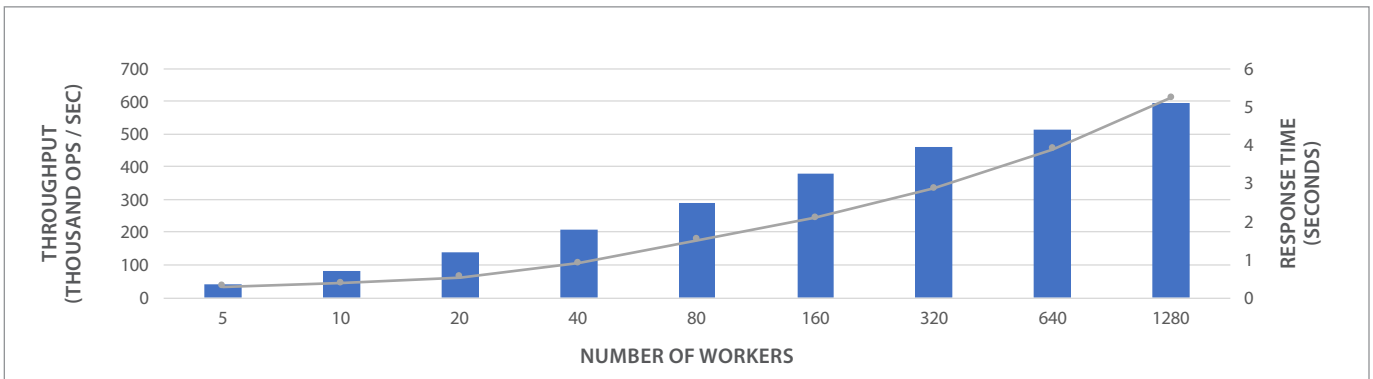


Figure 11. 1MB Objects, 80% + 20% Write Operations

WORKERS	95%RT (MS)	THROUGHPUT (OPS/SEC)
5	290	48,350
10	380	112,530
20	540	223,690
40	910	406,110
80	1510	672,890
160	2090	994,840
320	2860	1,222,020
640	3890	1,289,300
1280	5240	1,348,690

Table 6. 128KB Objects, 80% Read + 20% Write Ops

WORKERS	95%RT (MS)	THROUGHPUT (OPS/SEC)
5	290	40,130
10	380	82,200
20	540	138,520
40	910	207,190
80	1510	291,150
160	2090	380,730
320	2860	460,080
640	3890	512,700
1280	5240	593,600

Table 7. 1MB Objects, 80% Read + 20% Write Ops



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FOR MORE INFORMATION

Supermicro SSG-5018D8-AR12L Datasheet
[www.supermicro.com/products/
system/1U/5018/SSG-5018D8-AR12L.cfm](http://www.supermicro.com/products/system/1U/5018/SSG-5018D8-AR12L.cfm)

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CONCLUSIONS

In order to keep up with today's digital data explosion, Supermicro created a new breed of server storage. The extremely dense and highly scalable storage solution based on the SSG-5018D8-AR12L and OpenIO object storage software have revolutionized the way cloud providers and datacenters store, share, and analyze data – all the while lowering their overall CAPEX and OPEX, and providing the best return on investment possible.



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About OpenIO

OpenIO offers an open source storage software that allows organizations to converge application and storage on a single scale-out platform, bringing flexibility and agility to large-scale storage infrastructures. The product is a pure Software Defined Storage solution. Officially launched in June 2015 as a company, OpenIO has a long track record in object storage having started the development of the product in 2006. At that date, only few pioneers existed and OpenIO is one of them. For the past 10 years the team has architected, delivered, and supported numerous hyper-scale storage platforms and hundreds of billions of objects, with remarkable stability and no down time. The company has offices in San Francisco, Paris, Madrid, Tokyo, and Montreal.

www.openio.io

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