

Intel and KIO Networks Solve Cloud Storage Problems

Intel® Solid-State Drive Data Center Family
Cloud Computing
Service Provider



KIO Networks uses Intel® Solid-State Drive Data Center Family and Ceph* software to cut storage power consumption while increasing efficiency

Power and cooling dominate a cloud service provider's month-to-month operating expenses. According to research done by Microsoft Research, out of every watt coming into a data center, IT equipment consumes over half of that wattage, and cooling uses about a third of it.¹ In Central and South America, the cost of power is increasing rapidly, putting pressure on data center operators in these regions to maximize power efficiencies, while still maintaining high service levels that meet client expectations and deliver the new experiences that users want.

With data centers spanning North and Central America plus Spain, Mexico City-based KIO Networks offers a wide range of services, from entire IT infrastructures to a variety of hosting services and off-premises private clouds. One of KIO Networks' most successful offerings is its KoolFit* private cloud solution built on open source OpenStack*, Open vSwitch*, and Ceph* software. To deploy KoolFit on a wider scale while also meeting customer demands, KIO Networks' cloud solution required next-level characteristics.

“Having the possibility to almost double the rack density in our data center due to the deployment of Intel® Solid-State Drives in each of our servers is just another great result of the long-term relationship Intel and KIO Networks have had for years.”

— Freddy Enrique Salas Quintero,
Cloud Product Manager,
KIO Networks

Challenges

- **Lack of storage scalability.** The company's storage needed to grow easily and flexibly to meet customer needs, but available proprietary solutions were difficult to scale and configure.
- **Costs of large-scale storage.** A solution based on spinning hard disk drives (HDDs) was not energy-efficient or cost-effective for the performance and capacity required.

Solutions

- **Intel® Solid-State Drive (Intel® SSD) Data Center Family.** The company chose Intel SSDs for their high performance and power efficiency.
- **Ceph open source storage.** The company selected the Ceph open source object store and file system to deliver high performance and infinite scalability.

Business Value

- **Customer satisfaction.** With the combination of Intel SSDs and Ceph, KIO Networks' IT experts maintained flexible storage services to meet customer service-level agreements (SLAs).
- **Power cost savings.** Using Intel SSDs, KIO Networks significantly reduced its power consumption by 1.6x in each rack and the total cost of ownership (TCO) of its data center.²

The Challenges of Proprietary Storage Solutions

Traditionally, cloud solutions have used SATA- and SAS-based spinning HDD storage networks for customer data and applications. Storage networks are usually connected over one of a variety of proprietary network technologies that storage suppliers offer. These storage solutions tend to lock service providers into a particular supplier's expensive product line with limited compatibility across the ecosystem of storage network technologies.

Proprietary-based systems end up being costly for IT, because providers must over-provision their data center with a supplier's expensive hardware to be able to quickly respond to sudden demands for more capacity and for spares without initiating a service call to the supplier. These systems also may require a supplier service contract to keep them running optimally, as well as excessive amounts of time to configure, update, and upgrade them to accommodate customer demands and technology changes. Totalling all the costs, KIO Networks found that it would have to spend up to five times more for a proprietary solution than for standard, commodity components. Finally, these hardware-based solutions are often not flexible and adaptable enough to allow service providers to quickly respond to new market opportunities. This limitation can severely restrict a solution's competitive advantage.



Ceph: A Basis for Flexible, Low-Cost Storage Solutions

For its KoolFit private cloud off-premises solution, KIO Networks deployed open source software. For storage, it installed Ceph software. Ceph offers high-speed block and object storage that is easy to deploy and manage with OpenStack software, eliminating the labor-intensive process of setting up customer storage solutions.

Using a proprietary storage solution would have meant relying on a third-party supplier to develop solutions for its customers. With Ceph, KIO Networks can develop solutions entirely in-house, allowing it to quickly respond to customer requirements. With Ceph and OpenStack, KIO Networks has increased its operating efficiency and lowered operating costs.

KIO Networks' implementation of Ceph is successfully running in two data centers as Ansible*-based and SaltStack*-based services, allowing the company to deploy customized cloud solutions within hours.

Cutting Drive Power Consumption

By building its own Ceph-based storage system, KIO Networks can use enterprise-grade hard drives available at low cost from a number of suppliers, and it can install an entirely new storage system in days instead of months. An inventory of commodity

drives is carried at each data center, which makes maintenance less costly and faster because failed components can be replaced or capacity expanded as needed in minutes. This approach alone reduces hardware costs and improves the ability to meet the terms of the SLAs.

More importantly, after KIO Networks began experimenting with the Intel SSD Data Center Family as part of its storage solutions, it found that while mechanical, spinning HDDs cost less to purchase compared to SSDs, spinning drives were more expensive to operate. Enterprise-grade mechanical hard drives consume on average from 5W at idle to 7W during maximum write operations. However, during the same operations, SSDs consume from a third of a watt to 3W. While the purchase cost for mechanical drives is less, over the life of the drive they use more energy, costing much more to operate and maintain. Considering the rising costs of power in Central and South America, the savings based on the use of SSDs are considerable.

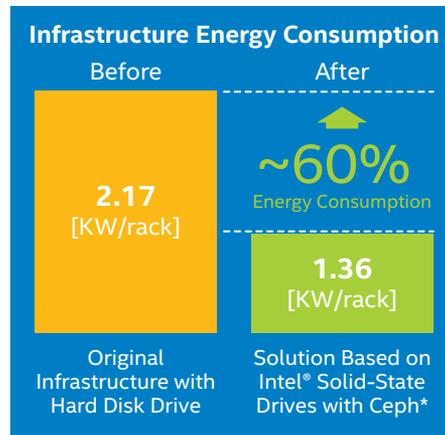
Lower power demand from SSDs means less heat generation and thus lower cooling requirements across the storage rack. KIO Networks engineers further cut their TCO for storage by redesigning their racks with fewer fans or enabling denser server racks (sometimes double the number of servers per rack), cutting overall power demand even more.

By switching to 100 percent use of SSDs, redesigning the racks, and managing storage with Ceph software, KIO Networks cut power consumption due to storage. It realized that in special cases³ it was consuming up to 1.8 times more energy/KW in each rack compared with the new solution—and on average, 1.6 times more energy/KW in most of its infrastructure based on spinning drives. The company estimates that the same spinning HDD infrastructure requires an estimated 2.17 KW/rack, while the SSD-based solution will consume on average only 1.62 KW/rack of power.

Ultimately, the reduced demand for power could impact the overall load on the cooling system, further reducing power draw and overall costs in its data centers and reducing general TCO.

Performance

Together, Ceph and Intel SSDs help improve the overall performance of storage in cloud solutions. KIO Networks worked with Ceph for a year to improve performance and optimize the software and configuration. KIO Networks found that using SSDs instead of spinning drives as its storage medium delivered the biggest increase in performance. With the use of SSDs, the speed is sufficiently faster—about a five times performance increase—than traditional network file server (NFS)-mounted storage solutions in the cloud. Recent improvements in Ceph may lead to an additional three times improvement in performance.



Conclusion

After eight months of operation, KIO Networks already has deployed an Intel SSD Data Center Family with over 1 PB of storage capacity, which Ceph software manages using the Raw Device Block protocol.

For companies that provide cloud services, minimizing power and cooling costs while delivering—or improving—on SLAs is imperative. KIO Networks reduced power demand for storage operations by switching to the Intel

SSD Data Center Family. Deploying open source-based storage using Ceph also improved operational efficiency, flexibility, and the ability to meet SLA terms.

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For more information about KIO Networks, visit kionetworks.com

For more information about Ceph software, visit ceph.com

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¹ Greenberg Albert, Hamilton James, Maltz David A., Patel Parveen. "The Cost of a Cloud: Research Problems in Data Center Networks." Microsoft Research.

² Based on a comparison of two equivalent racks at KIO Networks data center. Rack A represents an equivalent solution than Rack B. Rack A and B have same server density (same number of servers in each rack) with equivalent processor models (a combination of Intel Xeon E7 and Intel Xeon E5). Rack A have older processor version and OEM server's model compared to Rack B. Nevertheless; Rack A and Rack B have equivalent compute capability (within 25% of difference) according to SPECint_rate. Rack A have close to 95% of HDD in its components and Rack B have only SSDs in it. In average, the measurements shows that Rack A can consume up to 2.67 [KW] while Rack B can consume as little as 1.47 [KW]. This represents a 181.63% more energy consumption from Rack A compared to Rack B in extreme cases, with average comparison of 180.03 percent.

³ Based on a comparison of two similar racks at KIO Networks data center. Rack A represents almost the same structure than Rack B. Rack A and B have the same server density (same number of servers in each rack) with almost the same processor models (a combination of Intel Xeon E7 and Intel Xeon E5). Rack A has almost the same processors and OEM servers model compared to Rack B which brings an equivalent compute capability (within 10% of difference) according to SPECint_rate. Rack A has close to 93% of HDD in its components and Rack B has only SSDs in it. In average, the measurements shows that Rack A can consume up to 2.19 [KW] while Rack B can consume as little as 1.34 [KW]. This represents a 163.43% more energy consumption from Rack A compared to Rack B in extreme cases, with average comparison of 159.55 percent.

For more information about Intel Solid-State Drives, visit intel.com/SSD

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