OpenIO

HDF Group
ESRF September 2019
Kita-OIO SDS Integration
Agenda

September 2019

1. About OpenIO
2. OpenIO SDS + KITA
3. Demo
OpenIO ID
Founded in 2015

Quickly growing across geographies and vertical markets

40+

Large customers

Deployments from 3 nodes up to 40 Petabytes and tens of billions of objects

3

Continents

HQ
Lille

Offices
Paris, Tokyo

Teams across EMEA & Japan

40

Employees

Mostly R&D, Support, tech people

Growing fast

3

Investors

Recognition & awards:

OpenIO selected as Cloud start-up to follow closely, March 2019
OpenIO Vision and Mission

**Vision:**
We envision a data-centric world where OpenIO is recognized as the universal storage solution for unstructured data.

**Mission:**
OpenIO’s mission is to deliver an open source, high performance object storage solution that meets the demanding needs of customers working with HPC, Big Data and AI.
OpenIO SDS and HDF Kita

Jean-François Smigielski
OpenIO- CTO
Storage Landscape in HPC

OIO-Object Storage
- Cost effective-Scalable
- Very High throughput

Parallel FS
- MPI-IO capable
- Very-Low Latency
- Very-High throughput

Network Attached Storage
- POSIX / File
- Medium-Latency
- Average Scalability

Storage Area Network
- Block Storage- Low Latency
- High Throughput

Tape
- Offline copies
- High Latencies

Cold, Warm, Immutable
- Low $/GB
- High Latency

Hot, Mutable
- High $/GB
- High concurrency
- Low Latency

POSIX / File
- Medium-Latency
- Average Scalability

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Why object storage to fill the gap? TCO!

1/ What is Object Storage
- Unstructured Immutable Data + Metadata
- High Parallelism
- 100% Online Dataset
- Cloud-oriented, ideal for large scale
- *De facto* standards: S3 (AWS), Swift (Openstack)

2/ Meanwhile, in HPC...
- S3/Swift are not standards, HDF5 & MPI-IO are
- HDF5 was not designed to work with objects
- Huge mutable datasets
- Lower TCO would be appreciated

3/ How can it integrate?
- Hierarchically, behind a primary fast tier
- Independant tiers with data movements orchestrated

4/ KITA, the necessary middleware
- Persist mutable datasets as immutable objects!
- Independant Object Storage, with HDF5 as an orchestrator (import / export)
Why OpenIO? We Think Different!

**ConsciousGrid™ technology**

Never rebalance: Scale up and out in small or large increments and on any hardware that you choose, while maintaining consistent high performance.

**Directory with indirections**

Track containers and not objects:

**Grid of nodes**

Real-time load balancing for optimal data placement, more efficient than a ring-based architecture.

**Open Source & HW agnostic**

Avoid vendor lock-in and keep control of your data. Open source guarantees the continuity of the solution and gives your engineers the opportunity to understand how the tech works. Being hardware agnostic allows better capacity planning and improve your TCO.
KITA/OIO Integration Architecture
Kita's Architecture

Client SDKs for Python and C are drop-in replacements for libraries used with local files.

No significant code change to access local and cloud based data.
Kita / OIO Similar Architectures

What if we just juxtapose both?
Step 1: Easy Integration

Let's configure a single load-balanced endpoint for the persistence backend

- Many redundant scalability patterns (caching, sharding, load-balancing)
- Huge bandwidth usage: any stream is repeated
- 2 autonomous clusters with deployment patterns
  - Stateless, with K8s or Docker Swarm for Kita
  - Stateful, with Ansible on bare-metal for OpenIO

Barely acceptable for functional validation purposes, as a first step.
Step 2: Tighter Integration

Redirection as a LB

Registered in the ConsciousGrid

Colocated, local network

Metadata Proxy

Directory Service

Deployment Unit
Kita / OIO: Benefits of a Tight Integration

- Optimised performance
  - Tightly coupled architecture
  - Efforts on pragmatism and parcimony

- Optimised TCO
  - Lower HW cost & cost/giga
  - Lower management cost one cluster to manage rather than two!
  - Improved management cycle

- Scalability
  - Scaling up increase simultaneous clients and parallelism for HDF access

- OpenSource solution
  - Both HDF and OIO are born opensource
  - No vendor lock-in
  - De facto standards

OpenIO
A scientist visits a research facility and he/she starts a new experiment on an existing run

The test happens, data are dumped on a fast buffer storage (Parallel FS)

Soon after, copies are made on the secondary storage (Tape)

Preliminary validations are performed on the data in the fast buffer

His/Her long stay comes to an end, he/she returns with a pile of BluRay/DVD

The data is flushed from the buffer.

A scientist visits a research facility and he/she starts a new experiment on an existing run

The test happens, data are dumped on a fast buffer storage (Parallel FS)

Soon after, copies are made on the secondary storage (Private Cloud) and data is flushed from the buffer

Preliminary validations are performed from the cloud

His/Her short stay comes to an end, he/she returns with credentials to the cloud.

Much smaller and cheaper Buffer needed!
Better user experience!
Demo
Want to learn more?

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Try out Kita for free in our JupyterLab environment:

- See: http://www.hdfgroup.org/hdfkitalab/

Learn more about HDF Kita: https://www.hdfgroup.org/solutions/hdf-kita/

Learn more about OpenIO SDS: https://www.openio.io/product/product-overview