Hybrid Cloud Storage

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D3N: Object Store Caching for a Data Center

Cache services

Rack-local cache servers

Multiple cache layers across the network hierarchy

Data Lake (Object Store)

More Oversubscription

Datacenter Switches

Cluster Switches

Aggregation Switches

ToR

Rack

L3

L2

L1

L3

L2

L1

L3

L2

L1

L3

L2

L1

L3

L2

L1
The trace completion time

D3N improves performance significantly.

More than 4x reduction to backend traffic.
Towards Hybrid Cloud

Single Data Center

Data Lake

Cache

Public Cloud Region 1

Cache

Public Cloud Region 2

Cache

Private Data Center

Data Lake

Hybrid Cloud
What needs to be changed

- Read-only and intermediate datasets
- Consistent hashing
- Anycast based lookup service
- Internal protocol called *rados* is used to access the data lake

- Write-back durable cache
- Directory-based approach
- Kubernetes
- S3 protocol is used to access the data lake
Implementation

[Diagram showing RGW in both S3 & Swift and Public Cloud contexts, with Read/Write Cache and Private Data Center]
Where are we going?

- Directory enables richer policies
- Multiple back end data lakes
  - Where to store the data
  - Erasure coding
- Where do we compute on the data
- Prefetching
More Information

- Red Hat is upstreaming the initial prototype.
  - https://github.com/ceph/ceph/pull/24500
- Hybrid Cloud Cache implementation:
  - https://github.com/ekaynar/ceph
- Project Websites
  - https://www.bu.edu/rhcollab/projects/d3n/
  - https://massopen.cloud/d3n/

Thank you