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China 2019





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HDFS CSI: Speed Up Kubernetes in On-Premises Big Data Cluster

Yi Chen & Junping Du



About us



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- Yi Chen – Software engineer from Tencent, Apache Hadoop Committer & PMC, working on Apache Hadoop HDFS/Ozone.
- Junping Du – Chair of Tencent Open Source Committee, Apache ASF member, Apache Hadoop Committer & PMC.

Outline



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- Big Data Introduction
- Challenges
- CSI
- Solution Options

Big Data Stack



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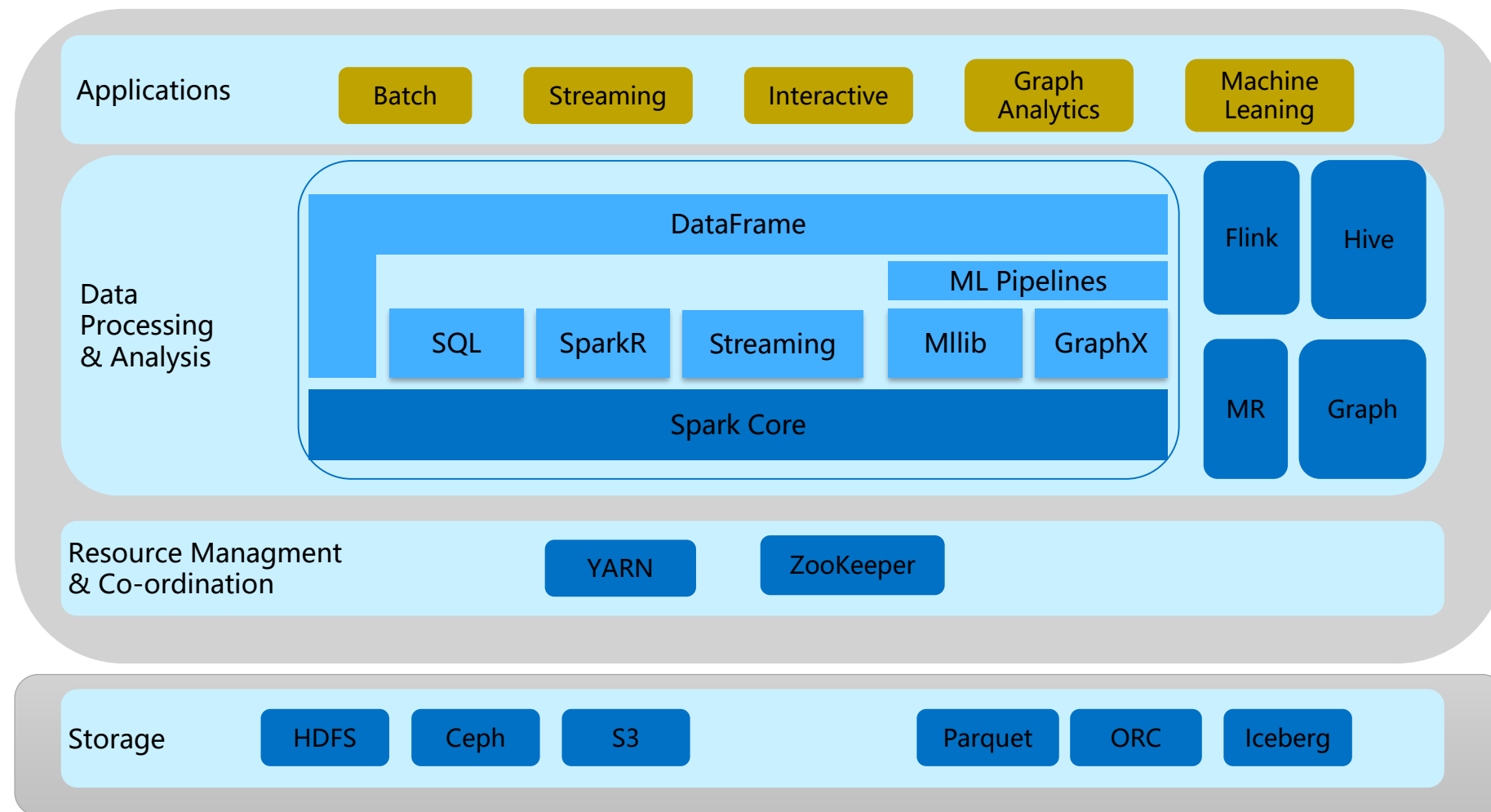


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Big Data Trend



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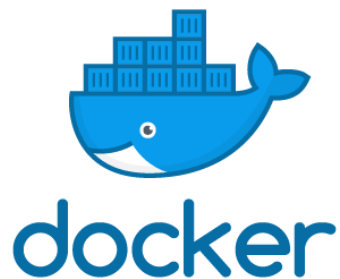


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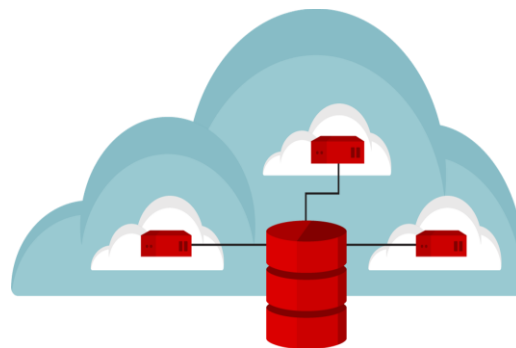
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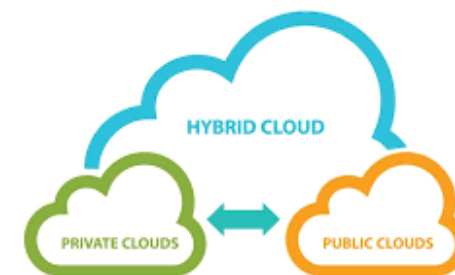
Move to cloud



Containerization



Compute and storage
disaggregation



Hybrid deployment

Benefit of Containerization



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- Improve hardware utilization
- Strong resource isolation without much virtualization overhead
- Better application packaging
- Deployment agility and infrastructure independence



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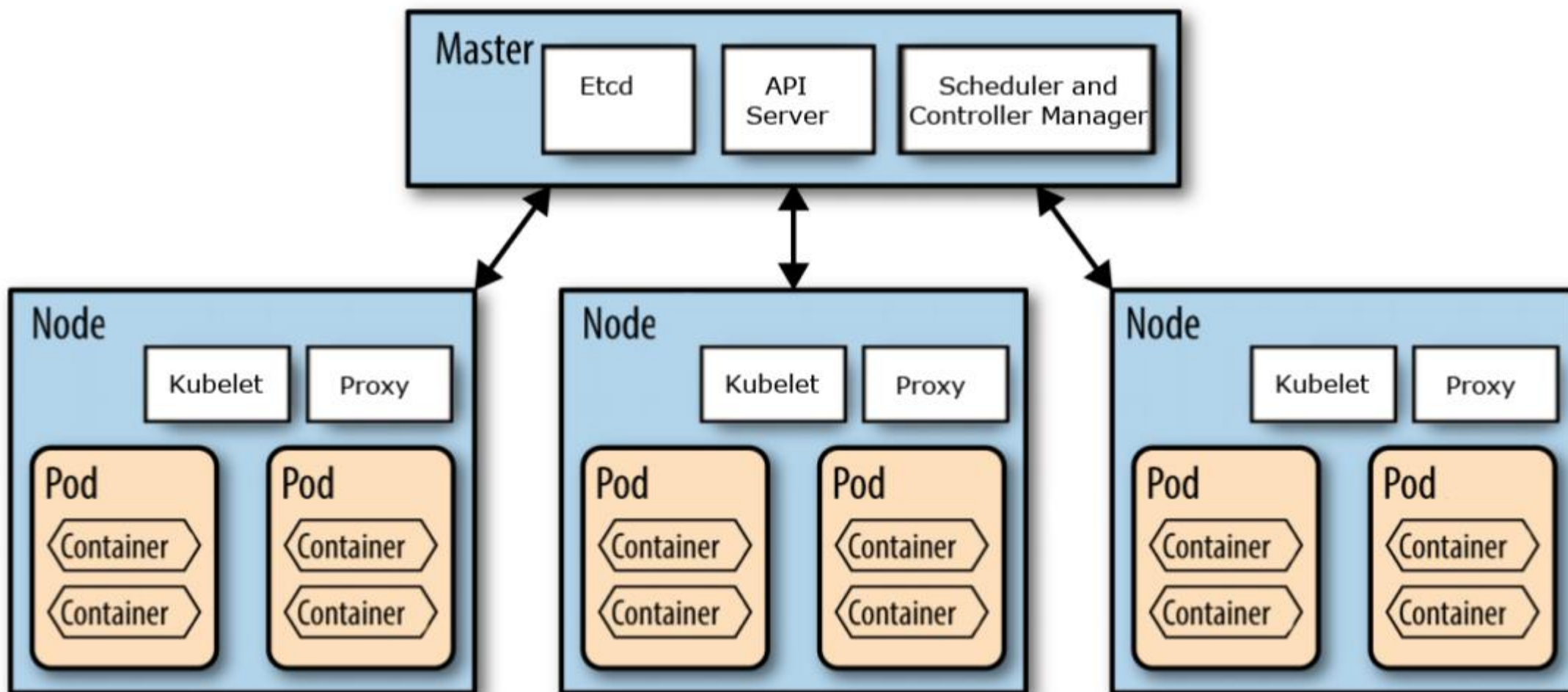
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Kubernetes Architecture



Challenges

Kubernetes

- Optimized for containerized microservices
- Running Big Data workloads along with microservices together
- Better tuned for cloud use cases

Big Data

- Improving capabilities for persistent volumes
- Containerize, microservices



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CSI(Container Storage Interface)

- Specification
- Interoperable
- Vendor neutral
- Control plane only
- Idempotency



CSI



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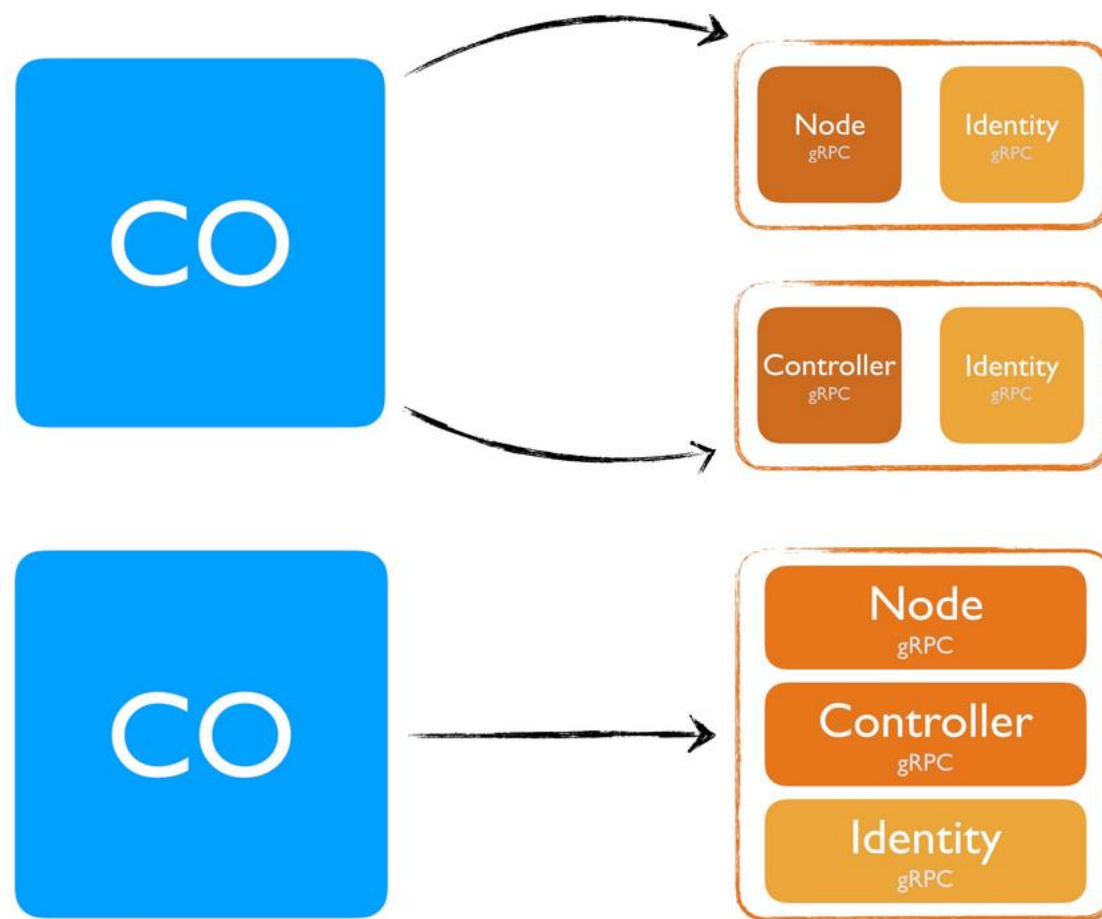
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- Identity Service
 - Provide CSI plugin version and capability information
- Controller Service
 - Create/Delete/Manager volumes
- Node Service
 - Mount/Unmount volumes on node





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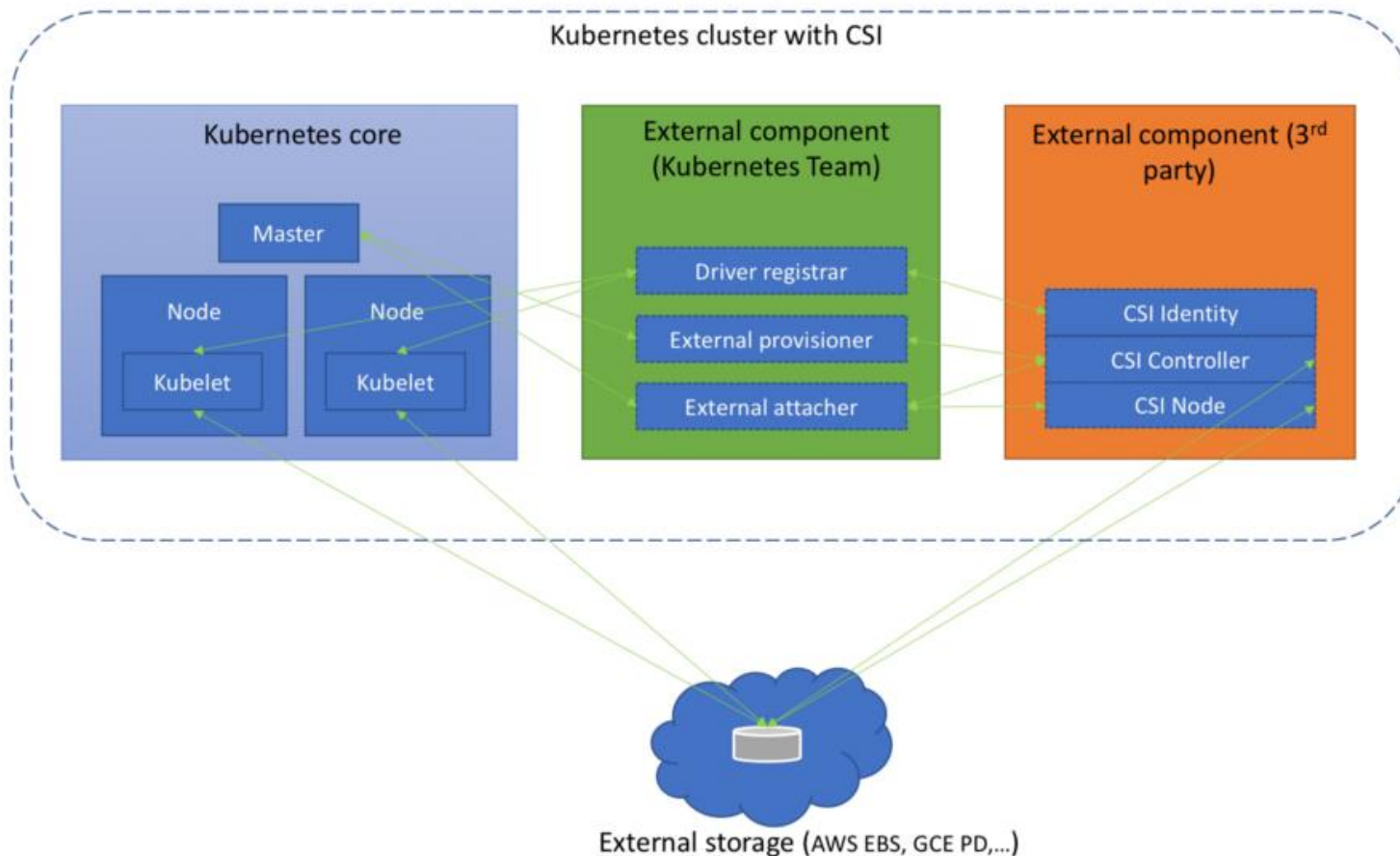


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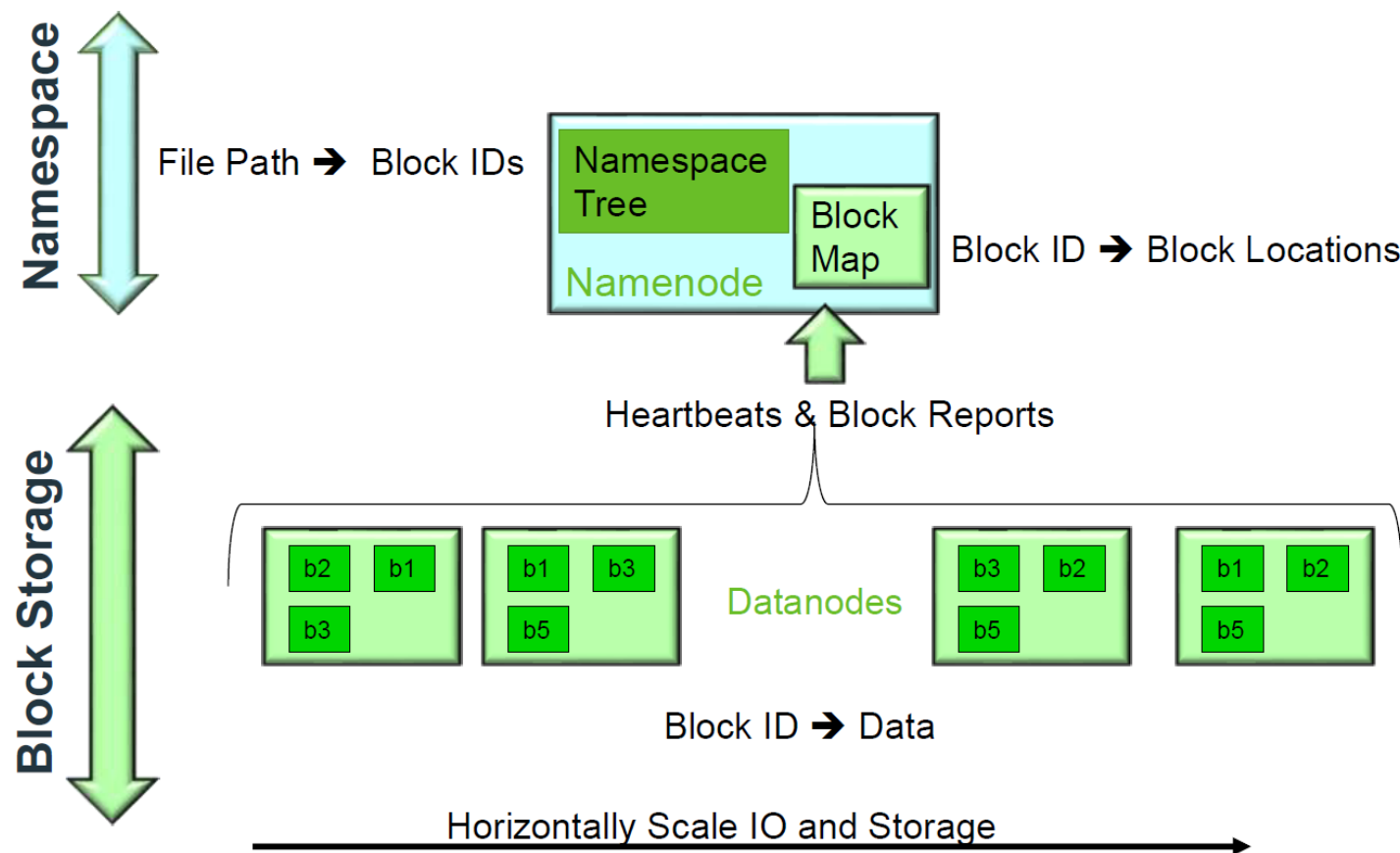
Kubernetes CSI Support

- Introduce CSI since v1.9
- GA v1.13
- 45+ CSI drivers supported



HDFS Architecture

- Strong consistency distributed file system
- 3 Replica, data high safety
- 10+ production adoption





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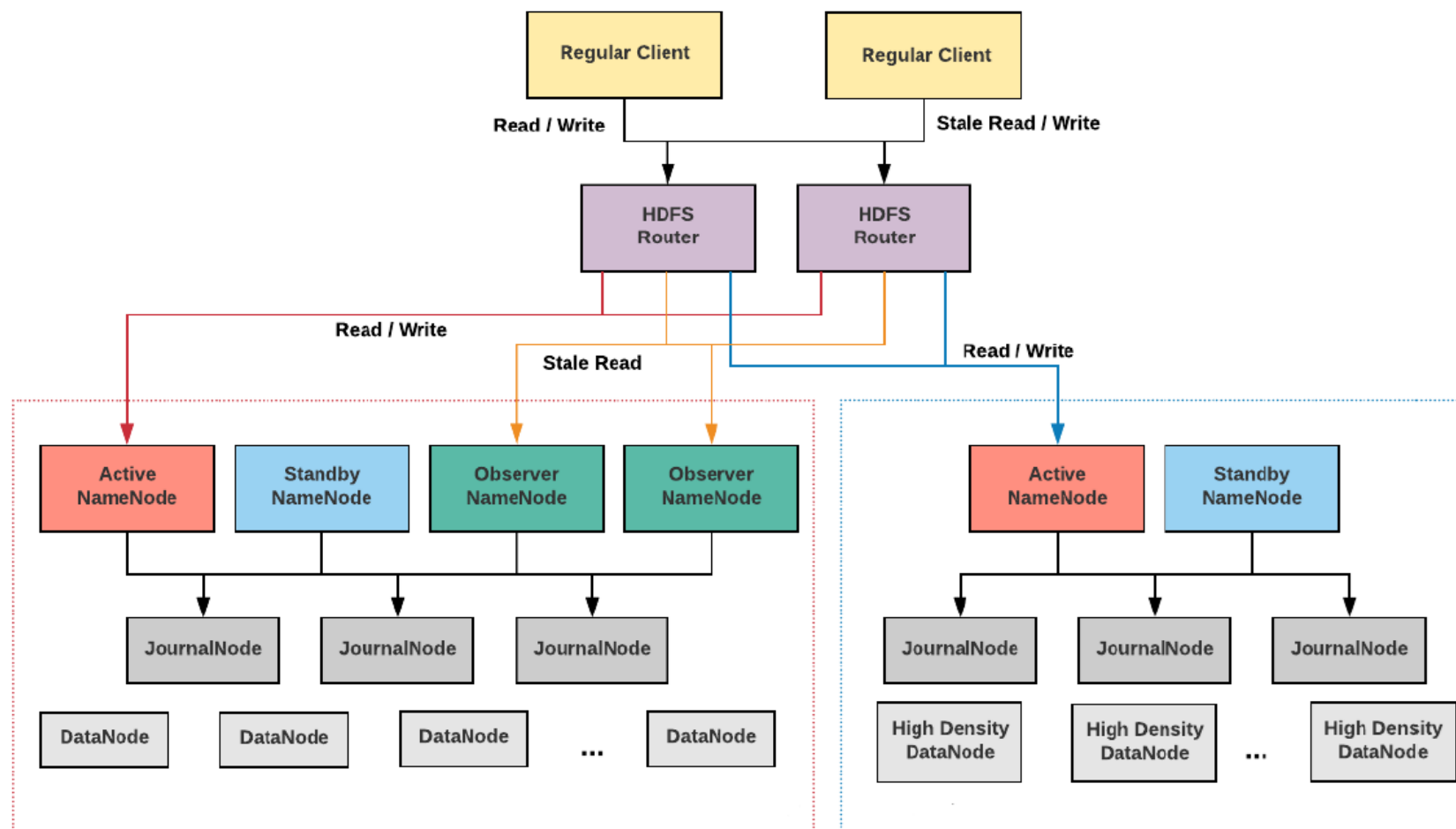


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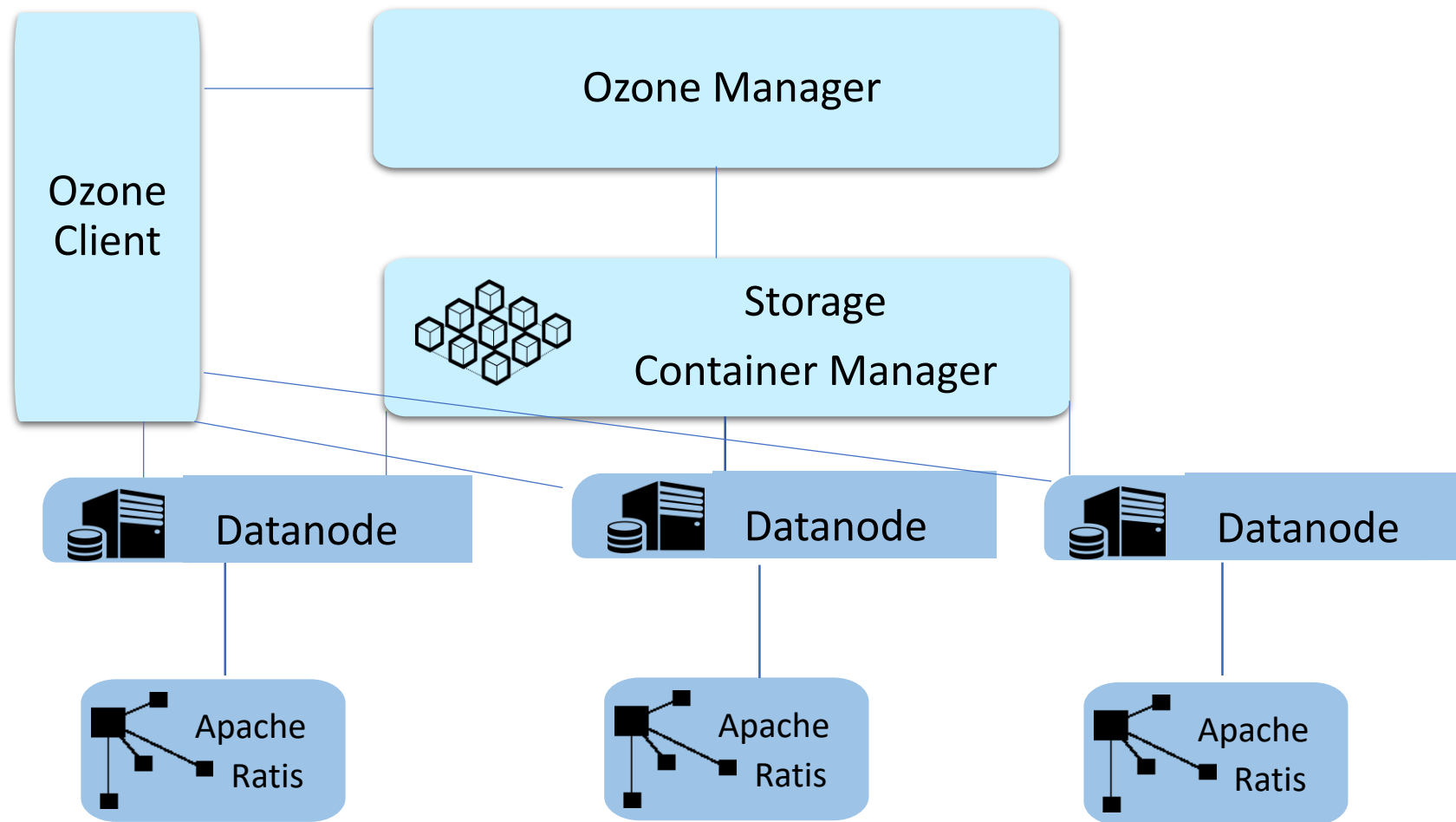
HDFS Cluster Scale

- Single cluster 4000+ nodes
- Federation cluster 20K+ nodes



HDFS - Ozone

- Object storage
- Scaling to trillions of objects
- S3 gateway
- Ozone File System



Solution Options



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- HDFS NFS Gateway
- HDFS Fuse
- HDFS CSI based on NFS Gateway
- OZone CSI
- HDFS Quadra CSI

HDFS CSI



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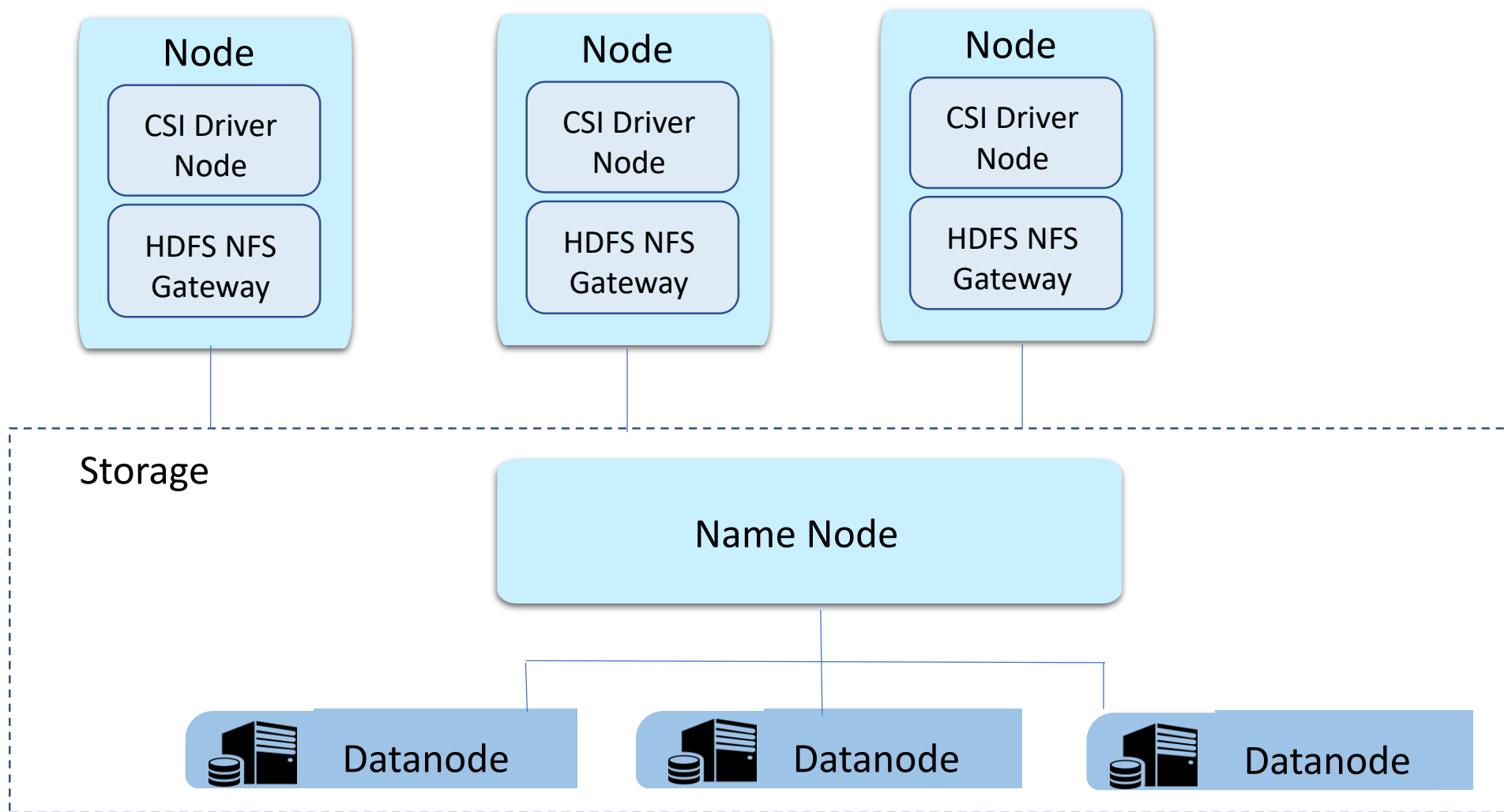


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Ozone CSI



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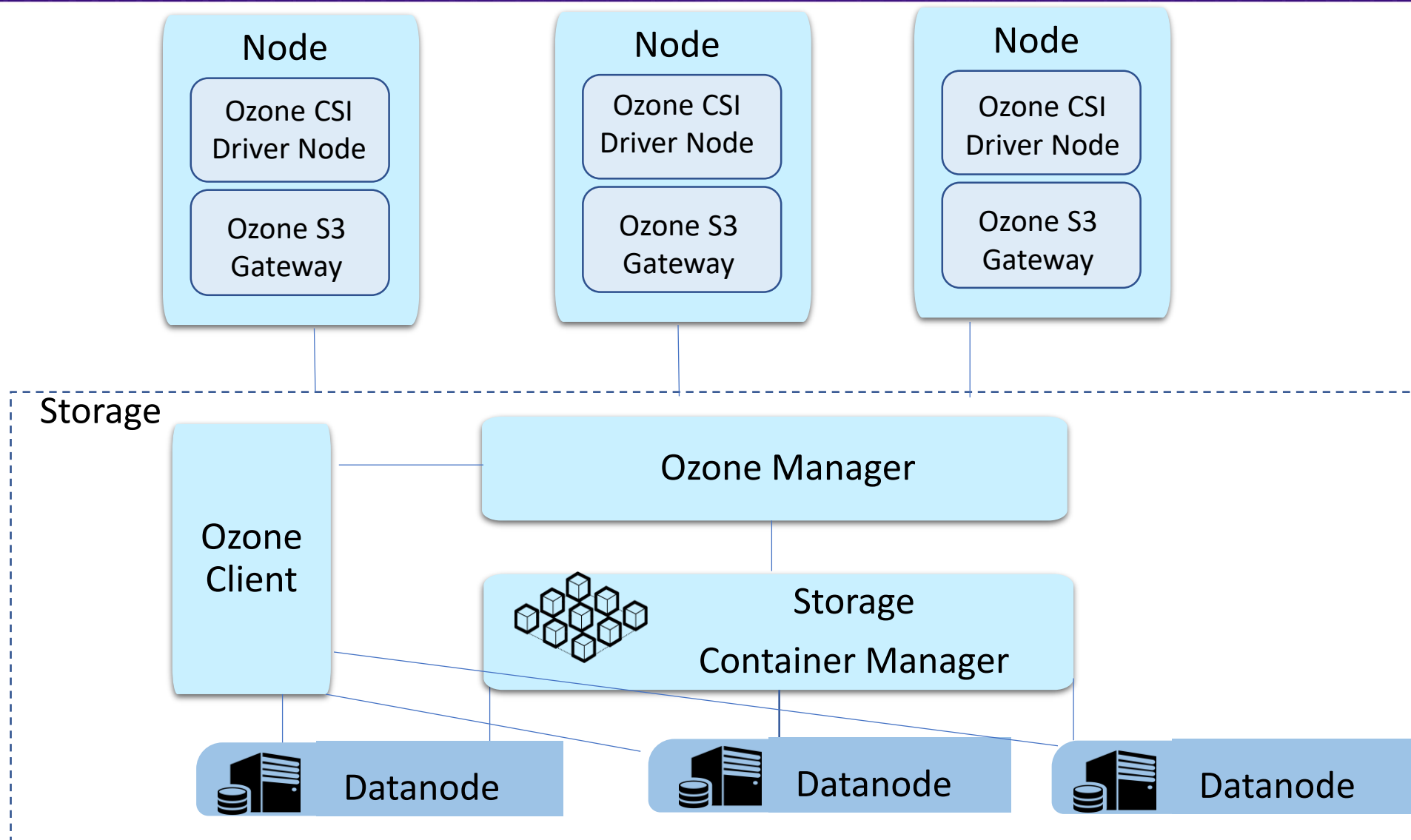


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Resources



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- CSI Spec
 - <https://github.com/container-storage-interface/spec>
- Kubernetes CSI Support
 - <https://kubernetes-csi.github.io/docs/>
- HDFS Ozone
 - <https://hadoop.apache.org/ozone/>