

# Red Hat OpenShift Data Foundation deployment agility

Converged, disaggregated, and decoupled options for scale, sharing, and fault-domain isolation

## Highlights

Architect container-native storage according to your organization's governance needs.

Deploy with speed and agility using Red Hat OpenShift Data Foundation internal mode.

Scale with performance and fault-domain isolation using OpenShift Data Foundation external mode.

Serve multiple OpenShift Container Platform clusters with the same Red Hat Ceph Storage cluster to unify development, test, and production, or honor data governance policies.

Protect your Red Hat Ceph Storage cluster investment by extending its services to Red Hat OpenShift clusters.

Optimize OpenShift Data Foundation performance with Intel® Xeon® Scalable processors, Intel Optane SSDs, and QLC NAND SSDs.

## Addressing Data Foundation agility, resilience, and performance at scale

Cloud-native app developers and data scientists need their data-intensive apps and machine learning (ML) pipelines to work the same wherever they are on the hybrid cloud, without variability in storage services capabilities, resilience, or performance at scale. Red Hat® OpenShift® Container Platform coupled with Red Hat OpenShift Data Foundation provide these workloads with a consistent, container-based operating environment across the hybrid cloud.

## Red Hat OpenShift Data Foundation deployment options

OpenShift Data Foundation now offers solution architects multiple deployment options to address these workload needs. These deployment options (Figure 1) preserve a common, consistent storage services interface to applications and workloads, while each provides different benefits:

- ▶ **Converged internal mode** schedules applications and OpenShift Data Foundation pods on the same nodes in the same Red Hat OpenShift cluster, offering simplified management, deployment speed, and agility.
- ▶ **Disaggregated internal mode** separates application and storage pods on different nodes in the same Red Hat OpenShift cluster, allowing an organization to balance Red Hat OpenShift compute and storage resources independently.
- ▶ **External mode**<sup>1</sup> decouples storage from Red Hat OpenShift clusters, allowing multiple Red Hat OpenShift clusters to consume storage from a single, external Red Hat Ceph® Storage cluster.

OpenShift Data Foundation coupled with the latest Intel Xeon processors and Intel solid state drive (SSD) technology provides a compelling solution to these challenges. OpenShift Data Foundation lets you couple container-based apps running in OpenShift Container Platform with an external Red Hat Ceph® Storage cluster. Building OpenShift Data Foundation internal and external clusters with Intel technologies can enhance performance for data intensive workloads.

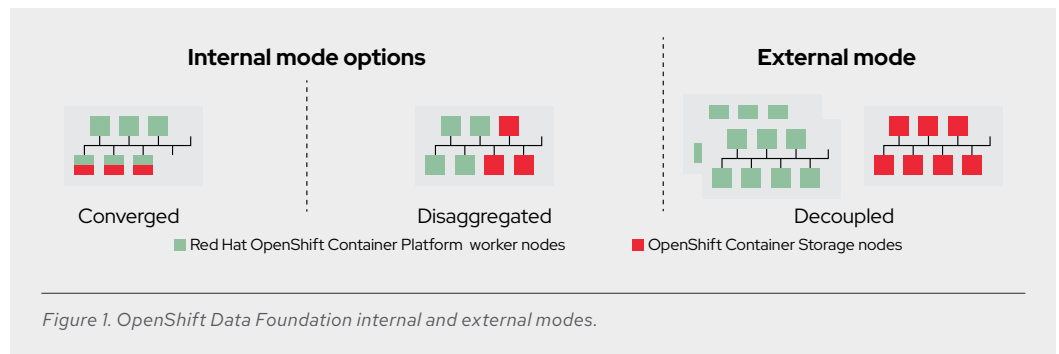


Figure 1. OpenShift Data Foundation internal and external modes.



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<sup>1</sup> External mode is available with Red Hat OpenShift Data Foundation 4.5 or later. See the [OpenShift Data Foundation documentation](#) for more information.

**External mode benefits:**

- Red Hat OpenShift Container Platform can access pre-existing Red Hat Ceph Storage clusters directly, eliminating the need to move data.
- Multiple Red Hat OpenShift clusters can now share the same Red Hat Ceph Storage cluster, supporting different teams or business units.
- Internal and external OpenShift Data Foundation modes can both be tuned and optimized, with external mode offering petabyte scalability for data-intensive apps.
- External mode isolates the storage fault domain to meet governance needs, while offering consistent OpenShift Data Foundation semantics.

**Workload performance results**

Recent Red Hat and Intel testing compared the performance of a PostgreSQL workload running on OpenShift Data Foundation using Intel Xeon Scalable processors with Intel Optane solid state drives (SSDs) and QLC NAND SSDs. Testing employed the same OpenShift Container Platform cluster hardware, configured alternately for OpenShift Data Foundation internal mode and external mode.<sup>2</sup> The PostgreSQL test bench simulated multiple databases being queried by multiple clients for a variety of query types, demonstrating an increase in transactions per second (TPS) for external mode, particularly as the number of Red Hat OpenShift worker nodes and databases were increased (Figure 2).<sup>3</sup>

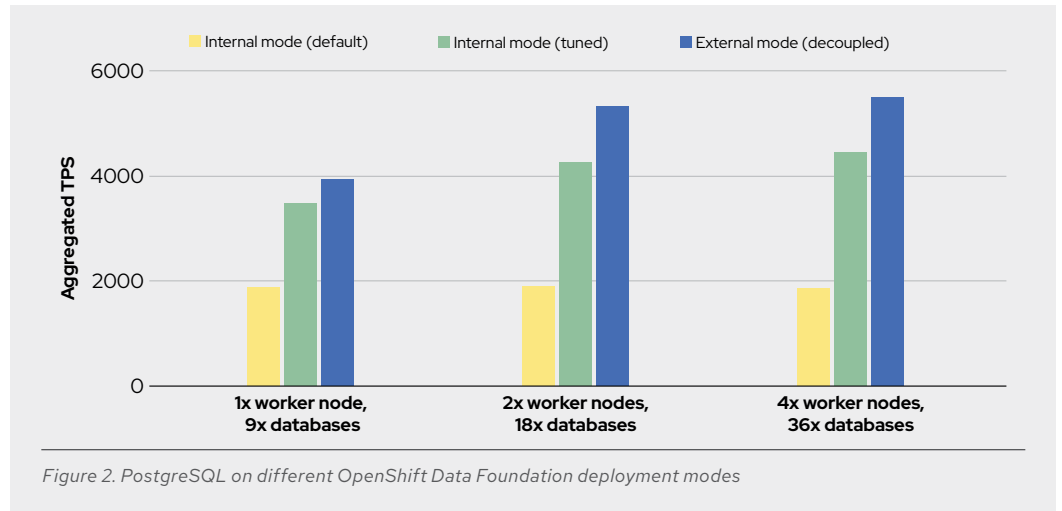


Figure 2. PostgreSQL on different OpenShift Data Foundation deployment modes

<sup>2</sup> The tuned internal-mode configuration allocated additional CPU and memory to OpenShift Data Foundation pods via the Kubernetes CustomResourceDefinition API (CRD) CPU request/limit. CPU and memory allocations were comparable for the tuned internal and external mode configurations.

<sup>3</sup> Red Hat testing of Starburst Enterprise has shown similar external mode scalability.

**Conclusion**

Red Hat OpenShift Data Foundation internal and external deployment modes offer applications a common, consistent interface while addressing a spectrum of different enterprise needs. Workload performance on OpenShift Data Foundation internal and external modes can be comparable, with similar media, CPU, and memory allocation. OpenShift Data Foundation external mode can provide better performance at scale as workloads grow and concurrency increases.

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