

# ROKS vs VCF Storage Performance Comparison

IBM Cloud ROKS (OpenShift Virtualization + ODF) vs VMware VCF (vSAN ESA + NFS Endurance)

ROKS run: perf-20260225-102034 — VCF run: 20260225 (150 GiB results)

**Matched test conditions:** Both platforms were tested with **medium VMs (4 vCPU, 8 GiB RAM)**, **150 GiB disks**, and **60s fio runtime**. Test conditions are matched across platforms — absolute values are directly comparable.

## Test Conditions [-]

### ROKS IBM Cloud ROKS

Platform	OpenShift Virtualization + ODF (Ceph)
Workers	3x bare metal (NVMe-backed ODF)
VM size	medium (4 vCPU, 8 GiB RAM)
Disk size	150 GiB
fio runtime	60s (10s ramp)
I/O depth	32
Threads	4 per job
Direct I/O	Yes (O_DIRECT)

### VCF VMware VCF

Platform	vSAN ESA 8.0.3 + NFS Endurance
Hosts	4x (vSAN cluster)
VM size	medium (4 vCPU, 8 GiB RAM)
Disk size	150 GiB
fio runtime	60s
I/O depth	32
Threads	4 per job
Direct I/O	Yes (O_DIRECT)

## Storage Mapping [-]

Category	ROKS StorageClass	VCF Storage Target	Rationale
Best Replicated	rep2 (2-way RBD)	raid1- <del>ftt1</del> -thick (RAID-1 thick)	Top replicated performer on each platform
Standard Replicated	rep3 (3-way RBD)	raid1- <del>ftt1</del> (RAID-1 thin)	Default replicated tier
Erasure Coded	ec-2-1 (2+1 EC)	raid5- <del>ftt1</del> (RAID-5 (3+1))	Parity-based space-efficient storage
NFS High Tier	bench-pool (Pool CSI, 40k IOPS)	workload-share-j7hfh (10 IOPS/GB Endurance)	Highest NFS tier available
NFS Mid Tier	ibmc-vpc-file-1000-iops (1000 IOPS)	workload-share-3hq5c (4 IOPS/GB Endurance)	Mid-range NFS
NFS Low Tier	ibmc-vpc-file-500-iops (500 IOPS)	workload-share-xlydq (2 IOPS/GB Endurance)	Low-end NFS

## Performance Comparison

ROKS wins VCF wins

### Random 4k IOPS (IOPS)

Category	ROKS	VCF	Delta	Winner
Best Replicated	133,789	81,578	+64.0%	ROKS
Standard Replicated	126,840	80,851	+56.9%	ROKS
Erasure Coded	61,210	69,361	-11.8%	VCF
NFS High Tier	95,095	25,668	+270.5%	ROKS
NFS Mid Tier	3,955	14,745	-73.2%	VCF
NFS Low Tier	1,977	7,671	-74.2%	VCF

### Sequential 1M BW (MiB/s)

Category	ROKS	VCF	Delta	Winner
Best Replicated	12,015	1,230	+877.2%	ROKS
Standard Replicated	11,427	1,223	+834.4%	ROKS
Erasure Coded	1,200	1,688	-28.9%	VCF
NFS High Tier	4,100	2,063	+98.7%	ROKS
NFS Mid Tier	252.9	999.0	-74.7%	VCF
NFS Low Tier	126.8	502.4	-74.8%	VCF

### Mixed 70/30 4k IOPS (IOPS)

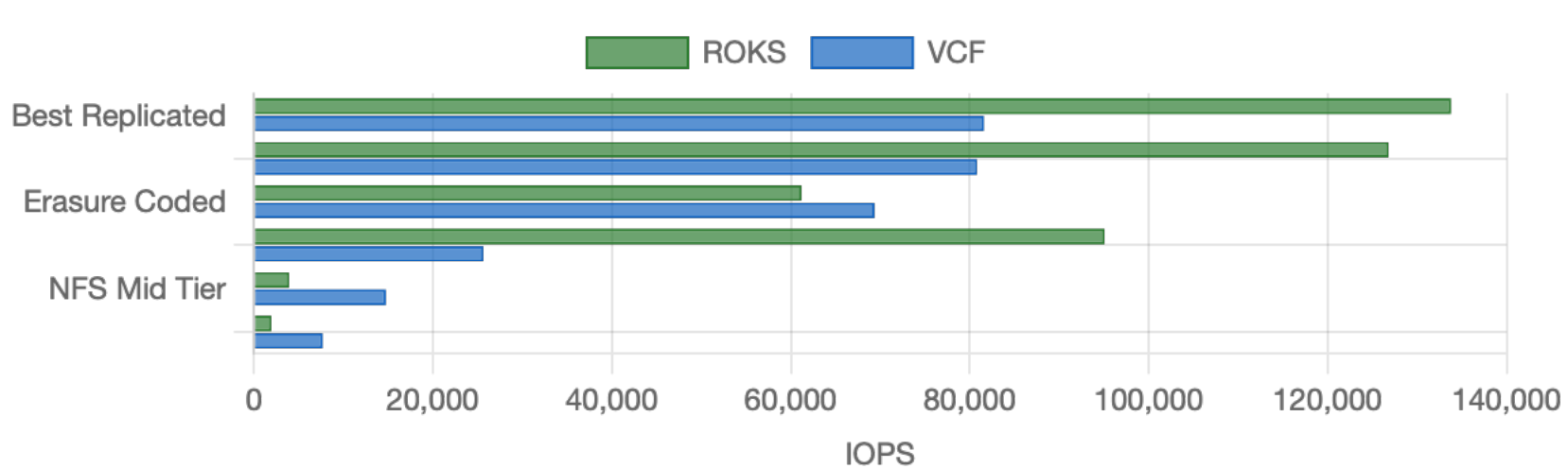
Category	ROKS	VCF	Delta	Winner
Best Replicated	103,316	22,515	+358.9%	ROKS
Standard Replicated	93,705	23,397	+300.5%	ROKS
Erasure Coded	4,016	23,049	-82.6%	VCF
NFS High Tier	60,053	10,963	+447.8%	ROKS
NFS Mid Tier	1,994	8,181	-75.6%	VCF
NFS Low Tier	992.0	4,086	-75.7%	VCF

### Avg p99 Latency (ms) — lower is better

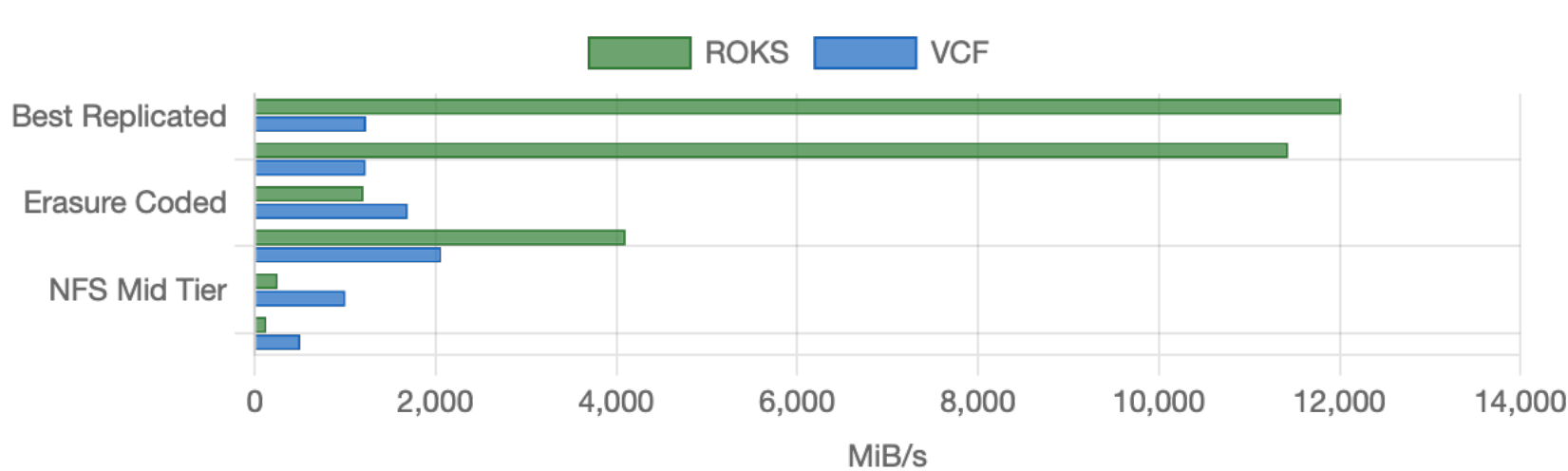
Category	ROKS	VCF	Delta	Winner
Best Replicated	76.7	10.3	+647.8%	VCF
Standard Replicated	84.7	10.3	+726.0%	VCF
Erasure Coded	231.9	13.3	+1639.6%	VCF
NFS High Tier	36.1	15.2	+138.2%	VCF
NFS Mid Tier	80.0	18.4	+333.4%	VCF
NFS Low Tier	174.6	20.9	+736.4%	VCF

## Visual Comparison

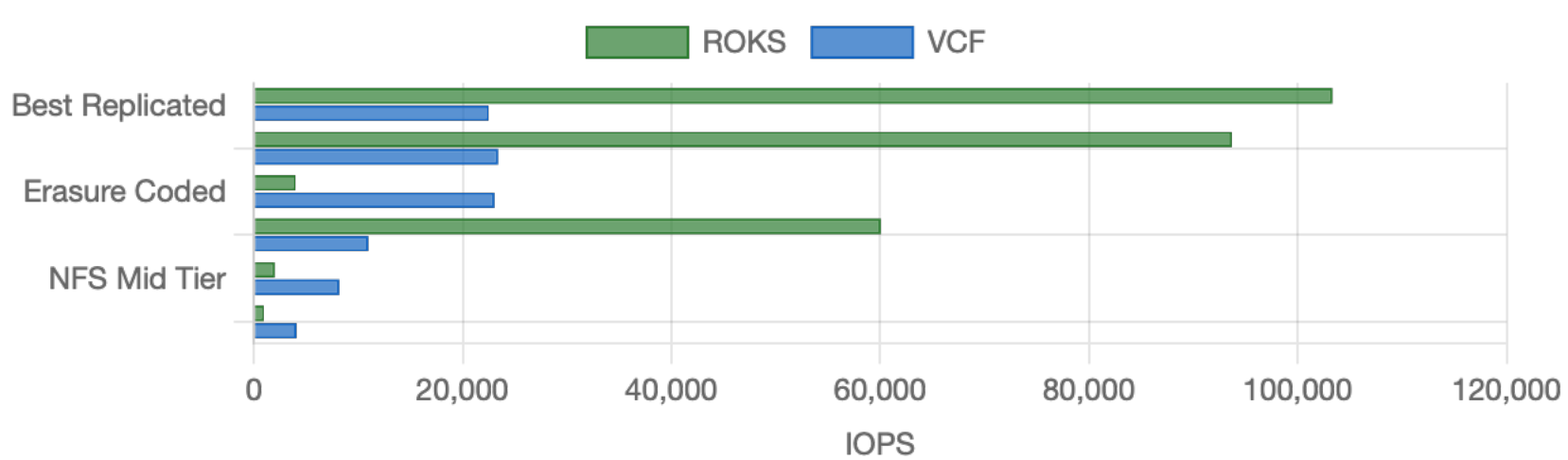
### Random 4k IOPS (IOPS)



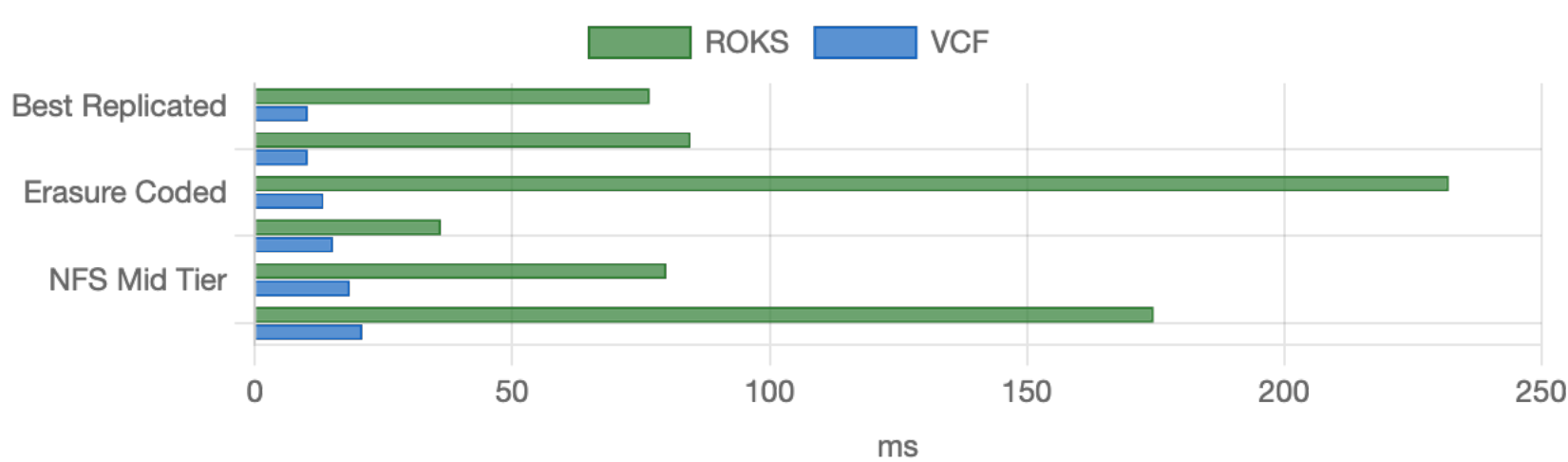
### Sequential 1M BW (MiB/s)



### Mixed 70/30 4k IOPS (IOPS)



### Avg p99 Latency (ms) (lower is better)



## Scorecard Summary

Category	IOPS Winner	Throughput Winner	Latency Winner
Best Replicated	ROKS	ROKS	VCF
Standard Replicated	ROKS	ROKS	VCF
Erasure Coded	VCF	VCF	VCF
NFS High Tier	ROKS	ROKS	VCF
NFS Mid Tier	VCF	VCF	VCF
NFS Low Tier	VCF	VCF	VCF

## Key Takeaways

**ROKS block storage dominates on IOPS and throughput.** The top replicated tiers (rep2, rep3) delivered 1.6x the random IOPS, 4-5x the mixed IOPS, and 8-9x the sequential throughput of their vSAN equivalents. Ceph's distributed striping across NVMe OSDs gives massive bandwidth advantages over vSAN ESA's per-host architecture.

**VCF wins decisively on latency — across every category.** VCF delivered 7-17x lower p99 tail latency than ROKS on block storage, and 2-8x lower on NFS. vSAN ESA's local-SSD architecture means I/O never crosses the network for reads, while Ceph's distributed model adds network round-trips. For latency-sensitive workloads (databases, real-time apps), this is the defining metric.

**VCF thick vs thin: negligible gap at 150 GiB.** At 150 GiB, raid1-~~ftt1~~ (thin) achieved 80,851 random IOPS — within 1% of thick provisioning's 81,578. The dramatic 7.3x gap seen at 50 GiB was a first-write zeroing artifact on fresh thin disks. For production workloads with reasonably sized disks, thin provisioning is not a performance concern on vSAN ESA.

**Erasure coding: VCF leads on mixed and throughput.** VCF RAID-5 delivered 5.7x the mixed IOPS and 1.4x the sequential throughput of ROKS ec-2-1, while ROKS had a slight 11.8% edge on random IOPS. ROKS EC pools are constrained by single-primary PG funneling on small (3-node) clusters; VCF RAID-5 (3+1 across 4 hosts) distributes writes more evenly.

**NFS high tier: ROKS Pool CSI dominates.** The 40,000 IOPS provisioned Pool CSI delivered 3.7x the random IOPS and 2x the throughput of VCF's 10 IOPS/GB Endurance share, achieving near-block-storage performance levels.

**NFS mid/low tiers: VCF Endurance wins across the board.** IBM Cloud File CSI's 500-1000 IOPS tiers are provisioned-IOPS-limited. VCF's Endurance shares at 2-4 IOPS/GB scale with capacity, delivering 3-4x better IOPS and throughput at these tiers.