

USER MANUAL

☀ Status Done

This guide walks you through a complete end-to-end workflow for building, configuring, testing, and operating the AVID-FP Object Store in both 3-of-5 and 4-of-6 modes, with detailed commands and expected results.

Prerequisites

- Docker ≥ 20.10 & Docker Compose (v2+)
- PowerShell (Windows) or bash (Linux/macOS)
- Go ≥ 1.23 (if building locally)
- jq (optional, for JSON inspection)

Repository Structure

```
distributed_object_store/
├── cmd/
│   ├── server/
│   │   └── main.go          # gRPC server endpoint
│   └── client/
│       └── main.go          # CLI client endpoint
├── pkg/
│   ├── config/
│   │   └── config.go        # YAML/ENV/CLI loader
│   ├── erasure/
│   │   └── erasure.go        # Reed-Solomon encode/decode
│   ├── fingerprint/
│   │   └── fingerprint.go    # Homomorphic fingerprint logic
│   ├── protocol/
│   │   ├── protocol.proto    # gRPC definitions
│   │   └── (generated .pb.go/.pb.gw.go)
│   └── storage/
│       ├── atomicfile.go     # AtomicWrite helper
│       └── batcher.go         # BoltDB write-batcher
├── configs/
│   ├── server1.yaml          # Node-specific YAML
│   ├── server2.yaml
│   ├── ...
│   └── server5.yaml          # (or server6.yaml for 4-of-6)
├── deploy/
│   ├── prometheus.yml        # Prometheus scrape config
│   └── grafana-dashboard.json # Grafana dashboard export
├── data-store1/
│   ├── store.db              # Host-mounted volume for node1
│   └── fragments/
│       └── <objectID>/0.bin ... 4.bin
├── data-store2/ ... data-store5/ # Volumes for other nodes
├── Dockerfile                 # Multi-stage Go build → distroless
├── docker-compose.yml         # 5-node cluster + Prometheus + Grafana
├── go.mod
├── go.sum
├── Commands.txt               # End-to-end test script & results
└── README.md                  # Overview & quickstart
```

1. Clean Up Previous State

Ensure no leftover containers, volumes, or files remain from earlier runs:

Stop and remove all Compose services + volumes

`docker compose down -v`

Prune dangling containers & volumes

`docker container prune -f`

`docker volume prune -f`

Remove local fragment directories, binaries, DBs, logs

`Remove-Item -Recurse -Force data* *.bin *.txt -ErrorAction SilentlyContinue`

`Get-ChildItem -Filter 'store-*.db' | Remove-Item -Force -ErrorAction SilentlyContinue`

Kill any local server processes

`Get-Process server -ErrorAction SilentlyContinue | Stop-Process -Force`

`taskkill /IM server.exe /F 2>$null`

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker compose down -v
>>
time="2025-05-07T22:49:43-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute ignored, please remove it to avoid potential confusion"
[+] Running 5/5
  ✓ Volume distributed_object_store_store3 Removed
  ✓ Volume distributed_object_store_store5 Removed
  ✓ Volume distributed_object_store_store4 Removed
  ✓ Volume distributed_object_store_store1 Removed
  ✓ Volume distributed_object_store_store2 Removed
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker container prune -f; docker volume prune -f
>>
Total reclaimed space: 0B
Total reclaimed space: 0B
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> Remove-Item -Recurse -Force data*, *.bin, *.txt -ErrorAction SilentlyContinue
>>
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> Get-ChildItem -Filter 'store-*.db' | Remove-Item -Force -ErrorAction SilentlyContinue
>>
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> Get-Process server -ErrorAction SilentlyContinue | Stop-Process -Force
>>
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> taskkill /IM server.exe /F 2>$null
>>
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store>
```

What this does:

- Tears down any running cluster
- Cleans Docker artifacts
- Wipes on-disk data (fragments, BoltDB files)
- Ensures a pristine environment

2. Build & Deploy 5-Node Cluster (m=3, n=5)

1. **Rebuild images** (picks up any code or config changes)

```

>> docker compose build --pull
C:\Users\dattu\OneDrive\Desktop\distributed_object_store>
time="2025-05-07T23:17:36-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute `version` is obsolete, it will be ignored, please remove it to avoid potential confusion"
Compose now can delegate build to bake for better performances
Just set COMPOSE_BAKE=true
[*] Building 1.0s (16/16) FINISHED
=> [server1 internal] load build definition from Dockerfile
=> => transferring dockerfile: 818B
=> [server1 internal] load metadata for gcr.io/distroless/static:latest
=> [server1 internal] load metadata for docker.io/library/golang:1.23
=> [server1 internal] load .dockerignore
=> => transferring context: 2B
=> [server1 stage-1 1/3] FROM gcr.io/distroless/static:latest@sha256:3d0f463de06b7ddff27684ec3bfd0b54a425149d0f8685308b1fdf297b0265e9
=> => resolve gcr.io/distroless/static:latest@sha256:3d0f463de06b7ddff27684ec3bfd0b54a425149d0f8685308b1fdf297b0265e9
=> [server1 build 1/6] FROM docker.io/library/golang:1.23@sha256:4b1ecd859fb212b81bdee255dcc8d6d045357d564cdb4dc540a9b0f499f4811e
=> => resolve docker.io/library/golang:1.23@sha256:4b1ecd859fb212b81bdee255dcc8d6d045357d564cdb4dc540a9b0f499f4811e
=> [server1 internal] load build context
=> => transferring context: 7.17kB
=> CACHED [server1 build 2/6] WORKDIR /src
=> CACHED [server1 build 3/6] COPY go.* ./
=> CACHED [server1 build 4/6] RUN go mod download
=> CACHED [server1 build 5/6] COPY . .
=> CACHED [server1 build 6/6] RUN CGO_ENABLED=0 go build -o /out/server ./cmd/server && CGO_ENABLED=0 go build -o /out/client ./cmd/client
=> CACHED [server1 stage-1 2/3] COPY --from=build /out/server /bin/server
=> CACHED [server1 stage-1 3/3] COPY --from=build /out/client /bin/client
=> [server1] exporting to image
=> => exporting layers
=> => exporting manifest sha256:a43ce05bf451332682b779afdf23661ce3801fd1cd535406a6a8b2b69b12f5a
=> => exporting config sha256:fd9a6ab6ea08f799a6eac456e69f4d9869f2aa92e306f7aef1718e46c44256
=> => exporting attestation manifest sha256:0e9631a663d81c70659e1309290bd102196ad45173bbefe197025340fd32e60
=> => exporting manifest list sha256:5e63e6c0a6ed38d8d959054511163bcf40f3d79552eb835f47995579dcd316a
=> => naming to docker.io/library/avid-fp-store:latest
=> => unpacking to docker.io/library/avid-fp-store:latest
=> [server1] resolving provenance for metadata file
[*] Building 1/1
✓ server1 Built

```

2. Start cluster + monitoring

```

[*] Building 1/1
>> docker compose up -d
C:\Users\dattu\OneDrive\Desktop\distributed_object_store>
time="2025-05-07T23:19:12-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute `version` is obsolete, it will be ignored, please remove it to avoid potential confusion"
[*] Running 13/13
✓ Network distributed_object_store_store Created
✓ Volume "distributed_object_store_store5" Created
✓ Volume "distributed_object_store_store1" Created
✓ Volume "distributed_object_store_store2" Created
✓ Volume "distributed_object_store_store3" Created
✓ Volume "distributed_object_store_store4" Created
✓ Container distributed_object_store-server3-1 Started
✓ Container distributed_object_store-prometheus-1 Started
✓ Container distributed_object_store-server4-1 Started
✓ Container distributed_object_store-grafana-1 Started
✓ Container distributed_object_store-server1-1 Started
✓ Container distributed_object_store-server5-1 Started
✓ Container distributed_object_store-server2-1 Started
time="2025-05-07T23:19:13-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute `version` is obsolete, it will be ignored, please remove it to avoid potential confusion"
NAME IMAGE COMMAND SERVICE CREATED STATUS PORTS
distributed_object_store-grafana-1 grafana/grafana:10.2.4 "/run.sh" grafana 2 seconds ago Up Less than a second 0.0.0.0:3000->3000/tcp
distributed_object_store-prometheus-1 prom/prometheus:v2.52.0 "/bin/prometheus --c..." prometheus 2 seconds ago Up Less than a second 0.0.0.0:9090->9090/tcp
distributed_object_store-server1-1 avid-fp-store:latest "/bin/server -config..." server1 2 seconds ago Up Less than a second 0.0.0.0:9102->9102/tcp, 0.0.0.0:50051->50051/tcp
distributed_object_store-server2-1 avid-fp-store:latest "/bin/server -config..." server2 2 seconds ago Up Less than a second 0.0.0.0:9103->9103/tcp, 0.0.0.0:50052->50052/tcp
distributed_object_store-server3-1 avid-fp-store:latest "/bin/server -config..." server3 2 seconds ago Up Less than a second 0.0.0.0:9104->9104/tcp, 0.0.0.0:50053->50053/tcp
distributed_object_store-server4-1 avid-fp-store:latest "/bin/server -config..." server4 2 seconds ago Up Less than a second 0.0.0.0:9105->9105/tcp, 0.0.0.0:50054->50054/tcp
distributed_object_store-server5-1 avid-fp-store:latest "/bin/server -config..." server5 2 seconds ago Up Less than a second 0.0.0.0:9106->9106/tcp, 0.0.0.0:50055->50055/tcp

```

You should see seven containers:

- **server1, ..., server5** (Up)
- **prometheus** (Up)
- **grafana** (Up)

3. 3-of-5 Happy-Path Write & Read

1. Parameters:

\$P = "server1:50051,server2:50052,server3:50053,server4:50054,server5:50055"
\$m = 3; \$n = 5

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> $P = "server1:50051,server2:50052,server3:50053,server4:50054,server5:50055"
>> $m = 3; $n = 5
```

2. Prepare input

"Happy-path demo \$(Get-Date)" | Set-Content demo.txt
docker compose cp demo.txt server1:/demo.txt

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> "Happy-path demo $(Get-Date)" | Set-Content demo.txt
>> docker compose cp demo.txt server1:/demo.txt
```

3. Disperse (write)

docker compose exec server1 /bin/client \
-mode disperse \
-file /demo.txt \
-id demo-3of5 \
-peers \$P \
-m \$m -n \$n

- Expected output: "Shard 1/5 dispersed ... Disperse complete for 'demo-3of5'"

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker compose exec server1 /bin/client `
>> -mode disperse `
>> -file /demo.txt `
>> -id demo1 `
>> -peers $P `
>> -m 3 -n 5
time="2025-05-08T00:50:13-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute `version` is obsolete, it will b
e ignored, please remove it to avoid potential confusion"
Shard 1/5 dispersed
Shard 2/5 dispersed
Shard 3/5 dispersed
Shard 4/5 dispersed
Shard 5/5 dispersed
Disperse complete for "demo1"
```

4. Retrieve (read)

docker compose exec server2 /bin/client \
-mode retrieve \
-file ok.txt \
-id demo-3of5 \
-peers \$P \
-m \$m -n \$n

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker compose exec server2 /bin/client `
>> -mode retrieve `
>> -file /demo_out.txt `
>> -id demo1 `
>> -peers $P `
>> -m 3 -n 5
time="2025-05-08T00:50:31-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute `version` is obsolete, it will b
e ignored, please remove it to avoid potential confusion"
Retrieved "demo1" -> "/demo_out.txt"
```

5. Verify integrity

Compare-Object (Get-Content demo.txt) (Get-Content ok.txt)

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> Compare-Object (Get-Content demo.txt) (Get-Content ok.txt)
>>
```

No differences → happy-path successful.

4. 3-of-5 Availability Test ($\leq f=2$ Faults)

1. Simulate two node failures

docker compose stop server2 server4

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker compose stop server2 server4
>>
time="2025-05-08T00:51:09-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute 'version' is obsolete, it will be ignored, please remove it to avoid potential confusion"
[+] Stopping 2/2
 ✓ Container distributed_object_store-server4-1 Stopped 1.3s
 ✓ Container distributed_object_store-server2-1 Stopped 1.5s
```

2. docker compose exec server3 /bin/client \

```
-mode retrieve \
-file avail.txt \
-id demo-3of5 \
-peers $P \
-m $m -n $n
```

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker compose exec server1 /bin/client `
>> -mode retrieve `
>> -file /avail.txt `
>> -id demo1 `
>> -peers $P2 `
>> -m 3 -n 5
time="2025-05-08T00:51:34-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute 'version' is obsolete, it will be ignored, please remove it to avoid potential confusion"
Retrieved "demo1" → "/avail.txt"
```

3. Verify

Compare-Object (Get-Content demo.txt) (Get-Content avail.txt)

- Still matches → availability under 2 faults holds.

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> Compare-Object (Get-Content demo.txt) (Get-Content avail.txt)
>>
```

4. Restore nodes

docker compose start server2 server4

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker start distributed_object_store-server2-1 distributed_object_store-server4-1
>>
```

5. 3-of-5 Integrity-Failure Test (> f shards corrupted)

1. Prepare New Object

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> "Phase-2 demo $(Get-Date)" | Set-Content demoB.txt
>>
```

2. Disperse New Object

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker start distributed_object_store-server2-1 distributed_object_store-server4-1
>>
distributed_object_store-server2-1
distributed_object_store-server4-1
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> "Phase-2 demo $(Get-Date)" | Set-Content demoB.txt
>>
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> .\bin\client.exe -mode disperse -file demoB.txt -id demoB -peers $P
>>
Shard 1/5 dispersed
Shard 2/5 dispersed
Shard 3/5 dispersed
Shard 4/5 dispersed
Shard 5/5 dispersed
Disperse complete for "demoB"
```

3. Corrupt f+1 = 3 shards on nodes 1-3

```
foreach ($idx in 0,1,2) {
    foreach ($s in 1,2,3) {
        $ctr = "distributed_object_store-server${s}-1"
        $rem = "/data/data-5005${s}/demoB/${idx}.bin"
        $tmp = "tmp_${idx}_${s}.bin"

        docker cp "$($ctr):$rem" $tmp
        $bytes = [IO.File]::ReadAllBytes($tmp)
        $bytes[0] = $bytes[0] -bxor 0xFF # flip first byte
        [IO.File]::WriteAllBytes($tmp,$bytes)
        docker cp $tmp "$($ctr):$rem"
        Remove-Item $tmp
    }
}
```

```
Successfully copied 2.05kB to C:\Users\dattu\OneDrive\Desktop\distributed_object_store\tmp_0_1.bin
Successfully copied 2.05kB to distributed_object_store-server1-1:/data/data-50051/demoB/0.bin
Successfully copied 2.05kB to C:\Users\dattu\OneDrive\Desktop\distributed_object_store\tmp_0_2.bin
Successfully copied 2.05kB to distributed_object_store-server2-1:/data/data-50052/demoB/0.bin
Successfully copied 2.05kB to C:\Users\dattu\OneDrive\Desktop\distributed_object_store\tmp_0_3.bin
Successfully copied 2.05kB to distributed_object_store-server3-1:/data/data-50053/demoB/0.bin
Successfully copied 2.05kB to C:\Users\dattu\OneDrive\Desktop\distributed_object_store\tmp_1_1.bin
Successfully copied 2.05kB to distributed_object_store-server1-1:/data/data-50051/demoB/1.bin
Successfully copied 2.05kB to C:\Users\dattu\OneDrive\Desktop\distributed_object_store\tmp_1_2.bin
Successfully copied 2.05kB to distributed_object_store-server2-1:/data/data-50052/demoB/1.bin
Successfully copied 2.05kB to C:\Users\dattu\OneDrive\Desktop\distributed_object_store\tmp_1_3.bin
Successfully copied 2.05kB to distributed_object_store-server3-1:/data/data-50053/demoB/1.bin
Successfully copied 2.05kB to C:\Users\dattu\OneDrive\Desktop\distributed_object_store\tmp_2_1.bin
Successfully copied 2.05kB to distributed_object_store-server1-1:/data/data-50051/demoB/2.bin
Successfully copied 2.05kB to C:\Users\dattu\OneDrive\Desktop\distributed_object_store\tmp_2_2.bin
Successfully copied 2.05kB to distributed_object_store-server2-1:/data/data-50052/demoB/2.bin
Successfully copied 2.05kB to C:\Users\dattu\OneDrive\Desktop\distributed_object_store\tmp_2_3.bin
Successfully copied 2.05kB to distributed_object_store-server3-1:/data/data-50053/demoB/2.bin
```

4. Simulate two more faults

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker kill distributed_object_store-server4-1 distributed_object_store-server5-1
>>
distributed_object_store-server4-1
distributed_object_store-server5-1
```

5. Attempt retrieve (should fail)

Expected error: "cannot decode"

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> .\bin\client.exe `
>> -mode retrieve `
>> -file hacked.txt `
>> -id demoB `
>> -peers "localhost:50051,localhost:50052,localhost:50053"
>> # Expect: "only 2/3 good shards; cannot decode" (integrity enforced)
2025/05/01 14:31:53 failed to retrieve a valid shard-0 from any peer
```

6. Build & Deploy 6-Node Cluster (m=4, n=6)

Adjust `configs/server*.yaml`:

erasure:

data: 4

total: 6

Add server6.yaml with ports 50056/9107.

```
! server6.yaml U X
configs > ! server6.yaml
1 cluster:
2   peers:
3     [
4       "server1:50051",
5       "server2:50052",
6       "server3:50053",
7       "server4:50054",
8       "server5:50055",
9       "server6:50056",
10    ]
11   self: "server6:50056"
12
13 erasure:
14   data: 4
15   total: 6
16
17 object:
18   ttl: "24h"
19
20 storage:
21   datadir: "/data/fragments"
22   db: "/data/store.db"
23
24 server:
25   grpc_port: 50056
26   metrics_port: 9107
27
```

docker compose down -v

docker compose build --pull

docker compose up -d

docker compose ps

Verify **server1-server6**, **prometheus**, **grafana** are all **Up**.


```

=> [server1 internal] load build context                                0.1s
=> => transferring context: 7.21kB                                     0.0s
=> CACHED [server1 build 2/6] WORKDIR /src                             0.0s
=> CACHED [server1 build 3/6] COPY go.* ./                             0.0s
=> CACHED [server1 build 4/6] RUN go mod download                      0.0s
=> CACHED [server1 build 5/6] COPY . .                                0.0s
=> CACHED [server1 build 6/6] RUN CGO_ENABLED=0 go build -o /out/server ./cmd/server && CGO_ENABLED=0 go build -o /out/client ./cmd/client 0.0s
=> CACHED [server1 stage-1 2/3] COPY --from=build /out/server /bin/server 0.0s
=> CACHED [server1 stage-1 3/3] COPY --from=build /out/client /bin/client 0.0s
=> [server1] exporting to image                                       0.2s
=> => exporting layers                                                0.0s
=> => exporting manifest sha256:a43ce05bf451332682b779afdf23661ce3801fd1cd535406a6a8b2b69b12f5a 0.0s
=> => exporting config sha256:fb9a6ab6ea08f879a6eac456e69f4d9869f2aa92e306f7aeaf1718e46c44256 0.0s
=> => exporting attestation manifest sha256:e64be22c9cee10b10a88f8821e858cf24c7a865d6b2cc2bc1b0b1bbf732bc9a4 0.1s
=> => exporting manifest list sha256:c977761441b39d547424e9cde0543fac8cafbd8c72418181cd363af400704e 0.0s
=> => naming to docker.io/library/avid-fp-store:latest              0.0s
=> => unpacking to docker.io/library/avid-fp-store:latest          0.0s
=> [server1] resolving provenance for metadata file                  0.0s
[+] Building 1/1                                                    0.0s
✓ server1 Built
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker compose up -d
>>
time="2025-05-08T02:33:23-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute 'version' is obsolete, it will be ignored, please remove it to avoid potential confusion"
[+] Running 15/15
✓ Network distributed_object_store_store Created 0.0s
✓ Volume "distributed_object_store_store5" Created 0.0s
✓ Volume "distributed_object_store_store6" Created 0.0s
✓ Volume "distributed_object_store_store1" Created 0.0s
✓ Volume "distributed_object_store_store2" Created 0.0s
✓ Volume "distributed_object_store_store3" Created 0.0s
✓ Volume "distributed_object_store_store4" Created 0.0s
✓ Container distributed_object_store-server3-1 Started 1.5s
✓ Container distributed_object_store-grafana-1 Started 1.2s
✓ Container distributed_object_store-server2-1 Started 1.5s
✓ Container distributed_object_store-server6-1 Started 1.6s
✓ Container distributed_object_store-prometheus-1 Started 1.6s
✓ Container distributed_object_store-server5-1 Started 1.7s
✓ Container distributed_object_store-server1-1 Started 1.6s
✓ Container distributed_object_store-server4-1 Started 1.5s

```

7. 4-of-6 Happy-Path Write & Read

\$P6 =

"server1:50051,server2:50052,server3:50053,server4:50054,server5:50055,server6:50056"

\$m = 4; \$n = 6

1. Prepare input

"4-of-6 demo \$(Get-Date)" | Set-Content demo46.txt

docker compose cp demo46.txt server1:/demo46.txt

```

PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> "4-of-6 demo $(Get-Date)" | Set-Content demo46.txt
>> docker compose cp demo46.txt server1:/demo46.txt
>>

```

2. Disperse

docker compose exec server1 /bin/client \

-mode disperse \

-file /demo46.txt \

-id demo-4of6 \

-peers \$P6 \

-m \$m -n \$n

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker compose exec server1 /bin/client `
>> -mode disperse `
>> -file /demo46.txt `
>> -id demo46 `
>> -peers server1:50051,server2:50052,server3:50053,server4:50054,server5:50055,server6:50056 `
>> -m 4 `
>> -n 6
time="2025-05-08T02:34:42-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute 'version' is obsolete, it will b
e ignored, please remove it to avoid potential confusion"
Shard 1/6 dispersed
Shard 2/6 dispersed
Shard 3/6 dispersed
Shard 4/6 dispersed
Shard 5/6 dispersed
Shard 6/6 dispersed
Disperse complete for "demo46"
```

3. Simulate 2 failures (f = 2)

docker compose stop server5 server6

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker compose stop server5 server6
>>
time="2025-05-08T02:35:22-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute 'version' is obsolete, it will b
e ignored, please remove it to avoid potential confusion"
e ignored, please remove it to avoid potential confusion"
[+] Stopping 2/2
  ✓ Container distributed_object_store-server6-1 Stopped 1.4s
[+] Stopping 2/2
  ✓ Container distributed_object_store-server6-1 Stopped 1.4s
  ✓ Container distributed_object_store-server5-1 Stopped 1.3s
  ✓ Container distributed_object_store-server5-1 Stopped 1.3s
```

4. Retrieve

```
docker compose exec server2 /bin/client \
-mode retrieve \
-file demo46_out.txt \
-id demo-4of6 \
-peers $P6 \
-m $m -n $n
```

```
>> docker compose exec server2 /bin/client -mode retrieve -file demo46_out.txt -id demo46 -peers $P6 -m 4 -n 6
>>
time="2025-05-08T02:35:51-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute 'version' is obsolete, it will b
e ignored, please remove it to avoid potential confusion"
Retrieved "demo46" → "demo46_out.txt"
```

5. Verify

Compare-Object (Get-Content demo46.txt) (Get-Content demo46_out.txt)

```
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> Compare-Object (Get-Content demo46.txt) (Get-Content demo46_out.txt)
```

8. Metrics & Monitoring Validation

1. List scrape targets

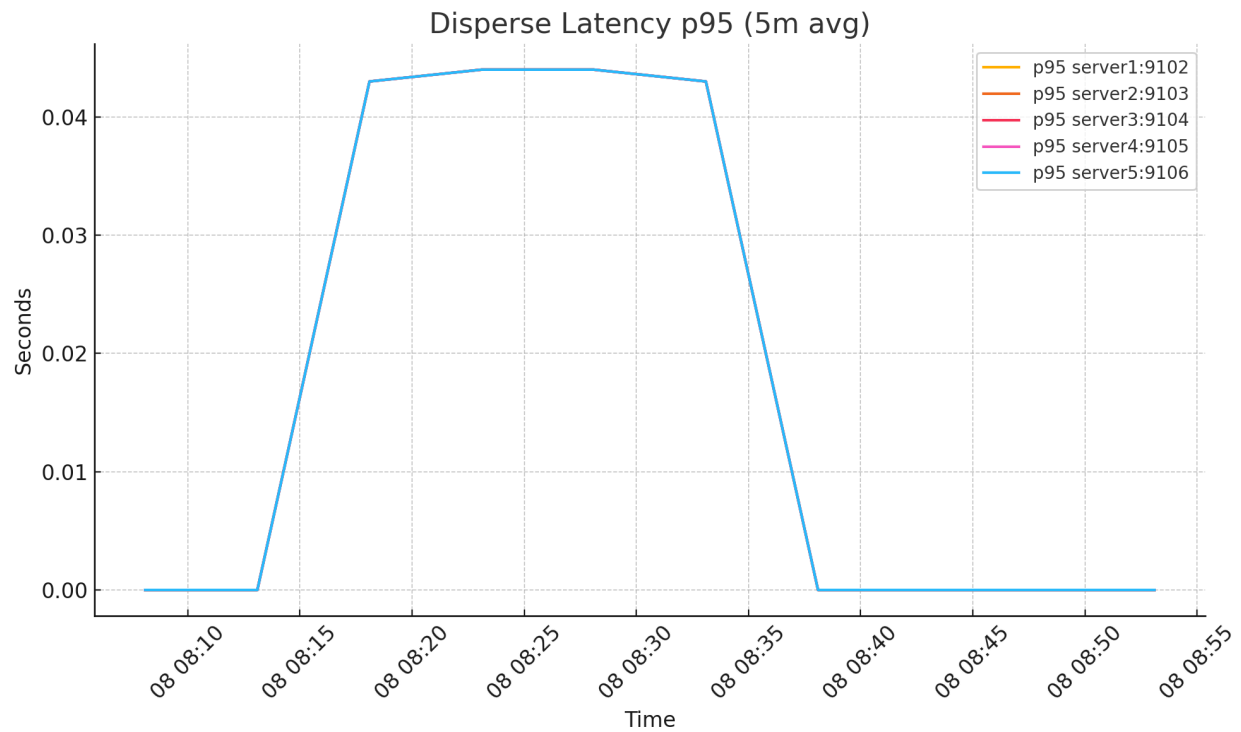
curl <http://localhost:9090/api/v1/targets> | jq '.data.activeTargets[] | {job,labels}'

2. Query disperse rate

curl 'http://localhost:9090/api/v1/query?query=rate(avid_fp_disperse_total[5m])'

3. Grafana:

- Import `deploy/grafana-dashboard.json`
- View write QPS, latency, failure rates



```

time="2025-05-08T03:01:49-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute 'version' is obsolete, it will be ignored, please remove it to avoid potential confusion"
Shard 1/5 dispersed
Shard 2/5 dispersed
Shard 3/5 dispersed
Shard 4/5 dispersed
Shard 5/5 dispersed
Disperse complete for "ping-test"
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> (Invoke-RestMethod `
>> -Uri "http://localhost:9090/api/v1/query?query=rate(avid_fp_disperse_total[5m])" `
>> ).data.result |
>> Select-Object metric,value
>>
metric                                value
-----
@{instance=server4:9105; job=avid-fp-store} {1746691317.042, 0.01678791207052799}
@{instance=server3:9104; job=avid-fp-store} {1746691317.042, 0.01676271381790816}
@{instance=server2:9103; job=avid-fp-store} {1746691317.042, 0.016735877348502057}
@{instance=server1:9102; job=avid-fp-store} {1746691317.042, 0.016936334082503654}
@{instance=server5:9106; job=avid-fp-store} {1746691317.042, 0.016898367079896812}

PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> (Invoke-RestMethod `
>> -Uri "http://localhost:9090/api/v1/query?query=histogram_quantile(0.95, rate(avid_fp_disperse_duration_seconds_bucket[5m]))" `
>> ).data.result |
>> Select-Object metric,value
>>
metric                                value
-----
@{instance=server3:9104; job=avid-fp-store} {1746691336.078, 0.04374999999999999}
@{instance=server2:9103; job=avid-fp-store} {1746691336.078, 0.04374999999999998}
@{instance=server1:9102; job=avid-fp-store} {1746691336.078, 0.043750000000000004}
@{instance=server5:9106; job=avid-fp-store} {1746691336.078, 0.04374999999999998}
@{instance=server4:9105; job=avid-fp-store} {1746691336.078, 0.04374999999999998}

```

9. Snapshot & GC Test

1. Take on-demand snapshot

```

docker compose exec server1 /bin/server \
-config /etc/avid/config.yaml \
-snapshot /snapshots
docker compose exec server1 ls /snapshots

```

```

PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker compose exec server1 /bin/server `
>> -config /etc/avid/config.yaml `
>> -snapshot /snapshots
>>
time="2025-05-08T04:28:02-05:00" level=warning msg="C:\\Users\\dattu\\OneDrive\\Desktop\\distributed_object_store\\docker-compose.yml: the attribute 'version' is obsolete, it will be ignored, please remove it to avoid potential confusion"
2025/05/08 09:28:02 snapshot created at /snapshots/20250508-092802

```

```

PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> Get-ChildItem .\snapshots_host -Recurse
>>

Directory: C:\Users\dattu\OneDrive\Desktop\distributed_object_store\snapshots_host

Mode                LastWriteTime         Length Name
----                -
dar--l             5/8/2025   4:31 AM             20250508-092802
d-----             5/8/2025   4:28 AM             snapshots

Directory: C:\Users\dattu\OneDrive\Desktop\distributed_object_store\snapshots_host\20250508-092802

Mode                LastWriteTime         Length Name
----                -
dar--l             5/8/2025   4:31 AM             demo46
dar--l             5/8/2025   4:31 AM             ping-test
-a---l             5/8/2025   4:28 AM          65536 store.db

Directory: C:\Users\dattu\OneDrive\Desktop\distributed_object_store\snapshots_host\20250508-092802\demo46

Mode                LastWriteTime         Length Name
----                -
-a---l             5/8/2025   4:28 AM             9 0.bin
-a---l             5/8/2025   4:28 AM             9 1.bin
-a---l             5/8/2025   4:28 AM             9 2.bin
-a---l             5/8/2025   4:28 AM             9 3.bin
-a---l             5/8/2025   4:28 AM             9 4.bin
-a---l             5/8/2025   4:28 AM             9 5.bin

```

2. Test TTL-based GC

- In `configs/server1.yaml` , set `object.ttl: 1s`

```

1  cluster:
2    peers:
3      [
4        "server1:50051",
5        "server2:50052",
6        "server3:50053",
7        "server4:50054",
8        "server5:50055",
9        "server6:50056",
10     ]
11    self: "server1:50051"
12
13  erasure:
14    data: 4 # m
15    total: 6 # n
16
17  object:
18    ttl: "1s"
19
20  storage:
21    datadir: "/data/fragments"
22    db: "/data/store.db"
23
24  server:
25    grpc_port: 50051
26    metrics_port: 9102
27

```

- Restart node, disperse small file
- Wait > 2 s, then:

```

PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> "gc-test $(Get-Date)" | Set-Content gc.txt
>>
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker compose cp gc.txt server1:/gc.txt
>>
time="2025-05-08T04:37:12-05:00" level=warning msg="C:\Users\dattu\OneDrive\Desktop\distributed_object_store\docker-compose.yml: the attribute `version` is obsolete, it will be ignored, please remove it to avoid potential confusion"
[+] Copying 1/1
✓ distributed_object_store-server1-1 copy gc.txt to distributed_object_store-server1-1:/gc.txt Copied 0.0s
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> $P = "server1:50051,server2:50052,server3:50053,server4:50054,server5:50055"
>>
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker compose exec server1 /bin/client `
>> -mode disperse `
>> -file /gc.txt `
>> -id gc-test `
>> -peers $P -m 3 -n 5
time="2025-05-08T04:37:28-05:00" level=warning msg="C:\Users\dattu\OneDrive\Desktop\distributed_object_store\docker-compose.yml: the attribute `version` is obsolete, it will be ignored, please remove it to avoid potential confusion"
Shard 1/5 dispersed
Shard 2/5 dispersed
Shard 3/5 dispersed
Shard 4/5 dispersed
Shard 5/5 dispersed
Disperse complete for "gc-test"
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> Start-Sleep -Seconds 3
>>

```

docker compose exec server1 ls /data/fragments

```

PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker cp "${cid}:/data/fragments" .\fragments_after_gc
>> Get-ChildItem .\fragments_after_gc -Recurse
>>
Successfully copied 1.54kB to C:\Users\dattu\OneDrive\Desktop\distributed_object_store\fragments_after_gc
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> $cid = (docker compose ps -q server1).Trim()
>>
time="2025-05-08T04:39:01-05:00" level=warning msg="C:\Users\dattu\OneDrive\Desktop\distributed_object_store\docker-compose.yml: the attribute 'version' is obsolete, it will b
e ignored, please remove it to avoid potential confusion"
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker kill --signal=USR1 $cid
>>
621e407fdd8a6ac7c7ald5c04a9a15ceflafc612f361dcd15b6b42b71b96f463
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> docker cp "${cid}:/data/fragments" .\fragments_after_gc
>>
Successfully copied 1.54kB to C:\Users\dattu\OneDrive\Desktop\distributed_object_store\fragments_after_gc
PS C:\Users\dattu\OneDrive\Desktop\distributed_object_store> Get-ChildItem .\fragments_after_gc -Recurse
>>

Directory: C:\Users\dattu\OneDrive\Desktop\distributed_object_store\fragments_after_gc

Mode                LastWriteTime         Length Name
----                -
d-----          5/8/2025   4:37 AM             fragments

```

- Expired object directory should be gone

10.Environment-Variable Overrides

docker compose down -v

docker compose up -d

On server1 only:

docker compose exec server1 bash -lc '

export AVID_FP_ERASURE_DATA=2

export AVID_FP_ERASURE_TOTAL=4

exec /bin/server -config /etc/avid/config.yaml

,

Then test a 2-of-4 write/read:

docker compose cp demo.txt server1:/demo.txt

docker compose exec server1 /bin/client

`-mode disperse -file /demo.txt -id demo-2of4`

-peers "server1:50051,server2:50052,server3:50053,server4:50054" -m 2 -n 4

docker compose exec server2 /bin/client `-mode retrieve -file ok2.txt -id demo-2of4`

-peers "server1:50051,server2:50052,server3:50053,server4:50054" -m 2 -n 4

11. Final Tear-Down

docker compose down -v

docker container prune -f volume prune -f

Remove-Item -Recurse -Force data* *.bin

.txt store-.db -ErrorAction SilentlyContinue

-END-
