
Achieve up to 80% better throughput and increase storage efficiency with the Dell PowerMax 8500

The science behind the report:

Achieve up to 80% better throughput and increase storage efficiency with the Dell PowerMax 8500

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report Achieve up to 80% better throughput and increase storage efficiency with the Dell PowerMax 8500.

We concluded our hands-on testing on June 30, 2022. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on May 25, 2022 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

To learn more about how we have calculated the wins in this report, go to http://facts.pt/calculating-and-highlighting-wins. Unless we state otherwise, we have followed the rules and principles we outline in that document.

Table 2: Results of our testing.

	Dell™ PowerMax™ 8500 solution	Vendor E solution
Storage capacity		
Storage capacity needed for 62.5 TB of data (TB)	11.17	16.34
Simulated online transaction processing (OLTP) workload		
Maximum input/output operations per second (IOPS)	325,946	185,492
Latency (milliseconds)	0.593	1.089
Simulated data extraction workload		
Throughput (MB/s)	16,943	9,388
Latency (milliseconds)	0.659	1.011
Storage snapshots		
Average latency while taking snapshot (milliseconds)	0.271	4.837

System configuration information

Table 3: Detailed information on the systems we used.

System configuration information	4x Dell PowerEdge™ R740
BIOS name and version	Dell PowerEdge R740 2.7.7
Non-default BIOS settings	N/A
Operating system name and version/build number	Oracle® Enterprise Linux® 8.5
Date of last OS updates/patches applied	04/07/2022
System Profile Settings	Performance
Processor	
Number of processors	2
Vendor and model	Intel® Xeon® Gold 6226R
Core count (per processor)	16
Core frequency (GHz)	2.90
Memory module(s)	
Total memory in system (GB)	256
Number of memory modules	8
Vendor and model	Hynix HMA84GR7JJR4N-WM
Size (GB)	32
Type	DDR4 DIMM
Speed (MHz)	2,933
Speed running in the server (MHz)	2,933
Storage controller	
Vendor and model	Dell PERC H330
Cache size (GB)	0
Firmware version	25.5.6.0009
Local storage	
Number of drives	2
Drive vendor and model	Intel SSDSC2KB480G8R
Drive size (GB)	480
Drive information (speed, interface, type)	6Gbps, M.2, SSD

System configuration information	4x Dell PowerEdge™ R740
Network adapter	
Vendor and model	Broadcom Gigabit Ethernet BCM5720
Number and type of ports	2x 1Gb 2x 10Gb
Driver version	21.60.8
Network adapter	
Vendor and model	Emulex LPe35002-M2-D
Number and type of ports	Two-port 32Gb Fibre Channel
Firmware version	03.02.18
Power supplies	
Vendor and model	Dell 0PJMDNA02
Number of power supplies	2
Wattage of each (W)	750

Table 4: Detailed information on the storage arrays we tested.

System configuration information	Dell PowerMax 8500	Vendor E
Software version	6079.94.0	Latest version as of May 25, 2022
Number of storage shelves	2	2
Total number of drives	32	32
Drive size (TB)	2.9	2.9

How we tested

Detailed testing procedure

During our testing, both the Dell PowerMax 8500 array and the Vendor E array were located in an offsite data center lab. We performed all testing remotely after traveling to the lab to inspect the server clients, the network implementation, and the storage arrays. During testing, we had full control over and unfettered access to the testbeds. We used the same four load-generation servers for both testbeds, rezoning the Fibre Channel switch when switching testing from one storage array to the other. Each testbed had a total of four Dell PowerEdge R740 servers running Oracle Enterprise Linux 8.5 and four dual-port 32 Gb Emulex Fibre Channel adapters.

We verified that both testbeds were identical where possible, and we configured them as closely as possible where an identical configuration wasn't achievable. For example, we configured both storage arrays with RAID 5, but the PowerMax configuration was RAID 5 (4+1) and the Vendor E configuration was RAID 5 (7+1). Each array used 32 disks.

After completing the verification process, we moved into phase 1 of the four testing phases. In phase 1, we measured the data reduction ratio of each storage array. We created 64 volumes on each array and mapped them to the four connected servers so that each server had 16 mapped disks. We used multipathing for mapping the disks to the servers and followed each storage array's best practice, creating eight paths for the PowerMax array and four paths for the Vendor E array. In addition, we tested with eight paths to the Vendor E array and saw no performance improvements.

We started our set of tests by prefilling the volumes with Vdbench data with a compression ratio of 4:1. We measured the volume usage before and after prefilling and recorded the overall data reduction ratio of each array. We repeated the prefill and measurement process twice more. We report the median reduction ratio of three runs for each array.

We then moved into testing phase 2, which focused on performance. We used the same volume creation and mapping configuration that we used in phase 1. When we prefilled the volumes for phase 2, we used a 2:1 compression ratio and a 2:1 deduplication ratio.

We started phase 2 with a steady state test targeting 50,000 IOPS. The test ran for six hours and consisted of a mix of block sizes and read and write ratios with four threads. We then performed the simulated OLTP test and also used a mix of block sizes and read and write ratios and four threads. For the simulated OLTP test, we took advantage of the curve function in Vdbench, which first performs an initial test at the maximum I/O rate that the storage can handle and then performs a series of tests that increase the I/O rate at a set interval. The subsequent tests used a 10 percent interval, increasing from 10 percent of the maximum I/O rate to 120 percent.

Finally, we finished phase 2 testing and began phase 3 testing with a simulated extraction phase of a typical extract, transform, and load (ETL) workload. We again used a mix of block sizes and read and write ratios with four threads. We also used the curve function with the simulated extraction test. Between each set of tests (i.e., before volume prefill and after extraction), we unmapped the volumes from the storage array, deleted the volumes, and let the arrays sit idly for 24 hours to ensure that each array's AI didn't affect the variance between runs. We ran the simulated extraction phase test three times using the following order:

- Volume prefill
- Steady state
- OLTP
- Extraction

We report the median of three simulated extraction tests.

Instead of unmapping and deleting the volumes after the final run of phase 3, we left them in place to use for phase 4 of our testing. Phase 4 testing consisted of running a steady state workload targeting 50,000 IOPS for seven hours, and in the sixth hour, we took a snapshot of the volumes. We measured the maximum latency reported by Vdbench during the snapshot creation. We ran this phase 3 snapshot test three times. We report the median maximum latency.

We concluded our testing by analyzing the management tools and features of the PowerMax 8500. We assessed the abilities of the proactive health monitoring, multi-factor authentication (MFA), and deep integration with the cloud-native monitoring tools.

Performing the data reduction tests

Prefilling the volumes with data

To fill the volumes with data, we used 128KB sequential writes with a single thread. We used the following script to prefill the volumes:

```
messagescan=no
compratio=4
hd=default,vdbench=/bench/tcagbenchkit/vd,master=10.243.152.26,user=root,shell=ssh,jvms=1
hd=tcag4,system=10.243.152.26
hd=tcag5,system=10.243.152.43
hd=tcag6,system=10.243.152.28
```

```
hd=tcag7,system=10.243.152.29
sd=sd_1,host=tcag4,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_2,host=tcag4,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_3,host=tcag4,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_4,host=tcag4,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_5,host=tcag4,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_6,host=tcag4,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_7,host=tcag4,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_8,host=tcag4,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_9,host=tcag4,lun=/dev/mapper/mpathdq,openflags=o_direct
sd=sd_10,host=tcag4,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_11,host=tcag4,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_12,host=tcag4,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_13,host=tcag4,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_14,host=tcag4,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_15,host=tcag4,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_16,host=tcag4,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_17,host=tcag5,lun=/dev/mapper/mpathdb,openflags=o_direct
sd=sd_18,host=tcag5,lun=/dev/mapper/mpathdc,openflags=o_direct
sd=sd_19,host=tcag5,lun=/dev/mapper/mpathdd,openflags=o_direct
sd=sd_20,host=tcag5,lun=/dev/mapper/mpathde,openflags=o_direct
sd=sd_21,host=tcag5,lun=/dev/mapper/mpathdf,openflags=o_direct
sd=sd_22,host=tcag5,lun=/dev/mapper/mpathdg,openflags=o_direct
sd=sd_23,host=tcag5,lun=/dev/mapper/mpathdh,openflags=o_direct
sd=sd_24,host=tcag5,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_25,host=tcag5,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_26,host=tcag5,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_27,host=tcag5,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_28,host=tcag5,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_29,host=tcag5,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_30,host=tcag5,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_31,host=tcag5,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_32,host=tcag5,lun=/dev/mapper/mpathdq,openflags=o_direct
sd=sd_33,host=tcag6,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_34,host=tcag6,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_35,host=tcag6,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_36,host=tcag6,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_37,host=tcag6,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_38,host=tcag6,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_39,host=tcag6,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_40,host=tcag6,lun=/dev/mapper/mpathdy,openflags=o_direct
sd=sd_41,host=tcag6,lun=/dev/mapper/mpathdz,openflags=o_direct
sd=sd_42,host=tcag6,lun=/dev/mapper/mpathea,openflags=o_direct
sd=sd_43,host=tcag6,lun=/dev/mapper/mpatheb,openflags=o_direct
sd=sd_44,host=tcag6,lun=/dev/mapper/mpathec,openflags=o_direct
sd=sd_45,host=tcag6,lun=/dev/mapper/mpathed,openflags=o_direct
sd=sd_46,host=tcag6,lun=/dev/mapper/mpathee,openflags=o_direct
sd=sd_47,host=tcag6,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_48,host=tcag6,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_49,host=tcag7,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_50,host=tcag7,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_51,host=tcag7,lun=/dev/mapper/mpathbm,openflags=o_direct
sd=sd_52,host=tcag7,lun=/dev/mapper/mpathbn,openflags=o_direct
sd=sd_53,host=tcag7,lun=/dev/mapper/mpatheh,openflags=o_direct
sd=sd_54,host=tcag7,lun=/dev/mapper/mpathei,openflags=o_direct
sd=sd_55,host=tcag7,lun=/dev/mapper/mpathej,openflags=o_direct
sd=sd_56,host=tcag7,lun=/dev/mapper/mpathek,openflags=o_direct
sd=sd_57,host=tcag7,lun=/dev/mapper/mpathep,openflags=o_direct
sd=sd_58,host=tcag7,lun=/dev/mapper/mpatheq,openflags=o_direct
sd=sd_59,host=tcag7,lun=/dev/mapper/mpather,openflags=o_direct
sd=sd_60,host=tcag7,lun=/dev/mapper/mpathes,openflags=o_direct
sd=sd_61,host=tcag7,lun=/dev/mapper/mpathel,openflags=o_direct
sd=sd_62,host=tcag7,lun=/dev/mapper/mpathem,openflags=o_direct
sd=sd_63,host=tcag7,lun=/dev/mapper/mpathen,openflags=o_direct
sd=sd_64,host=tcag7,lun=/dev/mapper/mpatheo,openflags=o_direct
wd=wd_PREWRITETS_SW,sd=*,seekpct=eof
rd=rd_PREWRITETS,wd=wd_PREWRITETS_SW,elapsed=24h,interval=10,forxfersize=(128k),forrdpct=(0),forthreads=
(1),iorate=max,maxdata=64000g
```

Conducting the performance tests

Prefilling the volumes with data

To fill the volumes with data, we used 128KB sequential writes with a single thread. We used the following script to prefill the volumes:

```
messagescan=no
compratio=2
dedupratio=2
dedupunit=131072
hd=default,vdbench=/bench/tcagbenchkit/vd,master=10.243.152.26,user=root,shell=ssh,jvms=1
hd=tcag4,system=10.243.152.26
hd=tcag5,system=10.243.152.43
hd=tcag6,system=10.243.152.28
hd=tcag7,system=10.243.152.29
sd=sd_1,host=tcag4,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_2,host=tcag4,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_3,host=tcag4,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_4,host=tcag4,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_5,host=tcag4,lun=/dev/mapper/mpathdq,openflags=o_direct
sd=sd_6,host=tcag4,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_7,host=tcag4,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_8,host=tcag4,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_9,host=tcag4,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_10,host=tcag4,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_11,host=tcag4,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_12,host=tcag4,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_13,host=tcag4,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_14,host=tcag4,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_15,host=tcag4,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_16,host=tcag4,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_17,host=tcag5,lun=/dev/mapper/mpathdb,openflags=o_direct
sd=sd_18,host=tcag5,lun=/dev/mapper/mpathdc,openflags=o_direct
sd=sd_19,host=tcag5,lun=/dev/mapper/mpathdd,openflags=o_direct
sd=sd_20,host=tcag5,lun=/dev/mapper/mpathde,openflags=o_direct
sd=sd_21,host=tcag5,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_22,host=tcag5,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_23,host=tcag5,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_24,host=tcag5,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_25,host=tcag5,lun=/dev/mapper/mpathdf,openflags=o_direct
sd=sd_26,host=tcag5,lun=/dev/mapper/mpathdg,openflags=o_direct
sd=sd_27,host=tcag5,lun=/dev/mapper/mpathdh,openflags=o_direct
sd=sd_28,host=tcag5,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_29,host=tcag5,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_30,host=tcag5,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_31,host=tcag5,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_32,host=tcag5,lun=/dev/mapper/mpathdq,openflags=o_direct
sd=sd_33,host=tcag6,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_34,host=tcag6,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_35,host=tcag6,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_36,host=tcag6,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_37,host=tcag6,lun=/dev/mapper/mpathdz,openflags=o_direct
sd=sd_38,host=tcag6,lun=/dev/mapper/mpathea,openflags=o_direct
sd=sd_39,host=tcag6,lun=/dev/mapper/mpatheb,openflags=o_direct
sd=sd_40,host=tcag6,lun=/dev/mapper/mpathec,openflags=o_direct
sd=sd_41,host=tcag6,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_42,host=tcag6,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_43,host=tcag6,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_44,host=tcag6,lun=/dev/mapper/mpathdy,openflags=o_direct
sd=sd_45,host=tcag6,lun=/dev/mapper/mpathed,openflags=o_direct
sd=sd_46,host=tcag6,lun=/dev/mapper/mpathee,openflags=o_direct
sd=sd_47,host=tcag6,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_48,host=tcag6,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_49,host=tcag7,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_50,host=tcag7,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_51,host=tcag7,lun=/dev/mapper/mpathbm,openflags=o_direct
sd=sd_52,host=tcag7,lun=/dev/mapper/mpathbn,openflags=o_direct
sd=sd_53,host=tcag7,lun=/dev/mapper/mpathep,openflags=o_direct
sd=sd_54,host=tcag7,lun=/dev/mapper/mpatheq,openflags=o_direct
sd=sd_55,host=tcag7,lun=/dev/mapper/mpather,openflags=o_direct
sd=sd_56,host=tcag7,lun=/dev/mapper/mpathes,openflags=o_direct
```

```
sd=sd_57,host=tcag7,lun=/dev/mapper/mpatheh,openflags=o_direct
sd=sd_58,host=tcag7,lun=/dev/mapper/mpathei,openflags=o_direct
sd=sd_59,host=tcag7,lun=/dev/mapper/mpathej,openflags=o_direct
sd=sd_60,host=tcag7,lun=/dev/mapper/mpathek,openflags=o_direct
sd=sd_61,host=tcag7,lun=/dev/mapper/mpathel,openflags=o_direct
sd=sd_62,host=tcag7,lun=/dev/mapper/mpathem,openflags=o_direct
sd=sd_63,host=tcag7,lun=/dev/mapper/mpathen,openflags=o_direct
sd=sd_64,host=tcag7,lun=/dev/mapper/mpatheo,openflags=o_direct
wd=wd_PREWRITETS_SW,sd=*,seekpct=eof
rd=rd_PREWRITETS,wd=wd_PREWRITETS_SW,elapsed=24h,interval=10,forxfersize=(128k),forrdpct=(0),forthreads=
(1),iorate=max,maxdata=64000g
```

Running a steady state workload

For this workload, we deployed 64 1TB volumes and used the following script to configure Vdbench to run a workload that emulates a typical OLTP workload at a steady state of 50,000 IOPS:

```
messagescan=no
compratio=2
dedupratio=2
dedupunit=131072
hd=default,vdbench=/bench/tcagbenchkit/vd,master=10.243.152.26,user=root,shell=ssh,jvms=1
hd=tcag4,system=10.243.152.26
hd=tcag5,system=10.243.152.43
hd=tcag6,system=10.243.152.28
hd=tcag7,system=10.243.152.29
sd=sd_1,host=tcag4,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_2,host=tcag4,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_3,host=tcag4,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_4,host=tcag4,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_5,host=tcag4,lun=/dev/mapper/mpathdq,openflags=o_direct
sd=sd_6,host=tcag4,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_7,host=tcag4,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_8,host=tcag4,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_9,host=tcag4,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_10,host=tcag4,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_11,host=tcag4,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_12,host=tcag4,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_13,host=tcag4,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_14,host=tcag4,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_15,host=tcag4,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_16,host=tcag4,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_17,host=tcag5,lun=/dev/mapper/mpathdb,openflags=o_direct
sd=sd_18,host=tcag5,lun=/dev/mapper/mpathdc,openflags=o_direct
sd=sd_19,host=tcag5,lun=/dev/mapper/mpathdd,openflags=o_direct
sd=sd_20,host=tcag5,lun=/dev/mapper/mpathde,openflags=o_direct
sd=sd_21,host=tcag5,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_22,host=tcag5,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_23,host=tcag5,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_24,host=tcag5,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_25,host=tcag5,lun=/dev/mapper/mpathdf,openflags=o_direct
sd=sd_26,host=tcag5,lun=/dev/mapper/mpathdg,openflags=o_direct
sd=sd_27,host=tcag5,lun=/dev/mapper/mpathdh,openflags=o_direct
sd=sd_28,host=tcag5,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_29,host=tcag5,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_30,host=tcag5,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_31,host=tcag5,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_32,host=tcag5,lun=/dev/mapper/mpathdq,openflags=o_direct
sd=sd_33,host=tcag6,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_34,host=tcag6,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_35,host=tcag6,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_36,host=tcag6,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_37,host=tcag6,lun=/dev/mapper/mpathdz,openflags=o_direct
sd=sd_38,host=tcag6,lun=/dev/mapper/mpathea,openflags=o_direct
sd=sd_39,host=tcag6,lun=/dev/mapper/mpatheb,openflags=o_direct
sd=sd_40,host=tcag6,lun=/dev/mapper/mpathec,openflags=o_direct
sd=sd_41,host=tcag6,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_42,host=tcag6,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_43,host=tcag6,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_44,host=tcag6,lun=/dev/mapper/mpathdy,openflags=o_direct
```

```
sd=sd_45,host=tcag6,lun=/dev/mapper/mpathed,openflags=o_direct
sd=sd_46,host=tcag6,lun=/dev/mapper/mpathee,openflags=o_direct
sd=sd_47,host=tcag6,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_48,host=tcag6,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_49,host=tcag7,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_50,host=tcag7,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_51,host=tcag7,lun=/dev/mapper/mpathbm,openflags=o_direct
sd=sd_52,host=tcag7,lun=/dev/mapper/mpathbn,openflags=o_direct
sd=sd_53,host=tcag7,lun=/dev/mapper/mpathep,openflags=o_direct
sd=sd_54,host=tcag7,lun=/dev/mapper/mpatheq,openflags=o_direct
sd=sd_55,host=tcag7,lun=/dev/mapper/mpather,openflags=o_direct
sd=sd_56,host=tcag7,lun=/dev/mapper/mpathes,openflags=o_direct
sd=sd_57,host=tcag7,lun=/dev/mapper/mpatheh,openflags=o_direct
sd=sd_58,host=tcag7,lun=/dev/mapper/mpathei,openflags=o_direct
sd=sd_59,host=tcag7,lun=/dev/mapper/mpathej,openflags=o_direct
sd=sd_60,host=tcag7,lun=/dev/mapper/mpathek,openflags=o_direct
sd=sd_61,host=tcag7,lun=/dev/mapper/mpathel,openflags=o_direct
sd=sd_62,host=tcag7,lun=/dev/mapper/mpathem,openflags=o_direct
sd=sd_63,host=tcag7,lun=/dev/mapper/mpathen,openflags=o_direct
sd=sd_64,host=tcag7,lun=/dev/mapper/mpatheo,openflags=o_direct
wd=wd_OLTP2STS_RRH,sd=*,rhpct=100,rdpct=100,xfersize=8K,skew=20,range=(10m,30m)
wd=wd_OLTP2STS_RM1,sd=*,rdpct=100,xfersize=8k,skew=40,range=(73,80)
wd=wd_OLTP2STS_RM2,sd=*,rdpct=100,xfersize=8k,skew=5,range=(11,72)
wd=wd_OLTP2STS_RW1,sd=*,rdpct=0,xfersize=8K,skew=13,range=(73,80)
wd=wd_OLTP2STS_RW2,sd=*,rdpct=0,xfersize=8K,skew=2,range=(11,72)
wd=wd_OLTP2STS_SR1,sd=*,rdpct=100,seekpct=seqnz,range=(73,80),xfersize=64K,skew=9
wd=wd_OLTP2STS_SR2,sd=*,rdpct=100,seekpct=seqnz,range=(11,72),xfersize=64K,skew=1
wd=wd_OLTP2STS_SW1,sd=*,rdpct=0,seekpct=seqnz,range=(73,80),xfersize=64K,skew=9
wd=wd_OLTP2STS_SW2,sd=*,rdpct=0,seekpct=seqnz,range=(11,72),xfersize=64K,skew=1
rd=rd_OLTP2STS,wd=wd_OLTP2STS_*,iorate=50000,elapsed=6h,interval=10,warmup=60,forthreads=(4),hitarea=6m
```

Performing the simulated OLTP workload tests

For these tests, we deployed 64 1TB volumes and used the following script to configure Vdbench to run a curved workload that emulates a typical OLTP workload with four threads:

```
messagescan=no
compratio=2
dedupratio=2
dedupunit=131072
hd=default,vdbench=/bench/tcagbenchkit/vd,master=10.243.152.26,user=root,shell=ssh,jvms=1
hd=tcag4,system=10.243.152.26
hd=tcag5,system=10.243.152.43
hd=tcag6,system=10.243.152.28
hd=tcag7,system=10.243.152.29
sd=sd_1,host=tcag4,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_2,host=tcag4,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_3,host=tcag4,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_4,host=tcag4,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_5,host=tcag4,lun=/dev/mapper/mpathdq,openflags=o_direct
sd=sd_6,host=tcag4,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_7,host=tcag4,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_8,host=tcag4,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_9,host=tcag4,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_10,host=tcag4,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_11,host=tcag4,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_12,host=tcag4,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_13,host=tcag4,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_14,host=tcag4,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_15,host=tcag4,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_16,host=tcag4,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_17,host=tcag5,lun=/dev/mapper/mpathdb,openflags=o_direct
sd=sd_18,host=tcag5,lun=/dev/mapper/mpathdc,openflags=o_direct
sd=sd_19,host=tcag5,lun=/dev/mapper/mpathdd,openflags=o_direct
sd=sd_20,host=tcag5,lun=/dev/mapper/mpathde,openflags=o_direct
sd=sd_21,host=tcag5,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_22,host=tcag5,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_23,host=tcag5,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_24,host=tcag5,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_25,host=tcag5,lun=/dev/mapper/mpathdf,openflags=o_direct
```

```
sd=sd_26,host=tcag5,lun=/dev/mapper/mpathdg,openflags=o_direct
sd=sd_27,host=tcag5,lun=/dev/mapper/mpathdh,openflags=o_direct
sd=sd_28,host=tcag5,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_29,host=tcag5,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_30,host=tcag5,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_31,host=tcag5,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_32,host=tcag5,lun=/dev/mapper/mpathdq,openflags=o_direct
sd=sd_33,host=tcag6,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_34,host=tcag6,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_35,host=tcag6,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_36,host=tcag6,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_37,host=tcag6,lun=/dev/mapper/mpathdz,openflags=o_direct
sd=sd_38,host=tcag6,lun=/dev/mapper/mpathea,openflags=o_direct
sd=sd_39,host=tcag6,lun=/dev/mapper/mpatheb,openflags=o_direct
sd=sd_40,host=tcag6,lun=/dev/mapper/mpathec,openflags=o_direct
sd=sd_41,host=tcag6,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_42,host=tcag6,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_43,host=tcag6,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_44,host=tcag6,lun=/dev/mapper/mpathdy,openflags=o_direct
sd=sd_45,host=tcag6,lun=/dev/mapper/mpathed,openflags=o_direct
sd=sd_46,host=tcag6,lun=/dev/mapper/mpathee,openflags=o_direct
sd=sd_47,host=tcag6,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_48,host=tcag6,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_49,host=tcag7,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_50,host=tcag7,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_51,host=tcag7,lun=/dev/mapper/mpathbm,openflags=o_direct
sd=sd_52,host=tcag7,lun=/dev/mapper/mpathbn,openflags=o_direct
sd=sd_53,host=tcag7,lun=/dev/mapper/mpathep,openflags=o_direct
sd=sd_54,host=tcag7,lun=/dev/mapper/mpatheq,openflags=o_direct
sd=sd_55,host=tcag7,lun=/dev/mapper/mpather,openflags=o_direct
sd=sd_56,host=tcag7,lun=/dev/mapper/mpathes,openflags=o_direct
sd=sd_57,host=tcag7,lun=/dev/mapper/mpatheh,openflags=o_direct
sd=sd_58,host=tcag7,lun=/dev/mapper/mpathei,openflags=o_direct
sd=sd_59,host=tcag7,lun=/dev/mapper/mpathej,openflags=o_direct
sd=sd_60,host=tcag7,lun=/dev/mapper/mpathek,openflags=o_direct
sd=sd_61,host=tcag7,lun=/dev/mapper/mpathel,openflags=o_direct
sd=sd_62,host=tcag7,lun=/dev/mapper/mpathem,openflags=o_direct
sd=sd_63,host=tcag7,lun=/dev/mapper/mpathen,openflags=o_direct
sd=sd_64,host=tcag7,lun=/dev/mapper/mpatheo,openflags=o_direct
wd=wd_OLTP2S_RRH,sd=*,rhpct=100,rdpct=100,xfersize=8K,skew=20,range=(10m,30m)
wd=wd_OLTP2S_RM1,sd=*,rdpct=100,xfersize=8k,skew=40,range=(73,80)
wd=wd_OLTP2S_RM2,sd=*,rdpct=100,xfersize=8k,skew=5,range=(11,72)
wd=wd_OLTP2S_RW1,sd=*,rdpct=0,xfersize=8K,skew=13,range=(73,80)
wd=wd_OLTP2S_RW2,sd=*,rdpct=0,xfersize=8K,skew=2,range=(11,72)
wd=wd_OLTP2S_SR1,sd=*,rdpct=100,seekpct=seqnz,range=(73,80),xfersize=64K,skew=9
wd=wd_OLTP2S_SR2,sd=*,rdpct=100,seekpct=seqnz,range=(11,72),xfersize=64K,skew=1
wd=wd_OLTP2S_SW1,sd=*,rdpct=0,seekpct=seqnz,range=(73,80),xfersize=64K,skew=9
wd=wd_OLTP2S_SW2,sd=*,rdpct=0,seekpct=seqnz,range=(11,72),xfersize=64K,skew=1
rd=rd_OLTP2S,wd=wd_OLTP2S_*,iorate=curve,curve=(10-120,10),elapsed=120,interval=10,warmup=60,forthreads=
(4),hitarea=6m
```

Performing the simulated extraction workload tests

For these tests, we deployed 64 1TB volumes and used the following script to configure Vdbench to run a curved workload that simulated an extraction phase from an ETL workload with multiple block sizes and four threads:

```
messagescan=no
compratio=2
dedupratio=2
dedupunit=131072
hd=default,vdbench=/bench/tcagbenchkit/vd,master=10.243.152.26,user=root,shell=ssh,jvms=1
hd=tcag4,system=10.243.152.26
hd=tcag5,system=10.243.152.43
hd=tcag6,system=10.243.152.28
hd=tcag7,system=10.243.152.29
sd=sd_1,host=tcag4,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_2,host=tcag4,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_3,host=tcag4,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_4,host=tcag4,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_5,host=tcag4,lun=/dev/mapper/mpathdq,openflags=o_direct
```

```
sd=sd_6,host=tcag4,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_7,host=tcag4,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_8,host=tcag4,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_9,host=tcag4,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_10,host=tcag4,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_11,host=tcag4,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_12,host=tcag4,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_13,host=tcag4,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_14,host=tcag4,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_15,host=tcag4,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_16,host=tcag4,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_17,host=tcag5,lun=/dev/mapper/mpathdb,openflags=o_direct
sd=sd_18,host=tcag5,lun=/dev/mapper/mpathdc,openflags=o_direct
sd=sd_19,host=tcag5,lun=/dev/mapper/mpathdd,openflags=o_direct
sd=sd_20,host=tcag5,lun=/dev/mapper/mpathde,openflags=o_direct
sd=sd_21,host=tcag5,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_22,host=tcag5,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_23,host=tcag5,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_24,host=tcag5,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_25,host=tcag5,lun=/dev/mapper/mpathdf,openflags=o_direct
sd=sd_26,host=tcag5,lun=/dev/mapper/mpathdg,openflags=o_direct
sd=sd_27,host=tcag5,lun=/dev/mapper/mpathdh,openflags=o_direct
sd=sd_28,host=tcag5,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_29,host=tcag5,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_30,host=tcag5,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_31,host=tcag5,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_32,host=tcag5,lun=/dev/mapper/mpathdq,openflags=o_direct
sd=sd_33,host=tcag6,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_34,host=tcag6,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_35,host=tcag6,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_36,host=tcag6,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_37,host=tcag6,lun=/dev/mapper/mpathdz,openflags=o_direct
sd=sd_38,host=tcag6,lun=/dev/mapper/mpathea,openflags=o_direct
sd=sd_39,host=tcag6,lun=/dev/mapper/mpatheb,openflags=o_direct
sd=sd_40,host=tcag6,lun=/dev/mapper/mpathec,openflags=o_direct
sd=sd_41,host=tcag6,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_42,host=tcag6,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_43,host=tcag6,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_44,host=tcag6,lun=/dev/mapper/mpathdy,openflags=o_direct
sd=sd_45,host=tcag6,lun=/dev/mapper/mpathed,openflags=o_direct
sd=sd_46,host=tcag6,lun=/dev/mapper/mpathee,openflags=o_direct
sd=sd_47,host=tcag6,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_48,host=tcag6,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_49,host=tcag7,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_50,host=tcag7,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_51,host=tcag7,lun=/dev/mapper/mpathbm,openflags=o_direct
sd=sd_52,host=tcag7,lun=/dev/mapper/mpathbn,openflags=o_direct
sd=sd_53,host=tcag7,lun=/dev/mapper/mpathep,openflags=o_direct
sd=sd_54,host=tcag7,lun=/dev/mapper/mpatheq,openflags=o_direct
sd=sd_55,host=tcag7,lun=/dev/mapper/mpather,openflags=o_direct
sd=sd_56,host=tcag7,lun=/dev/mapper/mpathes,openflags=o_direct
sd=sd_57,host=tcag7,lun=/dev/mapper/mpatheh,openflags=o_direct
sd=sd_58,host=tcag7,lun=/dev/mapper/mpathei,openflags=o_direct
sd=sd_59,host=tcag7,lun=/dev/mapper/mpathej,openflags=o_direct
sd=sd_60,host=tcag7,lun=/dev/mapper/mpathek,openflags=o_direct
sd=sd_61,host=tcag7,lun=/dev/mapper/mpathel,openflags=o_direct
sd=sd_62,host=tcag7,lun=/dev/mapper/mpathem,openflags=o_direct
sd=sd_63,host=tcag7,lun=/dev/mapper/mpathen,openflags=o_direct
sd=sd_64,host=tcag7,lun=/dev/mapper/mpatheo,openflags=o_direct
wd=wd_ETLS_RRH,sd=*,rhpct=100,rdpct=100,xfersize=8K,skew=5,range=(10m,30m)
wd=wd_ETLS_RW1,sd=*,rdpct=0,xfersize=8K,skew=2,range=(73,80)
wd=wd_ETLS_RM1,sd=*,rdpct=100,xfersize=8k,skew=16,range=(73,80)
wd=wd_ETLS_RM2,sd=*,rdpct=100,xfersize=8k,skew=2,range=(11,72)
wd=wd_ETLS_SR1,sd=*,rdpct=100,seekpct=seqnz,range=(73,80),xfersize=64K,skew=66
wd=wd_ETLS_SR2,sd=*,rdpct=100,seekpct=seqnz,range=(11,72),xfersize=64K,skew=9
rd=rd_ETLS,wd=wd_ETLS_*,iorate=curve,curve=(10-120,10),elapsed=120,interval=10,warmup=60,forthreads=(4),
hitarea=6m
```

Performing the snapshot tests

For these tests, we deployed 64 1TB volumes. We used the following script to configure Vdbench to run a steady state workload targeting 50,000 IOPS for seven hours at multiple block sizes and four threads and perform a snapshot at the sixth hour:

```
messagescan=no
compratio=2
dedupratio=2
dedupunit=131072
hd=default,vdbench=/bench/tcagbenchkit/vd,master=10.243.152.26,user=root,shell=ssh,jvms=1
hd=tcag4,system=10.243.152.26
hd=tcag5,system=10.243.152.43
hd=tcag6,system=10.243.152.28
hd=tcag7,system=10.243.152.29
sd=sd_1,host=tcag4,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_2,host=tcag4,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_3,host=tcag4,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_4,host=tcag4,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_5,host=tcag4,lun=/dev/mapper/mpathdq,openflags=o_direct
sd=sd_6,host=tcag4,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_7,host=tcag4,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_8,host=tcag4,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_9,host=tcag4,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_10,host=tcag4,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_11,host=tcag4,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_12,host=tcag4,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_13,host=tcag4,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_14,host=tcag4,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_15,host=tcag4,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_16,host=tcag4,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_17,host=tcag5,lun=/dev/mapper/mpathdb,openflags=o_direct
sd=sd_18,host=tcag5,lun=/dev/mapper/mpathdc,openflags=o_direct
sd=sd_19,host=tcag5,lun=/dev/mapper/mpathdd,openflags=o_direct
sd=sd_20,host=tcag5,lun=/dev/mapper/mpathde,openflags=o_direct
sd=sd_21,host=tcag5,lun=/dev/mapper/mpathdj,openflags=o_direct
sd=sd_22,host=tcag5,lun=/dev/mapper/mpathdk,openflags=o_direct
sd=sd_23,host=tcag5,lun=/dev/mapper/mpathdl,openflags=o_direct
sd=sd_24,host=tcag5,lun=/dev/mapper/mpathdm,openflags=o_direct
sd=sd_25,host=tcag5,lun=/dev/mapper/mpathdf,openflags=o_direct
sd=sd_26,host=tcag5,lun=/dev/mapper/mpathdg,openflags=o_direct
sd=sd_27,host=tcag5,lun=/dev/mapper/mpathdh,openflags=o_direct
sd=sd_28,host=tcag5,lun=/dev/mapper/mpathdi,openflags=o_direct
sd=sd_29,host=tcag5,lun=/dev/mapper/mpathdn,openflags=o_direct
sd=sd_30,host=tcag5,lun=/dev/mapper/mpathdo,openflags=o_direct
sd=sd_31,host=tcag5,lun=/dev/mapper/mpathdp,openflags=o_direct
sd=sd_32,host=tcag5,lun=/dev/mapper/mpathdq,openflags=o_direct
sd=sd_33,host=tcag6,lun=/dev/mapper/mpathdr,openflags=o_direct
sd=sd_34,host=tcag6,lun=/dev/mapper/mpathds,openflags=o_direct
sd=sd_35,host=tcag6,lun=/dev/mapper/mpathdt,openflags=o_direct
sd=sd_36,host=tcag6,lun=/dev/mapper/mpathdu,openflags=o_direct
sd=sd_37,host=tcag6,lun=/dev/mapper/mpathdz,openflags=o_direct
sd=sd_38,host=tcag6,lun=/dev/mapper/mpathea,openflags=o_direct
sd=sd_39,host=tcag6,lun=/dev/mapper/mpatheb,openflags=o_direct
sd=sd_40,host=tcag6,lun=/dev/mapper/mpathec,openflags=o_direct
sd=sd_41,host=tcag6,lun=/dev/mapper/mpathdv,openflags=o_direct
sd=sd_42,host=tcag6,lun=/dev/mapper/mpathdw,openflags=o_direct
sd=sd_43,host=tcag6,lun=/dev/mapper/mpathdx,openflags=o_direct
sd=sd_44,host=tcag6,lun=/dev/mapper/mpathdy,openflags=o_direct
sd=sd_45,host=tcag6,lun=/dev/mapper/mpathed,openflags=o_direct
sd=sd_46,host=tcag6,lun=/dev/mapper/mpathee,openflags=o_direct
sd=sd_47,host=tcag6,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_48,host=tcag6,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_49,host=tcag7,lun=/dev/mapper/mpathef,openflags=o_direct
sd=sd_50,host=tcag7,lun=/dev/mapper/mpatheg,openflags=o_direct
sd=sd_51,host=tcag7,lun=/dev/mapper/mpathbm,openflags=o_direct
sd=sd_52,host=tcag7,lun=/dev/mapper/mpathbn,openflags=o_direct
sd=sd_53,host=tcag7,lun=/dev/mapper/mpathep,openflags=o_direct
sd=sd_54,host=tcag7,lun=/dev/mapper/mpatheq,openflags=o_direct
sd=sd_55,host=tcag7,lun=/dev/mapper/mpather,openflags=o_direct
sd=sd_56,host=tcag7,lun=/dev/mapper/mpathes,openflags=o_direct
sd=sd_57,host=tcag7,lun=/dev/mapper/mpatheh,openflags=o_direct
```

```
sd=sd_58,host=tcag7,lun=/dev/mapper/mpathei,openflags=o_direct
sd=sd_59,host=tcag7,lun=/dev/mapper/mpathej,openflags=o_direct
sd=sd_60,host=tcag7,lun=/dev/mapper/mpathek,openflags=o_direct
sd=sd_61,host=tcag7,lun=/dev/mapper/mpathel,openflags=o_direct
sd=sd_62,host=tcag7,lun=/dev/mapper/mpathem,openflags=o_direct
sd=sd_63,host=tcag7,lun=/dev/mapper/mpathen,openflags=o_direct
sd=sd_64,host=tcag7,lun=/dev/mapper/mpatheo,openflags=o_direct
wd=wd_OLTP2HWSTS_RRM1,sd=*,rdpct=100,xfersize=8k,seekpct=100,skew=31,range=(73,80)
wd=wd_OLTP2HWSTS_RRM2,sd=*,rdpct=100,xfersize=8k,seekpct=100,skew=4,range=(11,72)
wd=wd_OLTP2HWSTS_RRH1,sd=*,rhpct=100,rdpct=100,xfersize=8K,seekpct=100,skew=9,range=(73,80)
wd=wd_OLTP2HWSTS_RRH2,sd=*,rhpct=100,rdpct=100,xfersize=8K,seekpct=100,skew=1,range=(11,72)
wd=wd_OLTP2HWSTS_RWM1,sd=*,rdpct=0,xfersize=8k,seekpct=100,skew=31,range=(73,80)
wd=wd_OLTP2HWSTS_RWM2,sd=*,rdpct=0,xfersize=8k,seekpct=100,skew=4,range=(11,72)
wd=wd_OLTP2HWSTS_SR1,sd=*,rdpct=100,xfersize=64k,seekpct=seqnz,skew=4,range=(73,80)
wd=wd_OLTP2HWSTS_SR2,sd=*,rdpct=100,xfersize=64k,seekpct=seqnz,skew=1,range=(11,72)
wd=wd_OLTP2HWSTS_SW1,sd=*,rdpct=0,xfersize=64k,seekpct=seqnz,skew=13,range=(73,80)
wd=wd_OLTP2HWSTS_SW2,sd=*,rdpct=0,xfersize=64k,seekpct=seqnz,skew=2,range=(11,72)
rd=rd_OLTP2HWSTS,wd=wd_OLTP2HWSTS_*,iorate=50000,elapsed=7h,interval=10,warmup=60,forthrea
ds=(4),hitarea=6m
```

Read the report at https://facts.pt/RvJvIb8

This project was commissioned by Dell Technologies.

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