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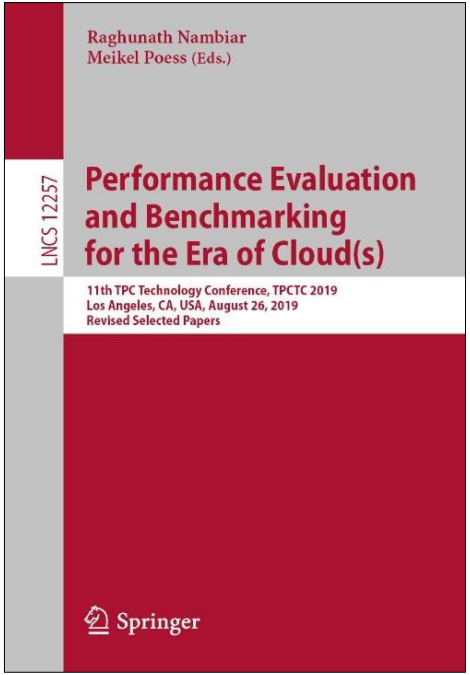
peakmarks® Key Performance Metrics

A complete performance review of the peakmarks® reference system, using two Exadata X7 database servers and three Exadata X8 storage servers, covering all peakmarks workloads and key performance metrics.

For Oracle 19c, Oracle 21c and Oracle 23ai

June 2025



peakmarks® presented its software at the 11th Technology Conference of the Transaction Processing Performance Council (TPC) 2019 in Los Angeles.

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All performance data in this presentation was determined with the peakmarks® Software under certain conditions and does not necessarily correspond to the manufacturer's specifications. All information in this presentation is current as of June 2025.

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Abbreviations and Metrics

Nodes	number of cluster nodes
Jobs	number of workload processes
[GBps]	gigabyte per second
[MBps]	megabyte per second
[kBps]	kilobyte per second
[kBpt]	kilobyte per transaction
[IOPS]	I/O operations per second
[dbps]	database blocks per second
[rbps]	redo blocks per second

[s]	seconds
[ms]	milliseconds
[µs]	microseconds
BuCache	Database Buffer Cache
FlCache	Database or Exadata Flash Cache
[qps]	queries per second
[rps]	rows per second
[tps]	transactions per second
[sps]	SQL executions per second
[Mops]	million operations per second

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Agenda

1 Platform Description of peakmarks® Reference System

2 Server Systems Performance

3 Storage Systems Performance

4 Log Writer Processes Performance

5 Database Writer Processes Performance

6 Data Load Performance

7 Data Analytics Performance

8 Online Transaction Processing Performance

9 PL/SQL Application Program Performance

10 Summary of peakmarks® Key Performance Reporting Scripts

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Performance is not everything.
But without performance, everything is worth nothing.

Platform description of peakmarks® Reference System

Platform Description

Database Server

	Oracle Exadata Flex Config Single Instance	Oracle Exadata Flex Config 2-node RAC Cluster
Database server	Exadata X7-2	Exadata X7-2
Launch date	2017	2017
Processor	Intel Xeon 8160, 2.1 – 3.7 GHz	Intel Xeon 8160, 2.1 – 3.7 GHz
#sockets, total	2	4
#cores, total	48	96
#threads, total	96	192
DRAM capacity, total	768 GByte, DDR4, 2.6 GHz	1,536 GByte, DDR4, 2.6 GHz
DRAM capacity per core	8 GByte	8 GByte
Operating System	Bare metal, OEL 8.10	Bare metal, OEL 8.10
Connectivity	InfiniBand, 2 x 40 Gbps	InfiniBand, 2 x 40 Gbps per server system

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Platform Description

Storage Server

	Oracle Exadata Flex Config Single Instance	Oracle Exadata Flex Config 2-node RAC Cluster
Storage server	Oracle Exadata X8	Oracle Exadata X8
Launch date	2018	2018
#storage server, total	3	3
DRAM capacity, total	192 GByte	192 GByte
PMEM capacity, total	-	-
XRMEM capacity, total	-	-
Flash capacity, total raw	76.8 TByte	76.8 TByte
Disk capacity, total raw	504 TByte	504 TByte
Connectivity	InfiniBand, 2 x 40 Gbps per storage system	InfiniBand, 2 x 40 Gbps per storage system
File system	ASM normal redundancy	ASM normal redundancy
Compression	No	No
Deduplication	No	No

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Platform Description

Database Software and Benchmark Software

	Oracle Exadata Flex Config Single Instance	Oracle Exadata Flex Config 2-node RAC Cluster
Database software	Oracle EE 23.7	Oracle EE 23.7
Database block size	8 KByte	8 KByte
Log Modus	NOARCHIVELOG	NOARCHIVELOG
DataGuard	No	No
REDO Log files	4 x 4 GByte without multiplexing	2 x 4 x 4 GByte without multiplexing
Database size	2 TByte	2 x 1 TByte
SGA size	384 GByte	2 x 384 GByte
Database to buffer cache size ratio	19%	38%
Benchmark Software	peakmarks® Software Version 10.4	peakmarks® Software Version 10.4

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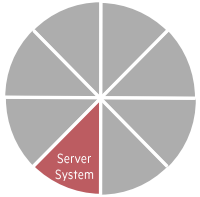
Stop guessing. Start measuring.

Server System Performance



Workload SRV-REPORT – Online Report, max throughput of Logical Reads

kpm_query.sql

Reference System
Single Instance

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Queries total [qps]	Queries per cpu [qps]	Response time [ms]	Log reads total [dbps]	Log reads per cpu [dbps]	BuCache read [%]	Elapsed time [s]
2	2	SRV-REPORT	1	1	2	1	0	98	6,164	6,164	0.162	787,493	787,493	100.00	302
	3	SRV-REPORT	1	24	26	25	0	74	104,206	4,342	0.229	13,283,878	553,495	100.00	305
	4	SRV-REPORT	1	48	51	50	1	49	181,056	3,772	0.263	23,001,582	479,200	100.00	306
	5	SRV-REPORT	1	72	75	74	1	25	204,904	2,846	0.347	25,960,706	360,565	100.00	308
	6	SRV-REPORT	1	96	99	97	1	1	224,268	2,336	0.422	28,348,375	295,296	100.00	308

Reference System
2-node Cluster

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Queries total [qps]	Queries per cpu [qps]	Response time [ms]	Log reads total [dbps]	Log reads per cpu [dbps]	BuCache read [%]	Elapsed time [s]
14	2	SRV-REPORT	2	2	2	1	0	98	12,634	6,317	0.158	1,611,380	805,690	100.00	304
	3	SRV-REPORT	2	48	26	25	0	74	208,533	4,344	0.228	26,579,629	553,742	100.00	305
	4	SRV-REPORT	2	96	51	50	1	49	357,930	3,728	0.266	45,943,044	478,573	100.00	305
	5	SRV-REPORT	2	144	75	74	1	25	405,172	2,814	0.349	51,332,403	356,475	100.00	309
	6	SRV-REPORT	2	192	99	97	1	1	445,950	2,323	0.426	56,379,900	293,645	100.00	308

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Workload SRV-LOOKUP – Simple look-up query, highest throughput, lowest response time

kpm_query.sql

Reference System
Single Instance

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Queries total [qps]	Queries per cpu [qps]	Response time [ms]	Log reads total [dbps]	Log reads per cpu [dbps]	BuCache read [%]	Elapsed time [s]
2	7	SRV-LOOKUP	1	1	2	1	0	98	84,315	84,315	0.012	337,704	337,704	99.98	301
	8	SRV-LOOKUP	1	24	26	25	0	74	1,534,613	63,942	0.016	6,124,017	255,167	100.00	304
	9	SRV-LOOKUP	1	48	51	50	1	49	2,232,217	46,505	0.021	8,884,855	185,101	100.00	304
	10	SRV-LOOKUP	1	72	75	74	1	25	2,343,023	32,542	0.030	9,298,278	129,143	100.00	307
	11	SRV-LOOKUP	1	96	98	96	1	2	2,489,017	25,927	0.038	9,849,829	102,602	100.00	305

Reference System
2-node Cluster

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Queries total [qps]	Queries per cpu [qps]	Response time [ms]	Log reads total [dbps]	Log reads per cpu [dbps]	BuCache read [%]	Elapsed time [s]
14	7	SRV-LOOKUP	2	2	2	1	0	98	168,546	84,273	0.012	675,661	337,831	99.98	301
	8	SRV-LOOKUP	2	48	26	25	0	74	2,991,839	62,330	0.016	12,209,063	254,355	100.00	304
	9	SRV-LOOKUP	2	96	51	50	1	49	4,466,692	46,528	0.021	17,795,664	185,372	100.00	304
	10	SRV-LOOKUP	2	144	75	73	1	25	4,667,153	32,411	0.030	18,544,898	128,784	100.00	309
	11	SRV-LOOKUP	2	192	98	96	1	2	4,983,115	25,954	0.038	19,743,708	102,832	100.00	306

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Workload SRV-QUERY – More complex query

kpm_query.sql

Reference System
Single Instance

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Queries total [qps]	Queries per cpu [qps]	Response time [ms]	Log reads total [dbps]	Log reads per cpu [dbps]	BuCache read [%]	Elapsed time [s]
2	12	SRV-QUERY	1	1	2	2	0	98	23,815	23,815	0.042	665,767	665,767	99.97	302
	13	SRV-QUERY	1	24	26	25	0	74	397,633	16,568	0.060	11,120,258	463,344	100.00	305
	14	SRV-QUERY	1	48	51	50	1	49	679,805	14,163	0.070	18,958,596	394,971	100.00	304
	15	SRV-QUERY	1	72	76	74	1	24	757,885	10,526	0.094	21,097,808	293,025	100.00	305
	16	SRV-QUERY	1	96	98	97	1	2	816,170	8,502	0.117	22,681,054	236,261	100.00	306

Reference System
2-node Cluster

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Queries total [qps]	Queries per cpu [qps]	Response time [ms]	Log reads total [dbps]	Log reads per cpu [dbps]	BuCache read [%]	Elapsed time [s]
14	12	SRV-QUERY	2	2	2	1	0	98	45,896	22,948	0.044	1,287,293	643,647	99.99	303
	13	SRV-QUERY	2	48	26	25	0	74	792,307	16,506	0.060	22,159,380	461,654	100.00	304
	14	SRV-QUERY	2	96	50	50	1	50	1,364,529	14,214	0.070	38,049,249	396,346	100.00	305
	15	SRV-QUERY	2	144	75	73	1	25	1,503,814	10,443	0.094	41,855,721	290,665	100.00	307
	16	SRV-QUERY	2	192	98	97	1	2	1,630,408	8,492	0.116	45,294,657	235,910	100.00	307

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Workload SRV-SCAN – Scan-Rate in Oracle Buffer Cache

kpm_scan.sql

Reference System
Single Instance

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Scan rate total [MBps]	Scan rate per cpu [MBps]	Log reads total [dbps]	Log reads per cpu [dbps]	BuCache read [%]	Elapsed time [s]
2	17	SRV-SCAN	1	1	2	1	0	98	2,932	2,932	375,947	375,947	100.00	301
	18	SRV-SCAN	1	24	26	25	0	74	57,588	2,399	7,357,516	306,563	100.00	307
	19	SRV-SCAN	1	48	51	50	0	49	98,070	2,043	12,249,509	255,198	100.00	307
	20	SRV-SCAN	1	72	76	74	1	24	119,646	1,662	14,524,826	201,734	100.00	307
	21	SRV-SCAN	1	96	98	97	1	2	129,806	1,352	15,583,102	162,324	100.00	308

Reference System
2-node Cluster

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Scan rate total [MBps]	Scan rate per cpu [MBps]	Log reads total [dbps]	Log reads per cpu [dbps]	BuCache read [%]	Elapsed time [s]
14	17	SRV-SCAN	2	2	2	1	0	98	5,750	2,875	737,020	368,510	100.00	303
	18	SRV-SCAN	2	48	26	25	0	74	114,799	2,392	14,670,230	305,630	100.00	308
	19	SRV-SCAN	2	96	51	50	1	49	195,578	2,037	24,432,203	254,502	100.00	307
	20	SRV-SCAN	2	144	75	74	1	25	238,978	1,660	28,979,732	201,248	100.00	308
	21	SRV-SCAN	2	192	98	97	1	2	258,459	1,346	31,078,657	161,868	100.00	307

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Workload SRV-MIXED – Mixed queries and full table scans

kpm_query.sql

Reference System
Single Instance

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Queries total [qps]	Queries per cpu [qps]	Response time [ms]	Log reads total [dbps]	Log reads per cpu [dbps]	BuCache read [%]	Elapsed time [s]
3	2	SRV-MIXED	1	1	2	1	0	98	3,995	3,995	0.250	337,292	337,292	100.00	305
	3	SRV-MIXED	1	24	26	25	0	74	85,853	3,577	0.278	6,821,394	284,225	100.00	305
	4	SRV-MIXED	1	48	51	50	1	49	147,395	3,071	0.323	11,505,111	239,690	100.00	306
	5	SRV-MIXED	1	72	76	75	1	24	173,132	2,405	0.408	13,404,486	186,173	100.00	309
	6	SRV-MIXED	1	96	98	97	1	2	197,922	2,062	0.480	15,272,921	159,093	100.00	307

Reference System
2-node Cluster

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Queries total [qps]	Queries per cpu [qps]	Response time [ms]	Log reads total [dbps]	Log reads per cpu [dbps]	BuCache read [%]	Elapsed time [s]
15	2	SRV-MIXED	2	2	2	1	0	98	9,038	4,519	0.221	764,690	382,345	100.00	303
	3	SRV-MIXED	2	48	26	25	0	74	169,143	3,524	0.281	13,409,862	279,372	100.00	305
	4	SRV-MIXED	2	96	51	50	1	49	293,109	3,053	0.324	22,993,656	239,517	100.00	306
	5	SRV-MIXED	2	144	76	74	1	24	354,500	2,462	0.401	27,589,577	191,594	100.00	308
	6	SRV-MIXED	2	192	98	97	1	2	389,996	2,031	0.487	30,529,190	159,006	100.00	307

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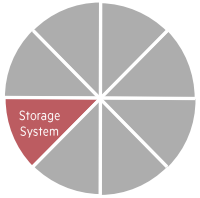
Swiss precision in performance measurement.

Storage System Performance



Workload STO-READ – Sequential Read

kpm_ioread.sql

Reference System
Single Instance

Run	Test	Workload	Wri [%]	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Phys reads total [IOPS]	IO time read [ms]	Phys reads total [MBps]	Phys reads FlCache [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
4	1	STO-READ	0	1	1	1	2	1	0	98	0	188	1.269	185	185	100.00	0.00	337
	2	STO-READ	0	1	4	1	3	2	1	97	0	3,534	0.664	3,517	3,517	100.00	0.00	364
	3	STO-READ	0	1	8	1	5	4	1	95	0	4,678	1.114	4,665	4,665	100.00	0.00	328
	4	STO-READ	0	1	12	1	4	3	1	96	0	4,235	1.457	4,225	4,225	100.00	0.00	466
	5	STO-READ	0	1	16	1	6	5	1	94	0	4,611	1.968	4,599	4,599	100.00	0.00	482
	6	STO-READ	0	1	20	1	5	4	1	95	0	5,039	2.904	5,028	5,028	100.00	0.00	429
	7	STO-READ	0	1	24	1	4	3	1	96	0	5,235	3.594	5,224	5,224	100.00	0.00	473

Reference System
2-node Cluster

Run	Test	Workload	Wri [%]	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Phys reads total [IOPS]	IO time read [ms]	Phys reads total [MBps]	Phys reads FlCache [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
16	1	STO-READ	0	2	2	1	2	1	0	98	0	399	1.280	388	388	100.00	0.00	368
	2	STO-READ	0	2	8	1	4	3	1	96	0	3,913	0.885	3,877	3,877	100.00	0.00	360
	3	STO-READ	0	2	16	1	4	3	1	96	0	7,791	1.268	7,761	7,761	100.00	0.00	369
	4	STO-READ	0	2	24	1	5	4	1	95	0	8,953	1.689	8,922	8,922	100.00	0.00	374
	5	STO-READ	0	2	32	1	6	5	1	94	0	9,042	2.263	9,001	9,001	100.00	0.00	378

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Workload STO-OFFLOAD – Sequential Read using offload technology

kpm_ioread.sql

Reference System
Single Instance

Run	Test	Workload	Wri [%]	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Phys reads total [IOPS]	IO time read [ms]	Phys reads total [MBps]	Phys reads FlCache [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
4	33	STO-OFFLOAD	0	1	1	1	2	1	0	98	0	68,681	0.280	68,560	68,560	100.00	0.00	300
	34	STO-OFFLOAD	0	1	4	1	2	1	1	98	0	73,448	0.601	73,343	73,343	100.00	0.00	300
	35	STO-OFFLOAD	0	1	8	1	2	1	1	98	0	73,721	0.724	73,615	73,615	100.00	0.00	302
	36	STO-OFFLOAD	0	1	12	1	3	1	1	97	0	73,726	0.704	67,416	73,620	109.20	0.00	302
	37	STO-OFFLOAD	0	1	16	1	3	1	1	97	0	72,954	0.915	72,848	72,848	100.00	0.00	304
	38	STO-OFFLOAD	0	1	20	1	3	1	1	97	0	72,766	1.193	72,661	72,661	100.00	0.00	303

Reference System
2-node Cluster

Run	Test	Workload	Wri [%]	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Phys reads total [IOPS]	IO time read [ms]	Phys reads total [MBps]	Phys reads FlCache [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
16	33	STO-OFFLOAD	0	2	2	1	1	1	0	99	0	72,271	0.450	72,106	72,106	100.00	0.00	300
	34	STO-OFFLOAD	0	2	8	1	2	1	1	98	0	73,925	0.557	73,781	73,781	100.00	0.00	301
	35	STO-OFFLOAD	0	2	16	1	2	1	1	98	0	73,708	0.865	73,552	73,552	100.00	0.00	302
	36	STO-OFFLOAD	0	2	24	1	2	1	1	98	0	73,698	1.418	73,553	73,553	100.00	0.00	303
	37	STO-OFFLOAD	0	2	32	1	2	1	1	98	0	73,872	2.130	73,727	73,727	100.00	0.00	303

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Workload STO-RANDOM – Random I/O, 100% read

kpm_ioread.sql

Reference System
Single Instance

Run	Test	Workload	Wri [%]	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Phys reads total [IOPS]	IO time read [ms]	Phys reads total [MBps]	Phys reads FlCache [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
4	65	STO-RANDOM	0	1	1	1	2	2	1	98	0	19,139	0.247	150	150	100.00	6.32	301
	68	STO-RANDOM	0	1	24	1	29	21	5	71	0	356,461	0.299	2,785	2,785	100.00	2.12	304
	71	STO-RANDOM	0	1	48	1	54	40	9	46	0	574,711	0.560	4,490	4,490	100.00	2.34	303
	74	STO-RANDOM	0	1	72	1	71	52	12	29	0	661,310	1.213	5,166	5,166	100.00	2.67	303
	77	STO-RANDOM	0	1	96	1	78	58	14	22	0	693,802	2.259	5,420	5,420	100.00	2.69	302
	79	STO-RANDOM	0	1	112	1	80	60	14	20	0	709,596	3.190	5,544	5,544	100.00	2.71	302

Reference System
2-node Cluster

Run	Test	Workload	Wri [%]	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Phys reads total [IOPS]	IO time read [ms]	Phys reads total [MBps]	Phys reads FlCache [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
16	65	STO-RANDOM	0	2	2	1	2	1	1	98	0	41,172	0.235	325	325	100.00	5.86	305
	67	STO-RANDOM	0	2	32	1	22	15	5	78	0	554,914	0.316	4,372	4,372	100.00	2.39	304
	69	STO-RANDOM	0	2	64	1	36	25	7	64	0	970,583	0.489	7,638	7,638	100.00	3.05	304
	71	STO-RANDOM	0	2	96	1	43	29	9	57	0	1,187,018	0.865	9,339	9,339	100.00	3.43	303
	73	STO-RANDOM	0	2	128	1	49	33	11	51	0	1,251,787	1.302	9,848	9,848	100.00	3.66	304
	75	STO-RANDOM	0	2	160	1	54	37	12	46	0	1,326,214	2.010	10,434	10,434	100.00	3.82	303
	76	STO-RANDOM	0	2	176	1	56	38	13	44	0	1,351,334	2.425	10,632	10,632	100.00	3.85	303

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Workload STO-RANDOM – Random I/O, 80% read, 20% write

kpm_ioread.sql

Reference System
Single Instance

Run	Test	Workload	Wri [%]	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Phys reads total [IOPS]	IO time read [ms]	Phys reads total [MBps]	Phys reads FlCache [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
4	97	STO-RANDOM	20	1	1	1	2	1	0	98	0	14,747	0.253	115	115	100.00	21.69	303
	98	STO-RANDOM	20	1	8	1	10	7	2	90	0	100,508	0.255	785	785	100.00	16.68	303
	99	STO-RANDOM	20	1	16	1	19	14	3	81	0	181,679	0.282	1,419	1,419	100.00	17.11	304
	100	STO-RANDOM	20	1	24	1	27	21	4	73	0	252,038	0.316	1,969	1,969	100.00	17.12	303
	101	STO-RANDOM	20	1	32	1	34	27	5	66	0	301,938	0.360	2,359	2,359	100.00	17.05	303
	102	STO-RANDOM	20	1	40	1	42	33	6	58	0	344,075	0.403	2,688	2,688	100.00	17.58	303

Reference System
2-node Cluster

Run	Test	Workload	Wri [%]	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Phys reads total [IOPS]	IO time read [ms]	Phys reads total [MBps]	Phys reads FlCache [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
16	97	STO-RANDOM	20	2	2	1	2	1	1	98	0	32,539	0.238	257	257	100.00	19.45	304
	99	STO-RANDOM	20	2	32	1	18	14	3	82	0	385,576	0.307	2,938	2,938	100.00	17.81	304
	100	STO-RANDOM	20	2	48	1	26	19	4	74	0	521,763	0.361	4,110	4,110	100.00	17.95	303
	101	STO-RANDOM	20	2	64	1	31	24	5	69	0	604,518	0.406	4,760	4,760	100.00	18.17	303
	102	STO-RANDOM	20	2	80	1	34	26	5	66	0	624,930	0.432	4,921	4,921	100.00	18.44	304
	103	STO-RANDOM	20	2	96	1	38	29	6	62	0	661,397	0.478	5,208	5,208	100.00	18.73	304

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Workload STO-SCATTER – Random Write foreground processes

kpm_iowrite.sql

Reference System
Single Instance

Run	Test	Workload	Wri [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Phys writes total [dbps]	Phys writes total [IOPS]	Phys writes total [MBps]	Phys writes FlCache [MBps]	FlCache write [%]	Elapsed time [s]
4	129	STO-SCATTER	N/A	1	1	2	1	1	98	0	51,323	12,824	402	402	100.00	302
	130	STO-SCATTER	N/A	1	4	6	3	2	94	0	174,077	43,474	1,363	1,363	100.00	302
	131	STO-SCATTER	N/A	1	8	11	5	4	89	0	277,268	69,203	2,171	2,171	100.00	302
	132	STO-SCATTER	N/A	1	12	14	7	5	86	0	280,874	70,113	2,199	2,199	100.00	302
	133	STO-SCATTER	N/A	1	16	17	8	6	83	0	298,197	74,456	2,335	2,335	100.00	302
	134	STO-SCATTER	N/A	1	20	23	11	9	77	0	357,313	89,220	2,798	1,968	70.35	302

Reference System
2-node Cluster

Run	Test	Workload	Wri [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Phys writes total [dbps]	Phys writes total [IOPS]	Phys writes total [MBps]	Phys writes FlCache [MBps]	FlCache write [%]	Elapsed time [s]
16	129	STO-SCATTER	N/A	2	2	2	1	1	98	0	99,128	24,831	776	776	100.00	302
	131	STO-SCATTER	N/A	2	16	9	4	3	91	0	397,184	99,201	3,110	3,110	100.00	302
	132	STO-SCATTER	N/A	2	24	10	5	4	90	0	418,514	104,551	3,277	3,277	100.00	302
	133	STO-SCATTER	N/A	2	32	12	6	4	88	0	435,876	108,985	3,416	3,415	99.98	303
	134	STO-SCATTER	N/A	2	40	13	6	5	87	0	461,411	115,468	3,618	3,618	100.00	303
	135	STO-SCATTER	N/A	2	48	14	7	5	86	0	471,613	118,063	3,698	3,698	100.00	303
	136	STO-SCATTER	N/A	2	56	14	7	5	86	0	478,482	119,829	3,752	3,752	100.00	303

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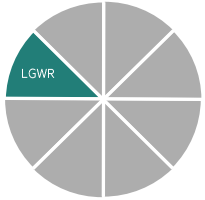
Swiss precision in performance measurement.

Log Writer Performance



Workload LGWR-LAT – Small transactions, max commit throughput, low commit latency

kpm_lgwr.sql

Reference System
Single Instance

Run	Test	Workload	REDO size [kBpt]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	#prc LGWR	Commit thrput [tps]	Commit latency [ms]	LogFile sync [ms]	REDO data [rbps]	REDO data [IOPS]	REDO data [MBps]	FlCache write [%]	Elapsed time [s]
5	1	LGWR-LAT	1	1	1	2	1	0	98	0	9	3,798	0.263	0.180	11,521	3,805	5	99.98	301
	4	LGWR-LAT	1	1	36	8	7	1	92	0	9	51,396	0.700	0.584	155,312	2,872	64	100.00	302
	7	LGWR-LAT	1	1	72	15	13	1	85	0	9	83,157	0.866	0.725	235,686	2,323	103	100.00	303
	10	LGWR-LAT	1	1	108	20	18	2	80	0	9	106,455	1.014	0.858	291,913	1,981	131	100.00	301
	13	LGWR-LAT	1	1	144	22	20	2	78	0	9	117,724	1.223	1.054	318,020	1,636	144	100.00	303
	16	LGWR-LAT	1	1	180	27	24	2	73	0	9	128,528	1.399	1.221	342,331	1,253	157	100.00	301
	19	LGWR-LAT	1	1	216	29	25	3	71	0	9	139,241	1.548	1.363	367,808	1,005	170	99.88	304
	22	LGWR-LAT	1	1	252	33	29	3	67	0	9	144,767	1.733	1.536	380,933	883	177	100.00	303

Reference System
2-node Cluster

Run	Test	Workload	REDO size [kBpt]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	#prc LGWR	Commit thrput [tps]	Commit latency [ms]	LogFile sync [ms]	REDO data [rbps]	REDO data [IOPS]	REDO data [MBps]	FlCache write [%]	Elapsed time [s]
17	1	LGWR-LAT	1	2	2	2	1	1	98	0	18	5,726	0.349	0.248	17,353	5,738	7	100.00	301
	4	LGWR-LAT	1	2	72	9	7	1	91	0	18	95,375	0.753	0.632	294,600	8,227	119	100.00	302
	7	LGWR-LAT	1	2	144	15	13	2	85	0	18	159,672	0.897	0.756	459,884	6,895	197	100.00	303
	10	LGWR-LAT	1	2	216	21	18	2	79	0	18	207,914	1.033	0.875	578,230	5,997	256	100.00	302
	13	LGWR-LAT	1	2	288	25	22	2	75	0	18	245,041	1.170	0.999	667,606	5,047	300	100.00	304
	16	LGWR-LAT	1	2	360	29	26	3	71	0	18	269,261	1.333	1.154	723,729	4,288	330	100.00	303
	19	LGWR-LAT	1	2	432	32	28	3	68	0	18	288,047	1.497	1.310	770,651	3,819	352	100.00	302
	20	LGWR-LAT	1	2	456	33	29	3	67	0	18	292,177	1.554	1.365	780,793	3,694	357	100.00	302

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Workload LGWR-THR – Maximum log writer throughput

kpm_lgwr.sql

Reference System
Single Instance

Run	Test	Workload	REDO size [kBpt]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	#prc LGWR	Commit thrput [tps]	Commit latency [ms]	LogFile sync [ms]	REDO data [rbps]	REDO data [IOPS]	REDO data [MBps]	FlCache write [%]	Elapsed time [s]
5	65	LGWR-THR	N/A	1	1	2	2	0	98	0	9	3	337.956	3.868	242,731	57	115	99.77	301
	67	LGWR-THR	N/A	1	8	12	10	1	88	0	9	18	436.619	3.486	1,486,255	497	702	99.66	302
	69	LGWR-THR	N/A	1	16	18	15	3	82	0	9	26	613.077	23.459	2,040,672	422	964	90.15	304
	71	LGWR-THR	N/A	1	24	23	19	3	77	0	9	32	751.035	48.595	2,441,891	356	1,154	60.01	304
	73	LGWR-THR	N/A	1	32	25	21	3	75	0	9	37	862.784	61.875	2,781,305	267	1,314	42.51	305
	74	LGWR-THR	N/A	1	36	25	21	3	75	0	9	37	956.526	61.484	2,757,057	252	1,303	43.45	304

Reference System
2-node Cluster

Run	Test	Workload	REDO size [kBpt]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	#prc LGWR	Commit thrput [tps]	Commit latency [ms]	LogFile sync [ms]	REDO data [rbps]	REDO data [IOPS]	REDO data [MBps]	FlCache write [%]	Elapsed time [s]
17	65	LGWR-THR	N/A	2	2	2	2	0	98	0	18	5	427.906	3.635	376,030	118	178	100.00	303
	67	LGWR-THR	N/A	2	16	12	10	1	88	0	18	30	531.325	17.062	2,409,565	654	1,138	100.00	304
	69	LGWR-THR	N/A	2	32	17	14	2	83	0	18	41	765.283	67.365	3,187,441	578	1,506	99.37	304
	71	LGWR-THR	N/A	2	48	23	18	4	77	0	18	50	956.495	44.939	3,798,952	793	1,762	88.29	304
	73	LGWR-THR	N/A	2	64	27	22	4	73	0	18	58	1,097.424	94.777	4,266,403	580	2,016	69.58	304
	75	LGWR-THR	N/A	2	80	29	23	4	71	0	18	62	1,272.447	73.578	4,449,570	581	2,102	54.26	305

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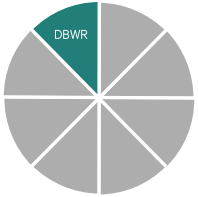
Database Writer Performance



Workload DBWR-THR – Maximum database writer throughput

kpm_dbwr.sql

Reference System
Single Instance

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	#prc DBWR	Completed check points	Phys writes total [dbps]	Phys writes total [IOPS]	Phys writes total [MBps]	REDO data [MBps]	Phys writes FlCache [MBps]	FlCache write [%]	Elapsed time [s]
6	1	DBWR-THR	1	1	2	2	0	98	0	12	2	21,982	1,973	216	17	178	82.37	302
	3	DBWR-THR	1	8	13	11	1	87	0	12	6	176,359	16,060	1,507	124	1,507	100.00	301
	5	DBWR-THR	1	16	18	15	2	82	0	12	8	225,113	21,894	1,926	161	1,920	99.68	302
	7	DBWR-THR	1	24	22	19	2	78	0	12	9	259,699	28,153	2,232	195	2,202	98.65	302
	9	DBWR-THR	1	32	32	27	3	68	0	12	12	342,637	34,394	2,944	256	1,807	61.39	303
	11	DBWR-THR	1	40	46	41	3	54	0	12	16	465,538	54,998	4,011	361	531	13.23	302

Reference System
2-node Cluster

Run	Test	Workload	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	#prc DBWR	Completed check points	Phys writes total [dbps]	Phys writes total [IOPS]	Phys writes total [MBps]	REDO data [MBps]	Phys writes FlCache [MBps]	FlCache write [%]	Elapsed time [s]
18	1	DBWR-THR	2	2	3	2	0	97	0	24	4	31,452	2,894	277	24	274	99.17	301
	3	DBWR-THR	2	16	15	12	2	85	0	24	10	292,508	28,534	2,476	175	2,476	100.00	302
	5	DBWR-THR	2	32	23	19	2	77	0	24	16	424,318	39,590	3,646	289	3,646	100.00	303
	7	DBWR-THR	2	48	27	23	3	73	0	24	17	467,361	49,305	4,018	326	4,004	99.65	303
	9	DBWR-THR	2	64	30	25	3	70	0	24	18	512,545	56,210	4,412	367	4,272	96.83	303
	10	DBWR-THR	2	72	32	27	3	68	0	24	18	513,851	55,436	4,452	369	4,341	97.51	303

Notes

- Oracle DBWR processes use asynchronous multiblock write operations. The ratio of [dbps] and [IOPS] show the average number of blocks per I/O.
- Oracle does not provide an accurate service time for random write operations..

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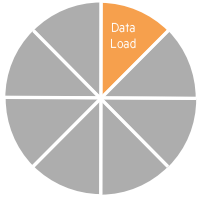
Data Load Performance



Workload DL-BUFFER – Transactional data load via buffer cache

kpm_dl.sql

Reference System
Single Instance

Run	Test	Workload	TXN size [rpt]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Load rate total [rps]	Load rate total [MBps]	Phys writes total [IOPS]	Phys writes total [MBps]	REDO data [MBps]	FlCache write [%]	Elapsed time [s]
7	1	DL-BUFFER	5	1	1	2	1	0	98	0	13,944	4	2,894	21	12	99.47	302
	4	DL-BUFFER	5	1	24	9	8	1	91	0	160,536	46	6,136	248	138	100.00	303
	7	DL-BUFFER	5	1	48	15	13	1	85	0	253,722	73	6,560	403	218	100.00	301
	10	DL-BUFFER	5	1	72	19	17	1	81	0	311,414	89	8,362	576	267	90.63	304
	13	DL-BUFFER	5	1	96	23	20	2	77	0	351,409	101	9,555	599	301	100.00	302
	16	DL-BUFFER	5	1	120	26	23	2	74	0	373,722	107	10,819	727	320	88.82	302
	19	DL-BUFFER	5	1	144	29	26	2	71	0	386,081	110	12,773	686	330	100.00	303

Reference System
2-node Cluster

Run	Test	Workload	TXN size [rpt]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Load rate total [rps]	Load rate total [MBps]	Phys writes total [IOPS]	Phys writes total [MBps]	REDO data [MBps]	FlCache write [%]	Elapsed time [s]
19	1	DL-BUFFER	5	2	2	2	1	1	98	0	25,106	7	5,222	38	22	100.00	302
	4	DL-BUFFER	5	2	48	10	8	1	90	0	283,996	81	12,073	461	244	100.00	303
	7	DL-BUFFER	5	2	96	15	13	2	85	0	465,360	133	14,180	825	399	96.72	303
	10	DL-BUFFER	5	2	144	20	17	2	80	0	581,250	166	18,674	1,043	498	100.00	302
	13	DL-BUFFER	5	2	192	23	21	2	77	0	661,636	189	18,898	1,221	567	95.59	304
	16	DL-BUFFER	5	2	240	27	24	2	73	0	716,776	205	21,418	1,277	613	100.00	303
	17	DL-BUFFER	5	2	256	28	25	2	72	0	724,587	207	22,049	1,312	620	100.00	303

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Workload DL-DIRECT – Bulk data load bypassing the buffer cache

kpm_dl.sql

Reference System
Single Instance

Run	Test	Workload	TXN size [rpt]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Load rate total [rps]	Load rate total [MBps]	Phys writes total [IOPS]	Phys writes total [MBps]	REDO data [MBps]	FlCache write [%]	Elapsed time [s]
7	33	DL-DIRECT	N/A	1	1	2	2	0	98	0	192,591	55	1,769	201	21	100.00	301
	34	DL-DIRECT	N/A	1	4	6	5	1	94	0	726,076	208	5,206	655	67	100.00	301
	35	DL-DIRECT	N/A	1	8	10	9	1	90	0	1,304,308	373	8,343	1,118	119	100.00	302
	36	DL-DIRECT	N/A	1	12	13	12	1	87	0	1,663,769	476	10,485	1,380	158	98.04	303
	37	DL-DIRECT	N/A	1	16	17	15	1	83	0	2,080,716	595	12,579	1,872	188	88.46	303
	38	DL-DIRECT	N/A	1	20	20	18	2	80	0	2,293,580	656	12,691	1,879	205	94.23	302
	39	DL-DIRECT	N/A	1	24	22	20	2	78	0	2,459,703	704	11,536	1,800	207	97.00	303

Reference System
2-node Cluster

Run	Test	Workload	TXN size [rpt]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Load rate total [rps]	Load rate total [MBps]	Phys writes total [IOPS]	Phys writes total [MBps]	REDO data [MBps]	FlCache write [%]	Elapsed time [s]
19	33	DL-DIRECT	N/A	2	2	2	2	0	98	0	409,246	117	2,152	336	41	100.00	302
	35	DL-DIRECT	N/A	2	16	11	9	1	89	0	2,709,196	775	17,228	2,348	246	100.00	303
	36	DL-DIRECT	N/A	2	24	15	13	1	85	0	3,530,331	1,010	22,547	3,109	330	96.53	304
	37	DL-DIRECT	N/A	2	32	18	16	2	82	0	4,230,996	1,210	25,103	3,609	383	95.52	304
	38	DL-DIRECT	N/A	2	40	21	19	2	79	0	4,539,403	1,299	24,360	3,535	386	96.95	304
	39	DL-DIRECT	N/A	2	48	23	20	2	77	0	4,669,246	1,336	23,992	3,425	395	100.00	303
	40	DL-DIRECT	N/A	2	56	24	21	2	76	0	4,690,454	1,342	22,740	3,366	384	100.00	303

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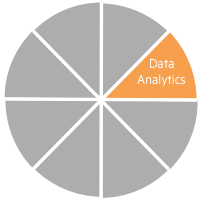
Data Analytics Performance



Workload DA-STORAGE – Data analytics query using conventional storage technology

kpm_da.sql

Reference System
Single Instance

Run	Test	Workload	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Scan rate total [rps]	Scan rate per cpu [rps]	Scan rate total [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
8	1	DA-STORAGE	1	1	1	2	1	0	98	0	695,558	695,558	235	100.00	0.00	302
	2	DA-STORAGE	1	8	1	4	2	1	96	0	16,322,160	2,040,270	5,529	100.00	0.00	301
	3	DA-STORAGE	1	16	1	3	2	1	97	0	19,017,685	1,188,605	6,251	100.00	0.00	302
	4	DA-STORAGE	1	24	1	4	2	1	96	0	19,200,532	800,022	6,260	100.00	0.00	302
	5	DA-STORAGE	1	32	1	4	2	1	96	0	19,405,249	606,414	6,255	100.00	0.00	305

Reference System
2-node Cluster

Run	Test	Workload	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Scan rate total [rps]	Scan rate per cpu [rps]	Scan rate total [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
20	1	DA-STORAGE	2	2	1	3	2	0	97	0	1,134,358	567,179	387	100.00	0.00	304
	2	DA-STORAGE	2	16	1	4	3	1	96	0	31,743,947	1,983,997	10,393	100.00	0.00	301
	3	DA-STORAGE	2	32	1	3	2	1	97	0	35,691,055	1,115,345	11,223	100.00	0.00	301
	4	DA-STORAGE	2	48	1	4	3	1	96	0	38,152,254	794,839	11,485	100.00	0.00	302
	5	DA-STORAGE	2	64	1	4	2	1	96	0	37,986,930	593,546	11,746	100.00	0.00	302
	6	DA-STORAGE	2	80	1	4	3	1	96	0	39,700,766	496,260	11,887	100.00	0.00	303

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Workload DA-OFFLOAD – Data analytics query using offload storage technology

kpm_da.sql

Reference System
Single Instance

Run	Test	Workload	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Scan rate total [rps]	Scan rate per cpu [rps]	Scan rate total [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
8	33	DA-OFFLOAD	1	1	1	1	1	0	99	0	77,940,521	77,940,521	26,514	100.00	0.00	300
	34	DA-OFFLOAD	1	8	1	2	1	1	98	0	203,647,408	25,455,926	69,273	100.00	0.00	300
	35	DA-OFFLOAD	1	16	1	2	1	1	98	0	210,940,374	13,183,773	71,753	100.00	0.00	300
	36	DA-OFFLOAD	1	24	1	2	1	1	98	0	212,136,859	8,839,036	72,160	100.00	0.00	300
	37	DA-OFFLOAD	1	32	1	3	1	1	97	0	212,431,046	6,638,470	72,260	100.00	0.00	300

Reference System
2-node Cluster

Run	Test	Workload	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Scan rate total [rps]	Scan rate per cpu [rps]	Scan rate total [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
20	33	DA-OFFLOAD	2	2	1	1	1	0	99	0	90,350,532	45,175,266	30,765	100.00	0.00	300
	34	DA-OFFLOAD	2	16	1	2	1	1	98	0	209,699,773	13,106,236	71,397	100.00	0.00	300
	35	DA-OFFLOAD	2	32	1	2	1	1	98	0	211,786,810	6,618,338	72,107	100.00	0.00	300
	36	DA-OFFLOAD	2	48	1	2	1	1	98	0	212,079,723	4,418,328	72,207	100.00	0.00	300

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Workload DA-ROWSTORE – Data analytics query using buffer cache row store

kpm_da.sql

Reference System
Single Instance

Run	Test	Workload	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Scan rate total [rps]	Scan rate per cpu [rps]	Scan rate total [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
8	97	DA-ROWSTORE	1	1	1	2	2	0	98	0	9,391,197	9,391,197	2,839	0.00	100.00	302
	98	DA-ROWSTORE	1	24	1	26	25	0	74	0	191,359,879	7,973,328	57,808	0.00	100.00	303
	99	DA-ROWSTORE	1	48	1	51	50	0	49	0	325,070,881	6,772,310	98,199	0.00	100.00	303
	100	DA-ROWSTORE	1	72	1	75	74	1	25	0	397,065,145	5,514,794	119,945	0.00	100.00	303
	101	DA-ROWSTORE	1	96	1	97	96	1	3	0	427,947,401	4,457,785	129,274	0.00	100.00	303

Reference System
2-node Cluster

Run	Test	Workload	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Scan rate total [rps]	Scan rate per cpu [rps]	Scan rate total [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
20	97	DA-ROWSTORE	2	2	1	2	2	0	98	0	18,454,052	9,227,026	5,584	0.00	100.00	301
	98	DA-ROWSTORE	2	48	1	26	25	0	74	0	378,710,451	7,889,801	114,405	0.00	100.00	303
	99	DA-ROWSTORE	2	96	1	51	50	1	49	0	642,406,677	6,691,736	194,057	0.00	100.00	304
	100	DA-ROWSTORE	2	144	1	75	74	1	25	0	786,123,110	5,459,188	237,466	0.00	100.00	303
	101	DA-ROWSTORE	2	192	1	97	96	1	3	0	836,117,159	4,354,777	252,568	0.00	100.00	303

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Workload DA-COLSTORE – Data analytics query using buffer cache column store

kpm_da.sql

Reference System
Single Instance

Run	Test	Workload	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Scan rate total [rps]	Scan rate per cpu [rps]	Scan rate total [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
8	65	DA-COLSTORE	1	1	1	2	2	0	98	0	5,227,419,798	5,227,419,798	1,792,168	0.00	99.65	302
	66	DA-COLSTORE	1	8	1	9	9	0	91	0	28,861,674,739	3,607,709,342	9,894,932	0.00	100.00	303
	67	DA-COLSTORE	1	16	1	18	17	0	82	0	45,538,815,763	2,846,175,985	15,612,520	0.00	100.00	303
	68	DA-COLSTORE	1	24	1	26	25	0	74	0	52,032,296,158	2,168,012,340	17,838,744	0.00	100.00	303
	69	DA-COLSTORE	1	32	1	35	34	1	65	0	60,988,392,369	1,905,887,262	20,909,251	0.00	100.00	303
	70	DA-COLSTORE	1	40	1	43	42	1	57	0	64,854,779,332	1,621,369,483	22,234,802	0.00	100.00	303
	71	DA-COLSTORE	1	48	1	52	50	1	48	0	68,092,356,367	1,418,590,758	23,344,773	0.00	100.00	303

Reference System
2-node Cluster

Run	Test	Workload	Nodes	Jobs	DOP	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	Scan rate total [rps]	Scan rate per cpu [rps]	Scan rate total [MBps]	FlCache read [%]	BuCache read [%]	Elapsed time [s]
20	65	DA-COLSTORE	2	2	1	2	2	0	98	0	9,567,590,407	4,783,795,204	3,352,768	0.00	100.00	301
	67	DA-COLSTORE	2	32	1	18	17	0	82	0	101,116,296,930	3,159,884,279	35,434,152	0.00	100.00	303
	69	DA-COLSTORE	2	64	1	34	33	1	66	0	131,474,258,316	2,054,285,286	46,072,483	0.00	100.00	302
	70	DA-COLSTORE	2	80	1	43	42	1	57	0	134,928,271,289	1,686,603,391	47,282,872	0.00	100.00	302
	71	DA-COLSTORE	2	96	1	52	50	1	48	0	138,226,502,624	1,439,859,402	48,438,670	0.00	100.00	303
	72	DA-COLSTORE	2	112	1	60	58	1	40	0	143,434,136,826	1,280,661,936	50,263,580	0.00	100.00	303
	73	DA-COLSTORE	2	128	1	68	66	1	32	0	145,870,272,267	1,139,611,502	51,117,274	0.00	100.00	303

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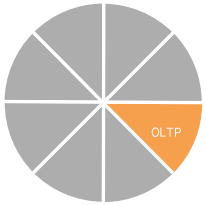
Swiss precision in performance measurement.

Online Transaction Processing Performance



Workload TP-REPORT – Online Report, Ø 25 rows per query

kpm_tp.sql

Reference System
Single Instance

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
10	2	TP-REPORT	N/A	1	1	2	1	0	98	0	0	0.000	747	1.339	34.97	99.96	83.14	302
	3	TP-REPORT	N/A	1	10	10	7	2	90	0	0	0.000	4,914	2.027	22.72	100.00	99.82	303
	4	TP-REPORT	N/A	1	20	18	12	4	82	0	0	0.000	9,130	2.180	21.72	100.00	99.99	303
	5	TP-REPORT	N/A	1	30	26	18	5	74	0	0	0.000	23,836	1.251	59.81	100.00	100.00	303

Reference System
2-node Cluster

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
22	2	TP-REPORT	N/A	2	2	2	1	1	98	0	0	0.000	1,603	1.247	51.08	100.00	99.93	302
	5	TP-REPORT	N/A	2	48	20	13	5	80	0	0	0.000	27,002	1.770	39.23	100.00	99.99	303
	8	TP-REPORT	N/A	2	96	36	22	9	64	0	0	0.000	43,269	2.209	37.04	100.00	100.00	303
	11	TP-REPORT	N/A	2	144	45	28	12	55	0	0	0.000	51,772	2.769	34.59	99.34	100.00	303
	14	TP-REPORT	N/A	2	192	50	31	13	50	0	0	0.000	63,227	3.021	38.72	100.00	100.00	303
	17	TP-REPORT	N/A	2	240	56	35	15	44	0	0	0.000	67,675	3.528	38.58	100.00	100.00	304

Note:
The workload TP-REPORT uses a simple SELECT statement without locking; therefore, it is not a transaction.

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Workload TP-LOOKUP – Look-up query, 1 row per query

kpm_tp.sql

Reference System
Single Instance

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
10	34	TP-LOOKUP	N/A	1	1	1	1	0	99	0	0	0.000	9,427	0.106	92.96	100.00	99.52	303
	36	TP-LOOKUP	N/A	1	20	22	21	0	78	0	0	0.000	1,308,326	0.015	100.00	99.83	100.00	302
	37	TP-LOOKUP	N/A	1	30	32	31	0	68	0	0	0.000	1,733,929	0.017	100.00	100.00	98.66	302
	38	TP-LOOKUP	N/A	1	40	42	41	1	58	0	0	0.000	2,032,749	0.020	100.00	100.00	100.00	302
	39	TP-LOOKUP	N/A	1	50	53	52	1	47	0	0	0.000	2,225,610	0.022	100.00	100.00	99.17	304
	40	TP-LOOKUP	N/A	1	60	63	62	1	37	0	0	0.000	2,299,664	0.026	100.00	100.00	100.00	303
	41	TP-LOOKUP	N/A	1	70	73	71	1	27	0	0	0.000	2,321,168	0.030	100.00	99.89	100.00	304

Reference System
2-node Cluster

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
22	34	TP-LOOKUP	N/A	2	2	2	1	0	98	0	0	0.000	15,993	0.125	92.79	100.00	99.73	303
	35	TP-LOOKUP	N/A	2	16	9	8	0	91	0	0	0.000	1,098,394	0.014	99.94	100.00	100.00	304
	36	TP-LOOKUP	N/A	2	32	18	17	0	82	0	0	0.000	2,179,101	0.015	100.00	100.50	100.00	302
	37	TP-LOOKUP	N/A	2	48	26	25	0	74	0	0	0.000	3,116,597	0.015	100.00	100.01	99.44	302
	38	TP-LOOKUP	N/A	2	64	34	33	0	66	0	0	0.000	3,625,336	0.018	100.00	100.27	100.00	302
	39	TP-LOOKUP	N/A	2	80	42	41	1	58	0	0	0.000	4,049,787	0.020	100.00	100.49	100.00	302
	40	TP-LOOKUP	N/A	2	96	51	50	1	49	0	0	0.000	4,477,406	0.021	100.00	100.58	100.03	302
	41	TP-LOOKUP	N/A	2	112	59	58	1	41	0	0	0.000	4,541,663	0.024	100.00	100.59	100.00	304

Note:
The workload TP-LOOKUP uses a simple SELECT statement without locking; therefore, it is not a transaction.

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Workload TP-LIGHT – Light transaction, 1 row per transaction, 20% updates

kpm_tp.sql

Reference System Single Instance

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
9	2	TP-LIGHT	20	1	1	2	1	0	98	0	994	1.006	1,211	0.826	79.33	100.00	100.00	302
	6	TP-LIGHT	20	1	40	27	19	6	73	0	38,897	1.022	47,046	0.845	87.05	100.00	100.00	303
	10	TP-LIGHT	20	1	80	38	27	7	62	0	61,998	1.284	74,541	1.068	88.88	100.00	100.00	303
	14	TP-LIGHT	20	1	120	48	36	9	52	0	81,793	1.462	98,476	1.214	88.96	100.00	99.99	303
	18	TP-LIGHT	20	1	160	56	42	10	44	0	94,773	1.683	113,984	1.399	88.93	100.00	100.00	302
	22	TP-LIGHT	20	1	200	63	48	11	37	0	103,141	1.933	124,109	1.606	88.92	100.00	100.00	302
	24	TP-LIGHT	20	1	220	66	50	11	34	0	105,699	2.075	127,200	1.724	88.89	100.00	100.00	302

Reference System 2-node Cluster

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
21	2	TP-LIGHT	20	2	2	2	1	1	98	0	1,869	1.069	2,351	0.850	83.72	100.00	100.00	301
	5	TP-LIGHT	20	2	60	25	18	5	75	0	52,513	1.136	63,139	0.945	90.58	100.00	100.00	303
	8	TP-LIGHT	20	2	120	37	26	8	63	0	87,793	1.360	105,661	1.130	91.22	100.00	100.00	303
	11	TP-LIGHT	20	2	180	48	34	9	52	0	119,070	1.505	143,236	1.251	91.23	100.00	100.00	303
	14	TP-LIGHT	20	2	240	56	40	11	44	0	140,029	1.707	168,463	1.419	91.28	100.00	100.00	303

Notes:

- The workload TP-LIGHT uses a SELECT FOR UPDATE statement; therefore, this SELECT statement is always a transaction.
- The update parameter specifies the number of SELECT statements that are followed by an UPDATE statement.

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Workload TP-MEDIUM – Medium transaction, Ø 25 row per transaction, 20% updates

kpm_tp.sql

Reference System Single Instance

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
9	34	TP-MEDIUM	20	1	1	2	1	1	98	0	329	3.044	445	2.248	66.53	100.00	100.00	302
	36	TP-MEDIUM	20	1	16	24	15	6	76	0	3,853	4.137	4,984	3.198	62.88	100.00	100.00	303
	37	TP-MEDIUM	20	1	24	29	19	7	71	0	5,094	4.695	6,168	3.877	62.13	100.00	100.00	303
	38	TP-MEDIUM	20	1	32	34	22	8	66	0	6,187	5.153	7,534	4.232	62.38	100.00	100.00	303
	39	TP-MEDIUM	20	1	40	39	26	9	61	0	7,036	5.663	8,552	4.659	62.49	100.00	100.00	303
	40	TP-MEDIUM	20	1	48	44	29	10	56	0	8,072	5.920	9,767	4.893	62.74	100.00	100.00	303
	41	TP-MEDIUM	20	1	56	44	30	10	56	0	8,138	6.842	9,909	5.619	63.35	100.00	100.00	303

Reference System 2-node Cluster

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
21	34	TP-MEDIUM	20	2	2	4	2	1	96	0	476	4.203	661	3.027	75.00	100.00	100.00	302
	37	TP-MEDIUM	20	2	48	38	24	9	62	0	7,131	6.706	8,749	5.466	71.60	100.00	100.00	303
	40	TP-MEDIUM	20	2	96	51	33	12	49	0	10,772	8.873	13,507	7.077	71.14	100.00	100.00	303
	43	TP-MEDIUM	20	2	144	58	38	13	42	0	13,326	10.750	16,261	8.809	71.70	100.00	100.00	303
	46	TP-MEDIUM	20	2	192	63	42	14	37	0	15,745	12.119	20,247	9.424	72.96	100.00	100.00	304
	48	TP-MEDIUM	20	2	224	63	43	14	37	0	16,332	13.612	20,462	10.865	73.16	100.00	100.00	304

Notes:

- The workload TP-MEDIUM uses a SELECT FOR UPDATE statement; therefore, this SELECT statement is always a transaction.
- The update parameter specifies the number of SELECT statements that are followed by an UPDATE statement.

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Workload TP-HEAVY – Heavy transaction, Ø 125 row per transaction, 20% updates

kpm_tp.sql

Reference System Single Instance

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
9	66	TP-HEAVY	20	1	1	3	2	1	97	0	130	7.666	177	5.658	68.81	100.00	100.00	302
	67	TP-HEAVY	20	1	8	18	11	4	82	0	784	10.164	982	8.111	63.64	100.00	100.00	302
	68	TP-HEAVY	20	1	16	28	18	6	72	0	1,327	12.014	1,899	8.394	63.66	100.00	100.00	303
	69	TP-HEAVY	20	1	24	37	25	8	63	0	1,750	13.621	2,136	11.158	63.47	100.00	100.00	304
	70	TP-HEAVY	20	1	32	41	28	9	59	0	1,975	16.103	2,655	11.977	63.72	100.00	100.00	304
	71	TP-HEAVY	20	1	40	41	28	9	59	0	1,967	20.223	2,442	16.286	63.98	100.00	100.00	304

Reference System 2-node Cluster

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
21	66	TP-HEAVY	20	2	2	3	2	1	97	0	273	7.314	436	4.590	77.65	100.00	100.00	302
	68	TP-HEAVY	20	2	32	32	20	8	68	0	2,055	15.477	2,644	12.025	71.17	100.00	100.00	304
	70	TP-HEAVY	20	2	64	46	30	10	54	0	3,066	20.725	3,783	16.796	71.92	100.00	99.99	305
	71	TP-HEAVY	20	2	80	50	33	11	50	0	3,389	23.377	4,280	18.512	71.69	100.00	99.99	304
	72	TP-HEAVY	20	2	96	50	33	11	50	0	3,824	24.786	5,248	18.059	71.83	100.00	99.29	306
	73	TP-HEAVY	20	2	112	48	32	11	52	0	4,160	26.637	5,285	20.966	72.79	100.00	99.37	305
	74	TP-HEAVY	20	2	128	48	32	11	52	0	4,203	30.227	5,577	22.780	73.86	100.00	98.93	304

Notes:

- The workload TP-HEAVY uses a SELECT FOR UPDATE statement; therefore, this SELECT statement is always a transaction.
- The update parameter specifies the number of SELECT statements which are followed by an UPDATE statement.

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Workload TP-MIXED1 – Mixed transactions with SELECT, UPDATE and INSERT statements

kpm_tp.sql

Reference System
Single Instance

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
10	66	TP-MIXED1	N/A	1	1	2	1	0	98	0	180	5.570	838	1.193	51.42	100.00	99.99	303
	69	TP-MIXED1	N/A	1	21	20	14	4	80	0	3,224	6.491	14,284	1.465	47.98	100.00	100.00	303
	72	TP-MIXED1	N/A	1	42	36	26	7	64	0	5,363	7.781	23,253	1.795	47.35	100.00	100.00	303
	75	TP-MIXED1	N/A	1	63	51	37	10	49	0	6,829	9.183	29,625	2.117	47.34	100.00	100.00	303
	78	TP-MIXED1	N/A	1	84	62	45	12	38	0	7,760	10.777	33,655	2.485	47.26	100.00	100.00	303
	79	TP-MIXED1	N/A	1	91	65	47	12	35	0	7,773	11.664	34,153	2.655	47.38	100.00	100.00	302

Reference System
2-node Cluster

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
22	66	TP-MIXED1	N/A	2	2	2	1	1	98	0	478	4.164	2,110	0.943	56.32	100.00	99.99	303
	69	TP-MIXED1	N/A	2	42	22	14	5	78	0	7,328	5.706	32,132	1.301	56.35	100.00	100.00	303
	72	TP-MIXED1	N/A	2	84	35	22	8	65	0	11,504	7.272	49,870	1.678	57.94	100.00	100.00	303
	75	TP-MIXED1	N/A	2	126	44	29	10	56	0	14,031	8.945	60,803	2.064	57.46	100.00	100.00	303
	78	TP-MIXED1	N/A	2	168	51	34	12	49	0	15,872	10.540	69,032	2.423	58.05	100.00	100.00	303
	81	TP-MIXED1	N/A	2	210	56	37	13	44	0	17,363	12.041	75,465	2.770	58.29	100.00	100.00	303
	84	TP-MIXED1	N/A	2	252	61	41	14	39	0	18,544	13.520	80,583	3.111	58.11	100.00	100.00	303

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Workload TP-MIXED2 – Mixed transactions with SELECT, UPDATE and INSERT statements

kpm_tp.sql

Reference System Single Instance

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
10	98	TP-MIXED2	N/A	1	1	2	2	1	98	0	289	3.459	1,529	0.654	68.01	99.97	99.14	301
	101	TP-MIXED2	N/A	1	21	21	15	4	79	0	4,805	4.350	22,704	0.921	61.06	100.00	100.00	303
	104	TP-MIXED2	N/A	1	42	39	27	8	61	0	7,776	5.377	36,748	1.138	60.75	100.00	100.00	303
	107	TP-MIXED2	N/A	1	63	52	37	10	48	0	9,646	6.505	45,578	1.377	61.46	100.00	100.00	303
	110	TP-MIXED2	N/A	1	84	61	44	12	39	0	11,130	7.519	52,635	1.590	62.15	100.00	100.00	302
	113	TP-MIXED2	N/A	1	105	68	49	13	32	0	12,097	8.638	57,247	1.825	62.02	100.00	100.00	303
	116	TP-MIXED2	N/A	1	126	73	54	13	27	0	12,702	9.878	60,223	2.084	62.00	100.00	100.00	302

Reference System 2-node Cluster

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
22	98	TP-MIXED2	N/A	2	2	2	1	1	98	0	716	2.790	3,466	0.577	73.52	100.00	100.00	302
	101	TP-MIXED2	N/A	2	42	23	15	5	77	0	10,167	4.110	47,972	0.871	66.60	100.00	100.00	303
	104	TP-MIXED2	N/A	2	84	35	23	8	65	0	15,783	5.302	74,520	1.123	66.71	100.00	100.00	303
	107	TP-MIXED2	N/A	2	126	44	29	10	56	0	19,876	6.316	93,963	1.336	69.35	100.00	100.00	303
	110	TP-MIXED2	N/A	2	168	49	33	11	51	0	21,999	7.613	104,091	1.609	68.90	100.00	100.00	302
	113	TP-MIXED2	N/A	2	210	55	37	12	45	0	24,271	8.610	115,031	1.817	68.80	100.00	99.99	303
	116	TP-MIXED2	N/A	2	252	60	40	13	40	0	26,287	9.535	124,504	2.013	68.96	100.00	100.00	303
	117	TP-MIXED2	N/A	2	266	60	41	13	40	0	26,788	9.882	126,887	2.086	68.96	100.00	100.00	303

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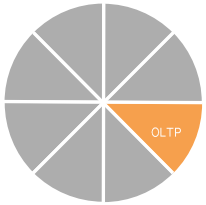
Analysis of Online Transaction Processing Workload TP-MIXEDx



Workload TP-MIXEDx – Mixed transactions with SELECT, UPDATE and INSERT statements

kpm_tp.sql

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
22	66	TP-MIXED1	N/A	2	2	2	1	1	98	0	478	4.164	2,110	0.943	56.32	100.00	99.99	303
	69	TP-MIXED1	N/A	2	42	22	14	5	78	0	7,328	5.706	32,132	1.301	56.35	100.00	100.00	303
	72	TP-MIXED1	N/A	2	84	35	22	8	65	0	11,504	7.272	49,870	1.678	57.94	100.00	100.00	303
	75	TP-MIXED1	N/A	2	126	44	29	10	56	0	14,031	8.945	60,803	2.064	57.46	100.00	100.00	303
	78	TP-MIXED1	N/A	2	168	51	34	12	49	0	15,872	10.540	69,032	2.423	58.05	100.00	100.00	303
	81	TP-MIXED1	N/A	2	210	56	37	13	44	0	17,363	12.041	75,465	2.770	58.29	100.00	100.00	303
	84	TP-MIXED1	N/A	2	252	61	41	14	39	0	18,544	13.520	80,583	3.111	58.11	100.00	100.00	303

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	TXN resp time [ms]	SQL thrput total [sps]	SQL resp time [ms]	BuCache read [%]	FlCache read [%]	FlCache write [%]	Elapsed time [s]
22	98	TP-MIXED2	N/A	2	2	2	1	1	98	0	716	2.790	3,466	0.577	73.52	100.00	100.00	302
	101	TP-MIXED2	N/A	2	42	23	15	5	77	0	10,167	4.110	47,972	0.871	66.60	100.00	100.00	303
	104	TP-MIXED2	N/A	2	84	35	23	8	65	0	15,783	5.302	74,520	1.123	66.71	100.00	100.00	303
	107	TP-MIXED2	N/A	2	126	44	29	10	56	0	19,876	6.316	93,963	1.336	69.35	100.00	100.00	303
	110	TP-MIXED2	N/A	2	168	49	33	11	51	0	21,999	7.613	104,091	1.609	68.90	100.00	100.00	302
	113	TP-MIXED2	N/A	2	210	55	37	12	45	0	24,271	8.610	115,031	1.817	68.80	100.00	99.99	303
	116	TP-MIXED2	N/A	2	252	60	40	13	40	0	26,287	9.535	124,504	2.013	68.96	100.00	100.00	303
	117	TP-MIXED2	N/A	2	266	60	41	13	40	0	26,788	9.882	126,887	2.086	68.96	100.00	100.00	303

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Workload TP-MIXEDx – Mixed transactions with SELECT, UPDATE and INSERT statements

kpm_tpio.sql

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	SQL thrput total [sps]	IO time read [ms]	LogFile sync [ms]	Phys reads total [dbps]	Phys writes total [dbps]	Completed check points
22	66	TP-MIXED1	N/A	2	2	2	1	1	98	0	478	2,110	0.224	0.410	19,189	3,789	2
	69	TP-MIXED1	N/A	2	42	22	14	5	78	0	7,328	32,132	0.297	0.566	279,311	91,706	6
	72	TP-MIXED1	N/A	2	84	35	22	8	65	0	11,504	49,870	0.388	0.932	420,976	146,476	8
	75	TP-MIXED1	N/A	2	126	44	29	10	56	0	14,031	60,803	0.485	1.217	518,703	174,292	10
	78	TP-MIXED1	N/A	2	168	51	34	12	49	0	15,872	69,032	0.585	1.511	582,577	189,277	9
	81	TP-MIXED1	N/A	2	210	56	37	13	44	0	17,363	75,465	0.680	1.812	633,051	198,335	10
	84	TP-MIXED1	N/A	2	252	61	41	14	39	0	18,544	80,583	0.770	2.120	675,159	201,989	10

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	SQL thrput total [sps]	IO time read [ms]	LogFile sync [ms]	Phys reads total [dbps]	Phys writes total [dbps]	Completed check points
22	98	TP-MIXED2	N/A	2	2	2	1	1	98	0	716	3,466	0.236	0.434	12,950	5,870	3
	101	TP-MIXED2	N/A	2	42	23	15	5	77	0	10,167	47,972	0.314	0.640	220,473	132,874	7
	104	TP-MIXED2	N/A	2	84	35	23	8	65	0	15,783	74,520	0.421	0.914	341,206	207,176	10
	107	TP-MIXED2	N/A	2	126	44	29	10	56	0	19,876	93,963	0.529	1.207	396,196	242,035	10
	110	TP-MIXED2	N/A	2	168	49	33	11	51	0	21,999	104,091	0.621	1.691	444,950	254,121	12
	113	TP-MIXED2	N/A	2	210	55	37	12	45	0	24,271	115,031	0.704	1.996	491,457	258,592	12
	116	TP-MIXED2	N/A	2	252	60	40	13	40	0	26,287	124,504	0.773	2.287	529,080	255,971	12
	117	TP-MIXED2	N/A	2	266	60	41	13	40	0	26,788	126,887	0.791	2.334	539,803	253,850	13

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Workload TP-MIXEDx – Mixed transactions with SELECT, UPDATE and INSERT statements

kpm_tpplus.sql

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	SQL thrput total [sps]	Log reads per SQL [dbps]	Log writes per SQL [dbps]	Phys reads per SQL [dbps]	Phys writes per SQL [dbps]	REDO data [kBpt]
22	66	TP-MIXED1	N/A	2	2	2	1	1	98	0	478	2,110	21	9	9	2	9.9
	69	TP-MIXED1	N/A	2	42	22	14	5	78	0	7,328	32,132	20	10	9	3	10.1
	72	TP-MIXED1	N/A	2	84	35	22	8	65	0	11,504	49,870	20	10	8	3	10.0
	75	TP-MIXED1	N/A	2	126	44	29	10	56	0	14,031	60,803	20	10	9	3	9.9
	78	TP-MIXED1	N/A	2	168	51	34	12	49	0	15,872	69,032	20	10	8	3	9.8
	81	TP-MIXED1	N/A	2	210	56	37	13	44	0	17,363	75,465	20	10	8	3	9.8
	84	TP-MIXED1	N/A	2	252	61	41	14	39	0	18,544	80,583	20	10	8	3	9.8

Run	Test	Workload	Upd [%]	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	CPU iow [%]	TXN thrput total [tps]	SQL thrput total [sps]	Log reads per SQL [dbps]	Log writes per SQL [dbps]	Phys reads per SQL [dbps]	Phys writes per SQL [dbps]	REDO data [kBpt]
22	98	TP-MIXED2	N/A	2	2	2	1	1	98	0	716	3,466	14	9	4	2	9.0
	101	TP-MIXED2	N/A	2	42	23	15	5	77	0	10,167	47,972	14	9	5	3	9.5
	104	TP-MIXED2	N/A	2	84	35	23	8	65	0	15,783	74,520	14	9	5	3	9.3
	107	TP-MIXED2	N/A	2	126	44	29	10	56	0	19,876	93,963	14	9	4	3	9.1
	110	TP-MIXED2	N/A	2	168	49	33	11	51	0	21,999	104,091	14	9	4	2	9.1
	113	TP-MIXED2	N/A	2	210	55	37	12	45	0	24,271	115,031	14	9	4	2	9.1
	116	TP-MIXED2	N/A	2	252	60	40	13	40	0	26,287	124,504	14	9	4	2	9.1
	117	TP-MIXED2	N/A	2	266	60	41	13	40	0	26,788	126,887	14	9	4	2	9.1

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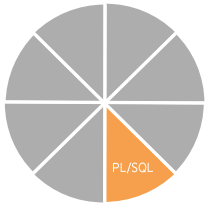
Swiss precision in performance measurement.

PL/SQL Application Program Performance



Workload PLS-MIXED – complex workload with most used PL/SQL operations and data types

kpm_pls.sql

Reference System
Single Instance

Run	Test	Workload	Parameter	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Operations total [Mops]	Operations per cpu [Mops]	Operation time [ns]	Elapsed time [s]
12	1	PLS-MIXED	N/A	1	1	2	2	0	98	11.38	11.38	87.90	301
	2	PLS-MIXED	N/A	1	24	26	25	0	74	102.79	4.28	232.43	302
	3	PLS-MIXED	N/A	1	48	51	50	0	49	105.90	2.21	451.95	302
	4	PLS-MIXED	N/A	1	72	75	75	1	25	137.08	1.90	523.83	302
	5	PLS-MIXED	N/A	1	96	97	97	0	3	159.10	1.66	601.79	302

Reference System
2-node Cluster

Run	Test	Workload	Parameter	Nodes	Jobs	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Operations total [Mops]	Operations per cpu [Mops]	Operation time [ns]	Elapsed time [s]
26	1	PLS-MIXED	N/A	2	2	2	1	0	98	22.54	11.27	88.65	301
	2	PLS-MIXED	N/A	2	48	26	25	0	74	205.12	4.27	232.91	302
	3	PLS-MIXED	N/A	2	96	51	50	1	49	208.51	2.17	458.97	302
	4	PLS-MIXED	N/A	2	144	75	74	1	25	267.26	1.86	537.21	302
	5	PLS-MIXED	N/A	2	192	97	96	1	3	311.50	1.62	614.75	302

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Workload PLS-FIBO and PLS-PRIME – single thread computing time of algorithms

kpm_algorithm.sql

Reference System
Single Instance

```
                                          CPU  CPU  CPU  CPU Elapsed
                         Para            busy user  sys idle    time
 Run Test Workload      meter Nodes  Jobs  [%]  [%]  [%]  [%]     [s]
---- ---- ------------ ------ ----- ----- ---- ---- ---- ---- -------
  12    6 PLS-FIBO         42     1     1    2    1    0   98      81
        7 PLS-PRIME      8000     1     1    2    1    0   98      83
```

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Summary of peakmarks® Key Performance Metrics Reporting Scripts

Summary of peakmarks® Key Performance Reporting Scripts

```
SQL> @kpm_all
```

```
SQL> @kpm_query
SQL> @kpm_scan
SQL> @kpm_ioread
SQL> @kpm_iowrite
SQL> @kpm_lgwr
SQL> @kpm_dbwr
SQL> @kpm_dl
SQL> @kpm_da
SQL> @kpm_tp
SQL> @kpm_tpplus
SQL> @kpm_tpio
SQL> @kpm_pls
SQL> @kpm_algorithm
```

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Identify Key Performance Metrics for Oracle Database Platforms.

On-Premises and in the Cloud.

For Quality Assurance, Evaluations, and Capacity Planning.