Oracle Database Performance on Exadata X7-2 Flex Configuration

A peakmarks Executive Summary

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Introduction

peakmarks® is dedicated to enhancing transparency in the performance of Oracle database platforms – on-premises and in the cloud. It provides clear and insightful performance indicators essential for quality assurance, evaluation, capacity planning, and optimizing license costs. This can be accomplished quickly and at a low cost. It requires minimal effort in just a few days while delivering impressive results. Along with other criteria, performance and price/performance ratios are crucial. peakmarks® offers performance metrics that aid system architects and management in making informed, fact-based decisions.

The peakmarks® software is a comprehensive benchmarking tool designed for Oracle databases, featuring over 30 different workloads. These workloads offer detailed insights into how effectively an Oracle platform can meet various business requirements. Unlike open-source software, peakmarks® is regularly updated to support the latest hardware technologies, Oracle versions, and features. Each workload is thoroughly analyzed in a PowerPoint presentation, facilitating a detailed performance evaluation. This report summarizes the key performance indicators that are most relevant to decision-makers.

Abbreviations and Metrics

[sps]	sql per second	[rps]	rows per second	[MBps]	megabyte per second
[qps]	queries per second	[dbps]	database blocks per second	[ms]	milliseconds
[tps]	transactions per second	[IOPS]	I/O operations per second		

Oracle Database Platform

	Exadata X7-2 Flex Single Instance	Exadata X7-2 Flex 2-node Rac Cluster
Database Server	Exadata X7-2 Database Server ▪ 2 x Xeon 8160, 2.1 – 3.7 GHz ▪ 48 cores, 96 threads ▪ 768 GByte RAM ▪ InfiniBand, 2 x 40 Gbps	Exadata X7-2 Database Server, each ▪ 2 x Xeon 8160, 2.1 – 3.7 GHz ▪ 48 cores, 96 threads ▪ 768 GByte RAM ▪ InfiniBand, 2 x 40 Gbps
Operating System	Bare Metal Oracle Enterprise Linux 8.10	Bare Metal Oracle Enterprise Linux 8.10
Launch	2017	2017
Connectivity	InfiniBand, 2 x 40 Gbps	InfiniBand, 2 x 40 Gbps
Storage Server	3 x Exadata X8 Storage Server HC, each ▪ 192 GByte RAM ▪ 4 x 6.4 GByte NVMe Flash ▪ 12 x 10 TByte HDD 7.2 krpm	3 x Exadata X8 Storage Server HC, each ▪ 192 GByte RAM ▪ 4 x 6.4 GByte NVMe Flash ▪ 12 x 10 TByte HDD 7.2 krpm
File System	ASM normal redundancy	ASM normal redundancy
Database System	Oracle 23.7 EE	Oracle 23-7 EE
Database Size	2 TByte	2 x 1 TByte
SGA Size	384 GByte (19% of database size)	2 x 384 GByte (38% of database size)
DataGuard	No	No
Benchmark Software	peakmarks® Software Version 10.4 Build 250625	peakmarks® Software Version 10.4 Build 250625

Key Performance Metrics for Server Systems in Oracle Database Operations

The server's performance significantly impacts the performance of all database operations, as well as the license and maintenance costs. The table shows the highest measured qps values and the lowest measured I/O response times. However, neither extreme value can be reached simultaneously.

Category	Workload	Key Performance Metric	Exadata X7-2 Flex Single Instance	Exadata X7-2 Flex 2-node Rac Cluster
Server System All the data accessed by these workloads is completely stored in the database buffer cache.	SRV-LOOKUP	Throughput Response time	2,489,017 qps 0.038 ms	4,983,115 qps 0.038 ms
	SRV-MIXED	Throughput Response time	197,922 qps 0.480 ms	389,996 qps 0.487 ms
	SRV-REPORT	Logical Reads	28,348,375 dbps	56,379,900 dbps
	SRV-SCAN	Buffer Cache Scan	129,806 MBps	258,459 MBps

Key Performance Metrics for Storage Systems in Oracle Database Operations

Storage performance significantly impacts the performance of all database operations and, in some cases, storage license and maintenance costs. The table shows the highest measured IOPS values and the lowest measured I/O service times. However, neither extreme value can be reached simultaneously.

Category	Workload	Key Performance Metric	Exadata X7-2 Flex Single Instance	Exadata X7-2 Flex 2-node Rac Cluster
Storage System All I/O operations are initiated by the database using SQL.	STO-READ	Throughput	5,224 MBps	9,001 MBps
	STO-OFFLOAD	Throughput	73,615 MBps	73,781 MBps
	STO-RANDOM 100% read	Throughput Service Time	709,596 IOPS 0.247 ms	1,351,334 IOPS 0.235 ms
	STO-RANDOM 80% read, 20% write	Throughput Service Time	344,075 IOPS 0.253 ms	661,397 IOPS 0.238 ms
	STO-SCATTER	Throughput	357,313, dbps	478,482 dbps

Log Writer Key Performance Metrics

Log writers play a key role in managing transactions and maintaining database consistency in the event of failures. These processes are essential for overall Oracle performance, particularly when there is a high

transaction load or when Oracle Data Guard is being utilized. The table shows the highest measured tps values and the lowest measured commit latency. However, neither extreme value can be reached simultaneously.

Category	Workload	Key Performance Metric	Exadata X7-2 Flex Single Instance	Exadata X7-2 Flex 2-node Rac Cluster
Log Writer	LGWR-LAT 1 Kbyte REDO per tx	Throughput Latency	144,767 tps 0.263 ms	292,177 tps 0.349 ms
	LGWR-THR	Throughput	1,304 MBps	2,102 MBps

Database Writer Key Performance Metrics

Database writer performance for buffer management is crucial to overall database performance, particularly for transaction systems with a high rate of updates and applications that primarily load data through the buffer cache.

Category	Workload	Key Performance Metric	Exadata X7-2 Flex Single Instance	Exadata X7-2 Flex 2-node Rac Cluster
Database Writer	DBWR-THR	Throughput	465,538 dbps	513,851 dbps

Data Load Key Performance Metrics

Data load performance capabilities are essential for all types of database applications, including transaction processing systems, data warehouse systems, and data analytics systems. The amount of data is increasing, and the time window for loading the data decreases.

Category	Workload	Key Performance Metric	Exadata X7-2 Flex Single Instance	Exadata X7-2 Flex 2-node Rac Cluster
Data Load	DL-BUFFER	Throughput	386,081 rps	724,587 rps
	DL-DIRECT	Throughput	704 MBps	1,342 MBps

Data Analytics Key Performance Metrics

Generally, data analytics operations result in full table scans. The performance of a full table scan operation depends on the location of data in the storage hierarchy (storage or memory) and the technology used to boost scan performance (smart scan for the data location storage system or an in-memory column store for the data location in memory).

Category	Workload	Key Performance Metric	Exadata X7-2 Flex Single Instance	Exadata X7-2 Flex 2-node Rac Cluster
Data Analytics	DA-STORAGE	Throughput	6,260 MBps	11,887 MBps
	DA-OFFLOAD	Throughput	72,260 MBps	72,207 MBps
	DA-ROWSTORE	Throughput	129,274 MBps	252,568 MBps
	DA-COLSTORE	Throughput	68,092,356,367 rps	145,870,272,267 rps

Online Transaction Processing Key Performance Metrics

Transaction processing is the most complex and demanding database operation, requiring a deep understanding of its nuances to ensure optimal performance. The table shows the highest measured sps and tps values and the lowest measured service time. However, neither extreme value can be reached simultaneously.

Category	Workload	Key Performance Metric	Exadata X7-2 Flex Single Instance	Exadata X7-2 Flex 2-node Rac Cluster
Online Transaction Processing	TP-REPORT	Throughput	23,836 sps	67,675 sps
		Service Time	1.251 ms	1.247 ms
	TP-LOOKUP	Throughput	2,321,168 sps	4,541,663 sps
		Service Time	0.015 ms	0.015 ms
	TP-MIXED1	Throughput	7,773 tps	18,544 tps
		Service Time	5.570 ms	4.164 ms
	TP-MIXED2	Throughput	12,702 tps	26,788 tps
		Service Time	3.459 ms	2.790 ms