



# Cloud at Customer Academy 3.0

Exadata Database Machine X9M Implementations Essentials – Q&A

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# Nossos Valores

Integridade

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## MARCEL LAMARCA

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and more 14 Oracle Certifications



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## Oracle Exadata Cloud at Customer Academy

Visando capacitar nossos parceiros em OCI Services, criamos a Academia Oracle Exadata Cloud at Customer ou Academia Oracle ExaC@C.

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Confira a agenda a seguir e inscreva-se. Contamos com a sua participação!

## Agenda

Troubleshooting tools – Demo Session 21 de agosto 10h às 11h30h (horário de Brasília)	<a href="#">Inscreve-se</a>
Monitoring – Demo Session 28 de agosto 10h às 11h (horário de Brasília)	<a href="#">Inscreve-se</a>
Smart Scan, HCC compression & In-Memory – Demo Session 11 de setembro 10h às 12h (horário de Brasília)	<a href="#">Inscreve-se</a>
A&Q for Certification 18 de setembro 10h às 12h (horário de Brasília)	<a href="#">Inscreve-se</a>
New Features - Demo Session 25 de setembro 10h às 12h (horário de Brasília)	<a href="#">Inscreve-se</a>
PCA - Private Cloud Appliance 17 de julho 10h às 12h (horário de Brasília)	<a href="#">Inscreve-se</a>
Patching – Demo Session 24 de julho 10h às 12h (horário de Brasília)	<a href="#">Inscreve-se</a>
Backup & Restore – Demo Session 31 de julho 10h às 11h30h (horário de Brasília)	<a href="#">Inscreve-se</a>



# Agenda

Exam 1Z0-092 Details and Topics

Exadata Smart Scan Deep Dive

Exadata Round 1 – Exam Q&A

Exadata Round 2 – Exam Q&A

Demo – Oracle Smart Scan (NO Exadata)

Demo – Oracle Smart Scan Monitoring

# Exam 1Z0-902 Informations

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## Exam 1Z0-902: Oracle Exadata Database Machine X9M Implementation Essentials



- Number of Questions **60**
- Format **Multiple Choice**
- Duration **90 minutes**
- Passing Score **64%**
- Oracle **RAC** and **GRID** administration knowledge required



# Exadata X9M implementation Exam Topics

## Exadata Database Machine Architecture and Key Capabilities

- Describe Exadata hardware architecture (2x database server types, 3x storage server types, power distribution, leaf and spine switches)
- Describe Exadata software architecture and deployment scenarios
- Describe Exadata Remote Direct Memory Access (RDMA) and Client network architecture (including multirack architecture, secure fabric)
- Explain the impact of various diskgroup failure group choices
- Describe the deployment options of Exadata including Virtualization and Bare Metal
- Exadata Database Machine Site and Implementation Planning (OECA&OEDA)

## Describe the function of Oracle Exadata Configuration Assistant and Oracle Exadata Deployment Assistant

- Design an Exadata Database Machine with Oracle ZFS Storage in a single rack using Oracle Exadata Configuration Assistant
- Configure Exadata Database virtual deployment using Oracle Exadata Deployment Assistant
- Add additional database server to a physical Exadata Database Machine using Oracle Exadata Deployment Assistant
- Describe physical site requirements and safety best practices for implementing Exadata (site planning, cooling, power)
- Install and configure Oracle Exadata using Oracle Exadata Deployment Assistant
- Exadata Database Machine Installation



## **Exadata Database Machine Integration**

- Describe the network integration options of Exadata Database Machine
- Connect Exadata Database Server in various scenarios, including client and backup networks
- Exadata Database Machine Configuration and Administration



## **Exadata Database Machine Security**

- Configure Exadata security (storage, secure boot, cellwall, AIDE, ASM Scoped Security, Database Scoped Security, FIPS secure filesystem)
- Implement Access Control for REST API

## **Exadata Database Machine Monitoring**

- Describe the monitoring recommendations for Exadata Database Machine database servers
- Use Cloud Control or DBMCLI to monitor Exadata Database Machine Database Servers
- Monitor Exadata Storage Server and Network using Command line or Cloud control
- Describe the Enterprise Manager cloud Control architecture as it specifically applies to Exadata Database Machine
- Use Enterprise Manager to discover Exadata Database Machine
- Describe the Auto Service Request (ASR) function and how it relates to Exadata Database Machine
- Describe Oracle Configuration Manager (OCM) and how it relates to Exadata Database Machine



## Exadata Database Maintenance Tasks

- Power Database Machine on and off
- Safely shut down a single Exadata Storage Server
- Replace a damaged physical disk on a cell
- Replace a damaged flash card on a cell
- Add additional storage to Exadata Database Servers
- Use the Exadata Cell Software Rescue Procedure



## Exadata Database Machine Installation

- Configure Exadata Database Server SP port (ILOM)
- Describe the procedure for receiving the rack on site
- Reconfigure the Exadata Database Machine to use a single power cable
- Verify the firmware of an Exadata Storage Server
- Set up Automatic Service Request (ASR) on the Exadata Database Machine

## Exadata Database Machine Updates

- Describe how software is maintained on different Database Machine components
- Use Exadata Software to deploy an update to an Exadata Database Machine without downtime
- Use patchmgr to update a single storage server

# Exadata X9M Implementation Specialist learning path

Exadata X8M: Impl & Admin

**Oracle Exadata Database Machine: Implementation And Administration**

Course Lab

24h 52m

100%   

X9M: What's New

**Oracle Exadata Database Machine X9M: What's New**

Course

1h 6m

100%   

Online Certification Exam

**Oracle Exadata Database Machine X9M Implementation Essentials (1Z0-902)**

1h 30m

You must register, attend and pass this exam to receive your official credential for this certification.





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# Exadata Database Machine Documentation

Welcome to the Oracle Exadata Database Machine documentation library. The Exadata Database Machine is a complete optimized package of software, servers, and storage. Simple and fast to implement, the Exadata Database Machine is ready to tackle your largest and most important database applications.

The Japanese documentation for Exadata Database Machine is at: <https://www.oracle.com/jp/database/technologies/oracle-exadata-database-machine-documentation.html>

## Get Started

Learn about the new features available for the Oracle Exadata System Software. Also, find topics that will help you get started using Oracle Exadata Database Machine right away.



### Learn About Oracle Exadata Database Machine

Learn about the new features available with each release of Oracle Exadata System Software.

[Learn about the technical architecture](#)

[New Features of Oracle Exadata System Software](#)

[Hardware Components of Oracle Exadata Database Machine](#)



### Configuring Oracle Exadata Database Machine

Procedures that describe how to configure the system, accounts, and software for Oracle Exadata Database Machine.

[Using Oracle Exadata Deployment Assistant](#)

[Site Checklists](#)

[Site Requirements](#)



### Access the Bookshelf

View the Exadata Database Machine books or download the entire library.

[View book list](#)

[Download ZIP file](#)





# Oracle Exadata X9M Installation guide

Engineered Systems / Exadata Database Machine

## Installation and Configuration Guide for Exadata Database Machine



Expand

### Title and Copyright Information

- ▶ Preface
- ▶ 1 Site Requirements for Oracle Exadata and Oracle Exadata Storage Expansion Rack
- ▶ 2 Understanding the Network Requirements for Oracle Exadata
- ▶ 3 Using Oracle Exadata Deployment Assistant

# Oracle® Exadata Database Machine

Installation and Configuration Guide for Exadata Database Machine

23.1

F29249-23

August 2023



Oracle® Exadata Database Machine





# Exadata Database Machine Documentation

## Books

These books are used to document all the information needed for using Exadata Database Machine.

View -All-



Group by Category

## Exadata Database Machine - Concept and Administration Books





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# Oracle Exadata Database Machine X9M

## Exadata Server Hardware <sup>1,2</sup>

SERVER TYPE	CPU	MEMORY	DISK	FLASH	NETWORK
<b>Database Server</b>	2 x 32-core Intel® Xeon® 8358 processors (2.6 GHz)	512 GB (factory option) 1024 GB (factory option and field upgrade) 1536 GB (field upgrade from 512 GB only) 2048 GB (factory option and field upgrade, max)	None	2 x 3.84 TB NVMe Flash SSD (hot swappable), (upgradeable to 4 x 3.84 TB)	<ul style="list-style-type: none"> <li>Client/backup adapter 1: 4 x 10 Gb copper Ethernet ports or 2 x 10/25 Gb optical Ethernet ports</li> <li>Client/backup adapter 2 (optional): 4 x 10 Gb copper Ethernet ports or 2 x 10/25 Gb optical Ethernet ports</li> <li>Client/backup adapter 3 : 4 x 10 Gb copper Ethernet ports or 2 x 10/25 Gb optical Ethernet ports</li> <li>1 x 1 Gb copper Ethernet port (mgmt)</li> <li>1 x ILOM Ethernet port</li> <li>2 x 100 Gb QSFP28 RoCE Fabric ports</li> </ul>
<b>Storage Server High Capacity (HC)</b>	2 x 16-core Intel® Xeon® 8352Y processors (2.2 GHz)	256 GB 1.5 TB Persistent Memory	12 x 18 TB 7,200 RPM disks	4 x 6.4 TB NVMe PCIe4.0 Flash cards	<ul style="list-style-type: none"> <li>2 x 100 Gb QSFP28 RoCE Fabric ports</li> <li>1 x 1 Gb copper Ethernet port (mgmt)</li> <li>1 x ILOM Ethernet port</li> </ul>
<b>Storage Server Extreme Flash (EF)</b>	2 x 16-core Intel® Xeon® 8352Y processors (2.2	256 GB 1.5 TB <small>Persistent</small>	None	8 x 6.4 TB NVMe PCIe4.0 Flash cards	

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# Exadata Features

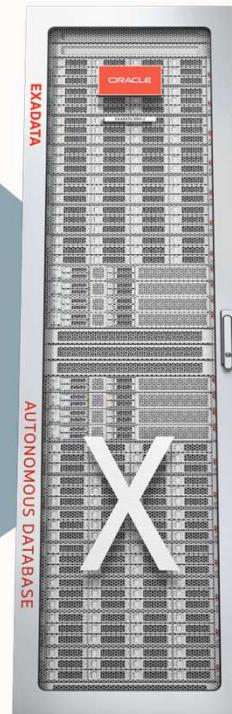
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# Oracle Exadata Database and Platform Innovations

- Multitenant
- In-Memory DB
- Real Application Clusters
- Active Data Guard
- Partitioning
- Advanced Compression
- Advanced Security, Label Security, DB Vault
- Real Application Testing
- Advanced Analytics, Spatial and Graph
- Management Packs for Oracle Database

All Oracle Database Innovations



All Exadata Innovations

- Offload SQL to Storage
- RoCE Fabric
- PMEM Commit and Data Accelerators
- Smart Flash Cache
- Storage Indexes
- Columnar Flash Cache
- Hybrid Columnar Compression
- I/O Resource Management
- Network Resource Management
- In-Memory Fault Tolerance
- Exafusion Direct-to-Wire Protocol

# Exadata Smart Scan

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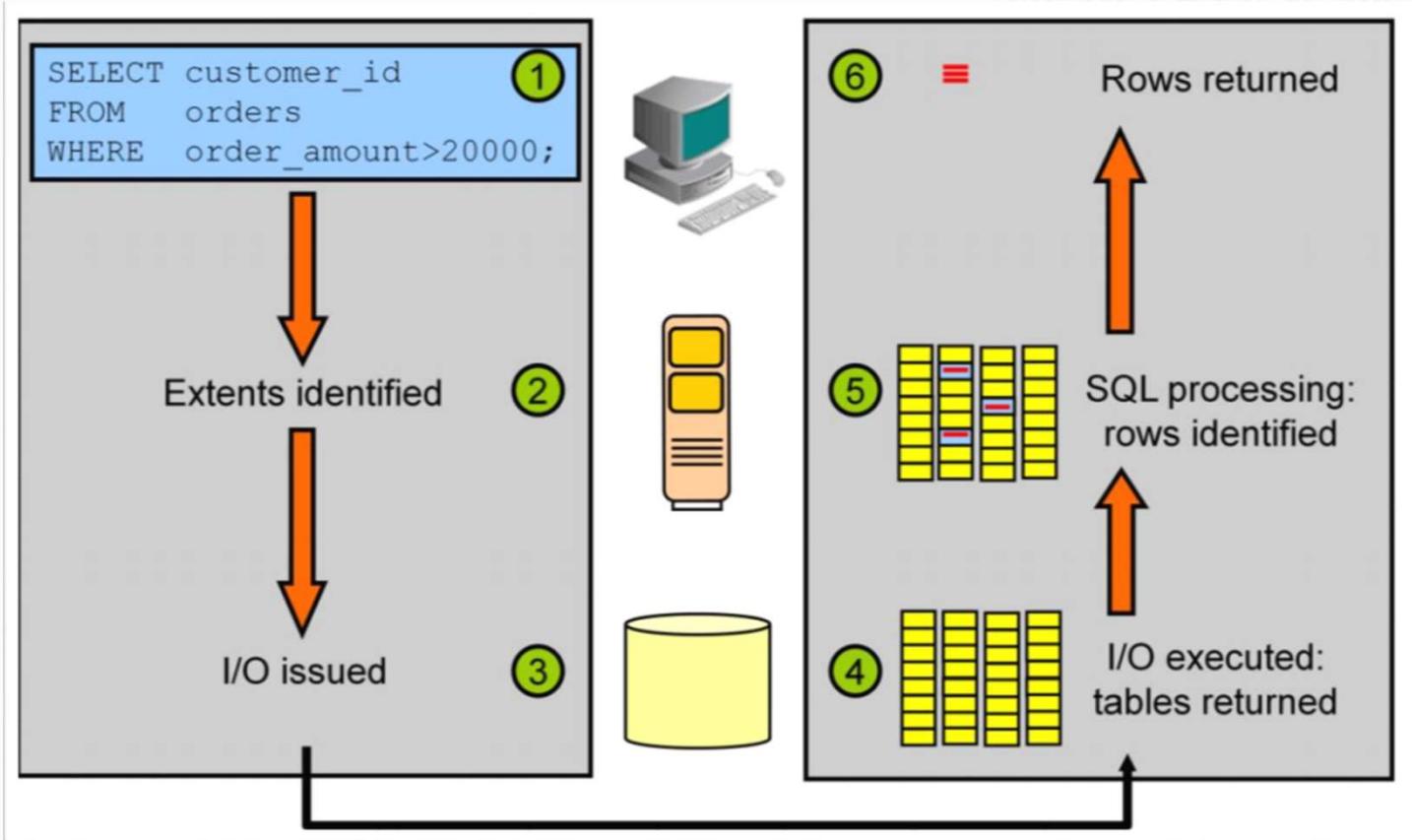


## What Exadata Smart Scan Is?

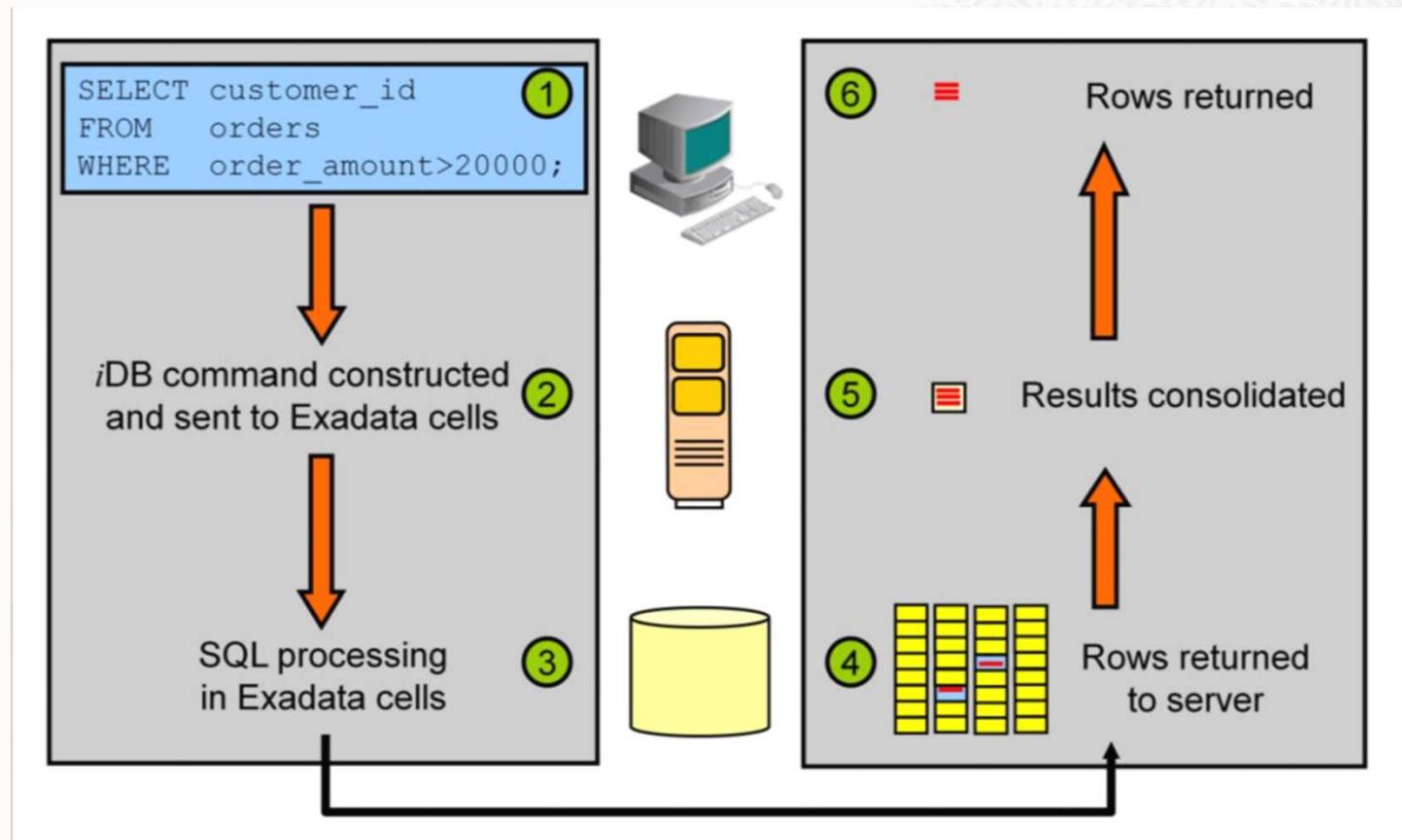


“Smart Scan is one of the great feature in Oracle Exadata. With this technology storage send only required rows to database node from **storage instead of entire Oracle Block**. Multiple rows are stored in one Oracle Block but non-exadata system return entire block even only one rows is required. On the other hand, Exadata Storage returns only **interested rows but not entire block.**”

## Oracle Database | No Exadata System



## Exadata Cloud a Smart Scan | Off Load Querying



## When Exadata Smart Scan Happens



- Full Table Scans
- Direct-path reads
- Not used by default for serial scans of small tables Can be forced via \_serial\_direct\_read=TRUE at either session or system level
- Full Index Scans
- Direct-path reads are automatically used for parallel queries

## Exadata Smart Scan | Why it's not working?

- Scan performed on a compressed table
- A Scan is performed on an index partitioned table
- Full scan is performed on a compressed index
- A full scan is performed on a reverse key index
- The table has row-level dependency tracking enabled.
- The optimizer wants the scan to return rows in ROWID order
- A BLOB or LONG column is being selected or queried
- A self-relation flashback query is being executed
- A query that references LOB columns is referenced

# Query Execution plan | Traditional Database Vs Exadata System

```
SQL> select * from table(dbms_xplan.display);
PLAN_TABLE_OUTPUT
-----
Plan hash value: 970577077

| Id  | Operation          | Name      | Rows  | Bytes | Cost (%CPU)| Time     |
| 0   | SELECT STATEMENT   |           | 902   | 23452 |    10  (0) | 00:00:01 |
| 1   | TABLE ACCESS BY INDEX ROWID BATCHED | CUSTOMERS | 902   | 23452 |    10  (0) | 00:00:01 |
|* 2  | INDEX RANGE SCAN   | CUSTOMERS_ID_PK | 902   |       |       6  (0) | 00:00:01 |

Predicate Information (identified by operation id):
-----
```



```
PLAN_TABLE_OUTPUT
-----
Plan hash value: 2008213504

| Id  | Operation          | Name      | Rows  | Bytes | Cost (%CPU)| Time     |
| 0   | SELECT STATEMENT   |           | 902   | 23452 | 306K (1) | 00:00:12 |
|* 1  | TABLE ACCESS STORAGE FULL | CUSTOMERS | 902   | 23452 | 306K (1) | 00:00:12 |

Predicate Information (identified by operation id):
-----
1 - storage("ID"=<=1000 AND "ID">=100)
      filter("ID"=<=1000 AND "ID">=100)
```



# Monitoring Smart Scan in SQL Execution Plan

- Relevant Initialization Parameters:
  - CELL\_OFFLOAD\_PROCESSING
    - TRUE | FALSE
    - Enables or disables Smart Scan and others smart storage capabilities
    - Dynamically modifiable at session or system level using ALTER SESSION or ALTER SYSTEM
  - CELL\_OFFLOAD\_PLAN\_DISPLAY
    - NEVER | AUTO | ALWAYS
    - Allows execution plan to show offloaded predicates
    - Dynamically modifiable at session or system level using ALTER SESSION or ALTER SYSTEM



## Others Stituations Affecting Smart Scan

- Seeing STORAGE in the execution plan does not guarantee that the query is satisfied using Smart Scan
- Even when Smart Scan is indicated by the execution plan, other block I/O might also :
  - If Exadata Storage Server is not sure that a block is current, it transfers that block read to the buffer cache
  - If chained or migrated rows are detected additional non-Smart Scan block reads may be required
  - I/O for dynamic sampling does not use Smart Scan
  - If Exadata Storage Server CPU utilization is significantly greater than CPU utilization on the database server, smart scan may send additional data to the database server
  - If all the required data already resides in the database buffer cache, the buffer cache copy is used and no disk I/O is performed
  - Smart Scan may de disabled if a statement is affected by a storage server quarantine
- Statistics and wait events can be used to confirm what is happening



# Exadata Storage Server Statistics | Overview

```
SQL> select s.name, m.value/1024/1024 mb from v$mystat m, v$sysstat s
  where m.statistic#=s.statistic#
    and (s.name like '%physical IO%' or s.name like '%optimized%'
    or s.name like 'physical%total bytes');
V$SQL
```

NAME	MB
- SQL_Text	
----- PHYSICAL_READ_BYTES -----	
<b>physical read_total_bytes</b>	<b>19.2192383</b>
physical write_total_bytes	0
cell physical_IO_interconnect_bytes	19.5942383
cell physical_IO_BYTES_saved_during_optimized_file_creation	0
cell physical_IO_BYTES_saved_during_optimized_RMAN_file_restore	0
cell physical_IO_CELL_OFFLOAD_RETURNED_BYTES_load	0
cell physical-IOPIMIZED_BYTES_READREQUEST	0
cell physical_IO_bytes_saved_by_columnar_cache	0
cell physical_IO_bytes_saved_by_storage_index	0
cell physical_V\$SYSSTAT sent directly to DB node to balance CPU	0
cell physical_IO_NAME processed for IM capacity	0
cell physical_IO_VALUE bytes processed for IM query	0
cell physical_IO bytes processed for no memcompress	0
cell physical_IO interconnect bytes returned by smart scan	0
cell physical_write_bytes saved by smart file initialization	0
cell IO_uncompressed_bytes	0
cell physical_write_IO_bytes_eligible_for_offload	0
cell physical_write_IO_host_network_bytes_written_during_offload	0



## Exadata Smart Scan statistics sample

```
SQL> select count (*) from erp.orders where CUST_ID > 1;

SQL> select s.name, m.value/1024/1024 mb from v$mystat m, v$sysstat s
  where m.statistic#=s.statistic#
    and (s.name like '%physical%total bytes' or s.name like '%cell phys%'
  or s.name like 'cell IO%');
```

NAME	MB
physical read total bytes	19.2192383
physical write total bytes	19.5942383
<b>cell physical IO interconnect bytes</b>	<b>150.876445</b>
cell physical IO bytes saved during optimized file creation	0
cell physical IO bytes saved during optimized RMAN file restore	0
<b>cell physical IO bytes eligible for predicate offload</b>	<b>150.876445</b>
cell physical IO bytes eligible for smart IOs	0
cell physical IO bytes saved by columnar cache	0
cell physical IO bytes saved by storage index	0
cell physical IO bytes sent directly to DB node to balance CPU	0
cell physical IO bytes processed for IM capacity	0
cell physical IO bytes processed for IM query	0
cell physical IO bytes processed for no memcompress	0
<b>cell physical IO interconnect bytes returned by smart scan</b>	<b>150.876445</b>
cell physical write bytes saved by smart file initialization	0



## Extreme concurrent Transaction | Example

```
SQL> select count (*) from erp.orders where CUST_ID > 1;
```

NAME	MB
physical read total bytes	19.2192383
SQL statement bytes, total_waits, time_waited/100 wait_secs	0.5942383
<b>cell physical IO interconnect bytes</b>	<b>150.876445</b>
from session bytes, starting optimized file creation	0
where physical bytes saved during optimized RMAN file restore	0
cell physical IO bytes eligible for predicate offload	0
EVENT physical IO bytes eligible for smart IO waits	0
cell physical bytes saved by columnar cache	0
Cell physical blocks physical read directly to DB Node balance	0.0006
<b>Cell single block physical read</b>	<b>1349704</b>
Cell physical bytes processed for IM capacity	0.0005
cell physical IO bytes processed for IM query	0
cell physical IO bytes processed for no memcompress	0
<b>cell physical IO interconnect bytes returned by smart scan</b>	<b>150.876445</b>
cell physical write bytes saved by smart file initialization	0



# I/O Sent Directly to database Server to balance CPU usage sample

```
SQL> select count (*) from erp.orders where CUST_ID > 1;

SQL> select s.name, m.value/1024/1024 mb from v$mystat m, v$sysstat s
      where m.statistic#=s.statistic#
        and (s.name like '%physical%total bytes' or s.name like '%cell phys%'
        or s.name like 'cell IO%');

NAME                                     MB
-----
physical read total bytes              19.2192383
physical write total bytes             19.5942383
cell physical IO interconnect bytes    0
cell physical IO bytes saved during optimized file creation 0
cell physical IO bytes saved during optimized RMAN file restore 0
cell physical IO bytes eligible for predicate offload 0
cell physical IO bytes eligible for smart IOs 0
cell physical IO bytes saved by columnar cache 0
cell physical IO bytes saved by storage index 0
cell physical IO bytes sent directly to DB node to balance CPU 2396.9877
cell physical IO bytes processed for IM capacity 0
cell physical IO bytes processed for IM query 0
cell physical IO bytes processed for no memcompress 0
cell physical IO interconnect bytes returned by smart scan 0
cell physical write bytes saved by smart file initialization 0
cell IO uncompressed bytes 0
cell physical write IO bytes eligible for offload 0
cell physical write IO host network bytes written during offload 0
```



# Exadata Storage Server Wait events | Overview

Connected to:  
Oracle Database 19c EE Extreme Perf Release 19.0.0.0.0 -  
Production  
Version 19.19.0.0.0

```
SQL> select distinct event, total_waits, time_waited/100 wait_secs,  
average_wait/100 avg_wait_secs  
from V$session_event e, v$mystat s  
where event like 'cell%' and e.sid = s.sid
```

WAIT EVENT	DESCRIPTION
cell interconnect retransmit during physical read	Database wait during retransmission for an I/O of a single-block
cell list of block physical read	Cell equivalent of db file parallel read
cell single block physical read	Cell equivalent of db file sequential read
cell multiblock physical read	Cell equivalent of scattered read
cell smart table scan	Database wait for table scan to complete
cell smart index scan	Database Wait for index or IOT fas full scan
cell smart file creation	Database wait for file creation operation
cell smart incremental backup	Database wait for incremental backup operation
cell smart restore from backup	Database wait during file initialization for restore



# Troubleshooting Smart Scan operations

Connected to:

Oracle Database 19c EE Extreme Perf Release 19.0.0.0.0 - Production  
Version 19.19.0.0.0

```
SQL> alter session set tracefile_identifier='10046';  
  
SQL> alter session set timed_statistics = true;  
  
SQL> alter session set statistics_level=all;  
  
SQL> alter session set max_dump_file_size = unlimited;  
  
SQL> alter session set events '10046 trace name context forever,level 12';
```

Run the sql query that is giving low performance.==> we need trace file to be uploaded.

```
SQL> alter session set up_cell_offload_processing=false;
```

Run the sql query that is giving low performance.==> we need trace file to be uploaded.



- **Exadata Smart Scan FAQ** (Doc ID 1927934.1)

### APPLIES TO:

Exadata Database Machine V2 - Version All Versions to All Versions [Release All Releases]  
Information in this document applies to any platform.

### PURPOSE

This document addresses the frequently asked questions related to Exadata Smart Scan.

### QUESTIONS AND ANSWERS

#### What is Smart Scan ?

The data search and retrieval processing can be offloaded to the Exadata Storage Servers. This feature is called Smart Scan. Using this Smart Scan, Oracle Database can optimize the performance of operations that perform table and index scans by performing the scans inside Exadata Storage Server, rather than transporting all the data to the database server.

Smart Scan capabilities includes :-

- 1) Predicate Filtering
- 2) Column filtering
- 3) Join Processing



- **Queries Generating High "Cell Single Block Physical Read" Wait Messages** ([Doc ID 2119510.1](#))

## APPLIES TO:

Oracle Database Backup Service - Version N/A and later  
Oracle Database - Enterprise Edition - Version 11.2.0.4 and later  
Oracle Database Cloud Schema Service - Version N/A and later  
Gen 1 Exadata Cloud at Customer (Oracle Exadata Database Cloud Machine) - Version N/A and later  
Oracle Cloud Infrastructure - Database Service - Version N/A and later  
Information in this document applies to any platform.

## SYMPTOMS

Symptoms of this issue will appear as follows:

- Trace file entries that look similar to the following:

```
WAIT #5: nam='cell single block physical read' ela= 672 cellhash#=2520626383 diskhash#=1377492511 bytes=16384 obj#=63
tim=1280416903276618
```

- The "Top 10 Foreground Events by Total Wait Time" section of the AWR report shows an exceedingly high number of waits but few to no average wait time. For example:

Event	Waits	Total Wait Time (sec)	Wait Avg(ms)	% DB time	Wait Class
cell single block physical read	19,654,319	4847,1	0	9.7	User I/O

- All or most of the events in the "Top SQL with Top Events" section of the ASH report are INDEX - STORAGE FAST FULL SCAN.



- **Support Policy for Generic SQL Performance Issues** (Doc ID 1198303.1)

## DETAILS

The following document outlines the policies that Oracle Support follows in order to provide the best Support experience and the shortest resolution time. Support will always strive to assist you in your efforts to make queries perform at their best and this document outlines what we can and cannot do to achieve this.

## ACTIONS

### Oracle Support Diagnoses Issues Relating to a Query's Performance

One of Oracle Support's roles is to assist its customers in the identification and resolution of SQL Performance Issues.

This is a complete cycle of activity within which, diagnosis is a key component.

Oracle Support can help with this diagnosis.

- If the diagnosis identifies RDBMS defects then Oracle Support will make efforts to provide workarounds and patches according to standing Oracle Support Policies.
- Additionally, Tuning the Query is a potential Solution to many SQL Performance issues.  
If the diagnosis indicates that the query needs manual tuning it will be the customer's responsibility to take the appropriate steps to do the tuning. Manual tuning includes setting hints, using SQL Profiles generated by the SQL Tuning Advisor (if the license has been purchased), creating proper indexes or using other database features to improve the query.

### Oracle Support does not provide a Query Tuning Service

Oracle Support does not provide an alternative to one of the advanced services that Oracle Support has available to execute a complete performance analysis on your system or to help you to tune your query.

See 'Limitations of Support under support policies tab' section in:



# Exadata Skill Test

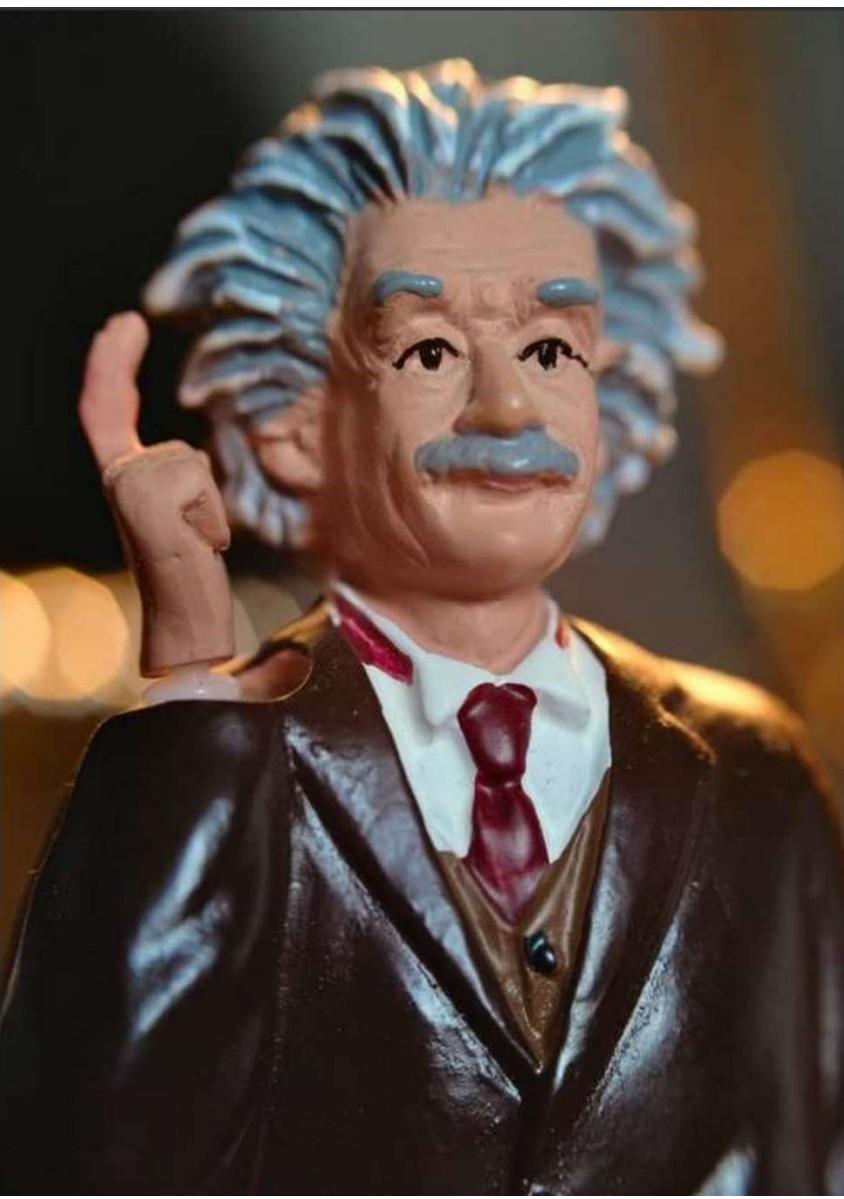
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**Time to test your skill!  
Are you ready?**

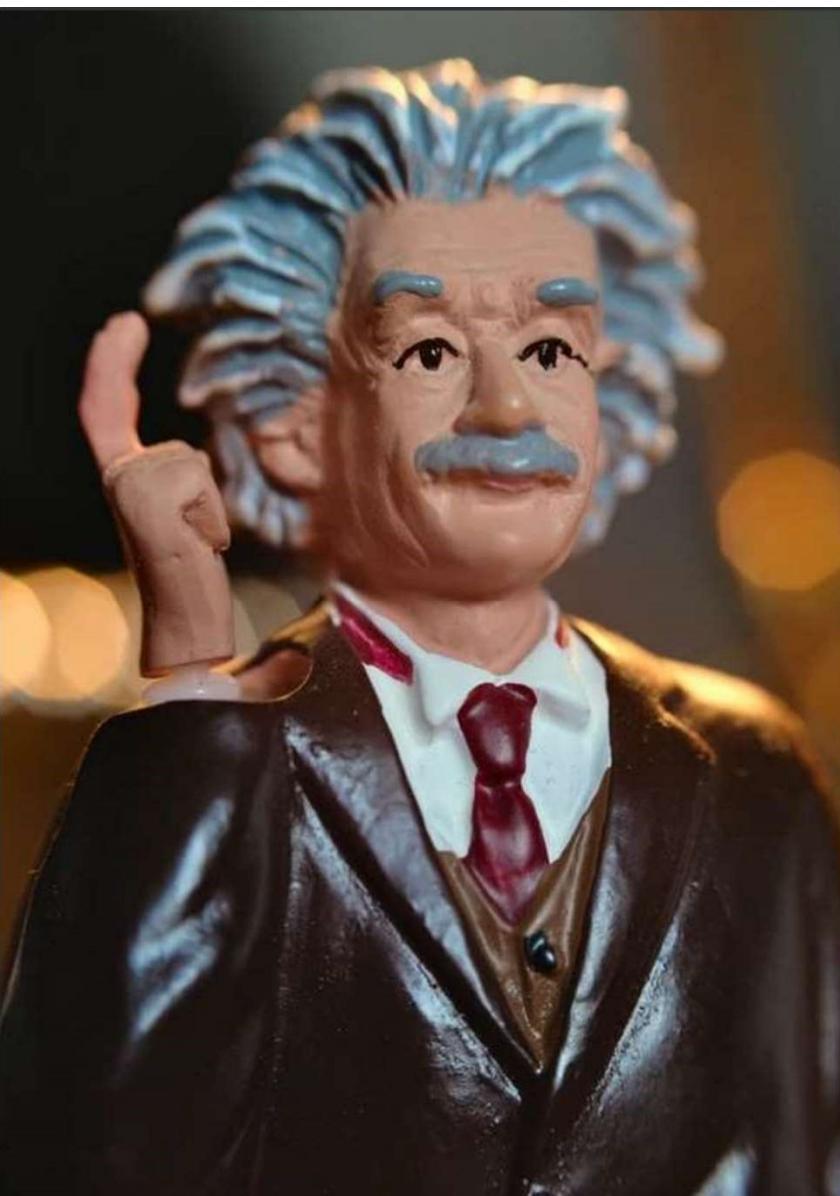
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## ROUND 1

O





## ROUND 2

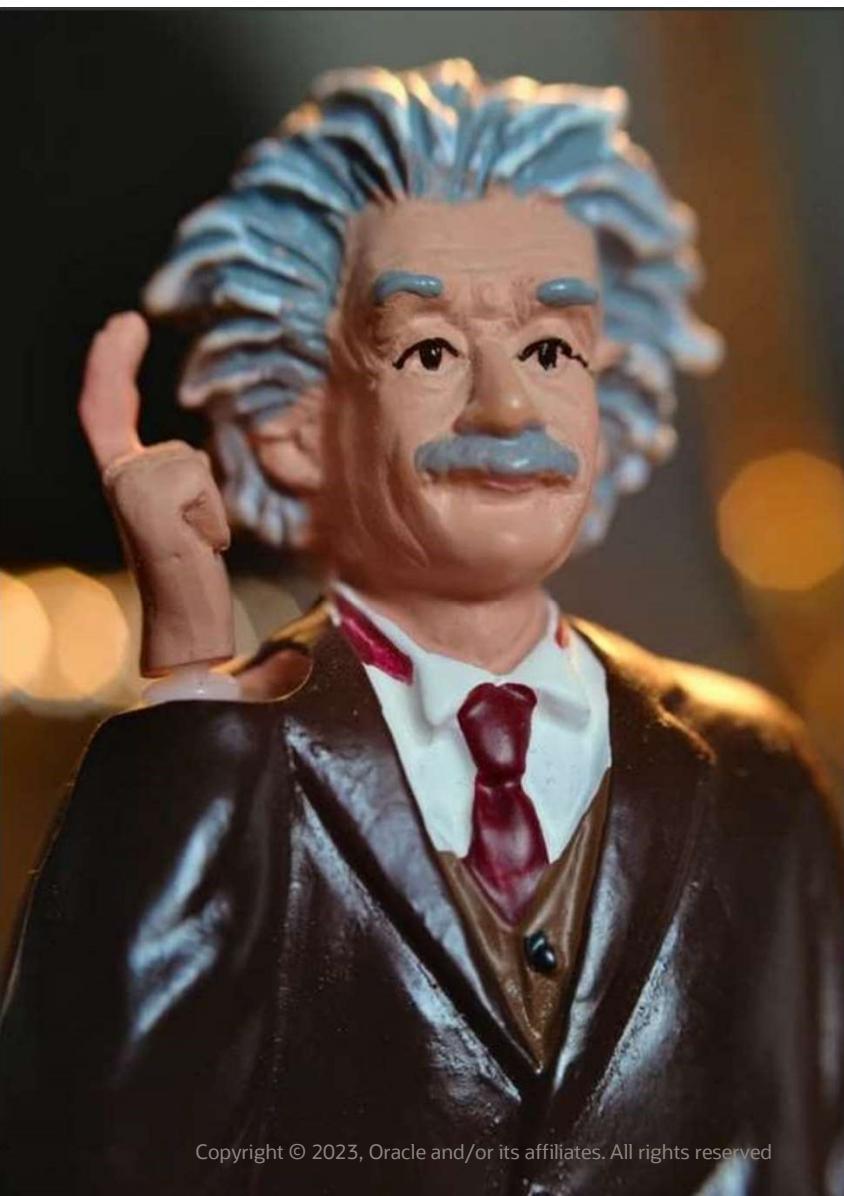
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# Demo

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## Demo 1 – Optimizer Smart Scan ( No Exadata)

- Configuring parameter CELL\_OFFLOAD\_PLAN\_DISPLAY
- Explain plan query report
- Changing index visibility
- Explain plan report part 2

## Demo 2 – Monitoring Smart Scan

- Execution no Smart Select using hint
- Getting Dictionary Statistics
- Executing query with no hint
- Compare both results

# Resources

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## Exam 1Z0-1093-23: Oracle Database Services 2023 Professional



- Number of Questions **55**
- Format **Multiple Choice**
- Exam Length **90 minutes**
- Passing Score **68%**
- **Exadata C@C** and **Exadata Cloud Service** topics included





**Thank You ☺**

**Questions / Feedback / Training Suggestions**

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**Ask for help ☺**

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