Oracle® Enterprise Manager Oracle Exadata Database Machine Getting Started Guide



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Oracle Enterprise Manager Oracle Exadata Database Machine Getting Started Guide, 13c Release 5

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Contents

Preface

Audience	ix
Documentation Accessibility	ix
Conventions	ix

1 Introduction to the Plug-in

Oracle Exadata Plug-in Features	1-1
Monitoring and Notification Features	1-1
Hardware Support Features	1-2
Target Discovery Features	1-3
Exadata Storage Server Grid Home Page and Server Home Page Features	1-3
Exadata Performance Page Features	1-4
Exadata Metrics Features	1-4
Oracle Exadata Database Machine Supported Hardware and Software	1-4
Exadata Database Machine Configuration Support	1-4
Hypervisor Support	1-5
Multi-Rack Support	1-5
Partitioned Support	1-5
IPv6 Support	1-5
Oracle SuperCluster Support	1-6
Supported Component Versions	1-6
Supported Operating Systems	1-7
Oracle Exadata Database Machine Hardware Not Supported	1-7

2 Prerequisites

Create a Database Server ILOM Service Processor User	2-1
Create an ExaCLI or RESTful API User	2-2
Create SNMPv3 Users	2-3
Create SNMPv3 Users on Compute Nodes and Storage Servers	2-3
Create Individual SNMPv3 Users on Exadata 19.3 and Above	2-4
Create All SNMPv3 Users on Exadata 19.2. and Below	2-4



Create SNMPv3 Users on Cisco Ethernet Switches	2-5
Create SNMP Community on Cisco Ethernet Switches	2-5
Create an SNMPv3 User in IB Switches	2-5
Create SNMP Community for InfiniBand Switch Targets	2-6
Enable SNMPv3 on PDUs	2-7
Create an SNMPv3 user on PDUs	2-7
Create SNMP Community on PDUs	2-8
Verify Software Versions	2-8
Exadata Storage Server Software	2-8
InfiniBand Switch	2-8
Cisco Ethernet Switch	2-9
PDU Firmware	2-9
Grid Infrastructure/DB Cluster	2-10
Verify Names Resolution	2-10
Verify Firewall Configuration	2-10
User Roles	2-12
Install Oracle Management Agent	2-12
Manually Deploy Exadata and Related Plug-ins	2-13
Prerequisites for Discovery Using EMCLI	2-14
Create Named Credentials for All the Target Types	2-14
Named Credentials and Commands to Create Them	2-14
Set Up SSH Key Authentication	2-25
Generate the SSH Key	2-25
Add SSH Public Key to Each Target	2-26
Create the Input File	2-27
Configuration Parameters	2-29
Parameters for Adding or Skipping Components	2-32
Parameters for Adding or Skipping Virtual Platform Components	2-32
Optional Verification of the Prerequisites	2-33
Prerequisites for Discovery and Monitoring Using Non-root User	2-34
Non-root User for Systems Infrastructure Remote Host Targets	2-34
Non-root User for Virtual Platform Targets	2-34

3 Exadata Database Machine Discovery

Discovering an Oracle Exadata Database Machine	3-1
Discover the Oracle Exadata Database Machine Target Using the Console	3-1
Fresh Discovery of Oracle Exadata Database Machine Target	3-2
Fresh Discovery of Exadata Database Machine on SuperCluster Systems	3-9
Convert Database Machine Targets with 12c Target Types to 13c Using the	
Console	3-11
Discover the Oracle Exadata Database Machine Target Using EMCLI	3-13



Submit the Deployment Procedure for the Discovery	3-13
View the Discovery Status	3-14
Convert 12c Type Database Machine Targets to 13c Using EMCLI	3-15
Discovering Grid Infrastructure and RAC	3-17
Switch from Using CellCLI to RESTful API	3-17
Update the Monitoring Configuration Using Console	3-18
Update the Monitoring Configuration Using EMCLI for Switching from CellCLI to	
RESTful API	3-18

4 Post-Discovery Configuration and Verification

Verify SNMP Subscription of the Oracle Management Agent to Exadata Storage Server	4-1
Using the ALTER CELL Command	4-2
Check Current SNMP Configuration	4-3
Configure SNMP Values Using dcli (optional)	4-4
Verify SSH Connectivity Using cellcli	4-4
Remove a Subscription	4-5
Verify SNMP Configuration for InfiniBand Switch Targets	4-5
Verify the Cisco Ethernet Switch SNMP Configuration	4-6
Verify the PDU SNMP Configuration	4-6
Convert SNMP V2 to V3 at Scale for All Hardware Components in Exadata	4-7

5 Oracle Exadata Database Machine Administration

Creating Roles to Manage the Plug-in	5-1
Exadata Database Machine Topology	5-2
Drilling Down to Individual Targets of Database Machine	5-3
Viewing Virtual Exadata Targets	5-4
Viewing Critical Hardware Information for the Database Machine	5-5
Viewing Exadata Resource Utilization	5-5
Compute Resources	5-5
Storage Resources	5-7
Viewing Database Machine Alerts	5-12
Viewing Metrics	5-12
Adding Exadata Database Machine Components Manually	5-12
Removing an Exadata Database Machine Target	5-13
Removing a Component of a Database Machine Target	5-14
Updating the Exadata Database Machine Schematic Diagram	5-14
Drop a Component from the Exadata Database Machine Schematic Diag	jram 5-15
Add Components to the Exadata Database Machine Schematic Diagram	5-15
Provisioning Virtualized Exadata Clusters	5-15
Creating a Database Cluster	5-16



Scaling Up a Database Cluster	5-21
Scaling Down a Database Cluster	5-23
Deleting a Database Cluster	5-23
Exadata Storage Server Metrics and Alert Settings	5-24
Exadata Storage Server Management	5-24
About Exadata Storage Server	5-25
Viewing an Exadata Storage Server Topology	5-25
Performing Administration Tasks on Exadata Storage Servers	5-26
Managing the I/O Resource	5-27
Add/Update IORM Configuration	5-28
The Inter-Database Plan	5-30
Diagnosing Exadata Storage Server Alerts	5-30
Managing the InfiniBand Fabric	5-31
InfiniBand/RoCE Switch Metrics	5-31
Performing Administration Tasks on InfiniBand Networks	5-32
Setting Up Alerts	5-33
Flash Cache Resource Monitoring	5-33
Exadata Database Machine Fault Monitoring	5-34
Monitoring Exadata Database Machine Components	5-34
Exadata Storage Servers	5-34
Cisco/RoCE Switch (Systems Infrastructure Switch)	5-34
ILOM Targets (Systems Infrastructure Server)	5-35
Monitoring Systems Infrastructure ILOM Server Target Using Non-root User	5-35
Power Distribution Units (PDUs)	5-35
InfiniBand Switch (Systems Infrastructure Switch)	5-36
Automatic Indexing for Database Nodes	5-36
Evaluating Compliance of Exadata Targets	5-37
Reporting	5-38
Accessing Oracle Support Workbench for Exadata Storage Server	5-38
Accessing Oracle Analytics Server Reports	5-39
Exadata Capacity Planning Details	5-39
Exadata vCPU Consumption Report	5-44
Oracle Exadata Database Machine Dashboard Creation	5-46
Exadata Database Machine Dashboard Creation	5-46
Find All Database Machine Reports	5-47
How to Make the Report "Public"	5-47

6 Exadata Warehouse

Setting Up Exadata Warehouse and Analyzing Performance Data	6-2
Simplifying Capacity Planning and Forecasting	6-2



Exadata Warehouse Sample Queries	6-4
Configuring Purge Settings for Old Metric Data	6-7

7 Exadata Metrics

Accessing Exadata Metrics	7-1
Example Metrics	7-1
Aggregated Exadata FlashDisk and HardDisk Metric	7-1
Exadata Storage Server Metric	7-2
Exadata Key Performance Indicators Metrics	7-4

8 Troubleshooting

Discovery Troubleshooting	8-1
Hardware Availability	8-2
Discovery Failure Diagnosis	8-2
Exadata Storage Server is not Discovered	8-2
Compute Node or InfiniBand Switch is not Discovered	8-3
Extra or Missing Components in the Newly Discovered Exadata Database Machine	8-3
ILOM, PDU, or Cisco Switch is not Discovered	8-3
Test Connection Fails in PDU	8-4
Target Does not Appear in the Components Step of Guided Discovery	8-4
Target Status is Down or Metric Collection Error After Discovery	8-4
ILOM Credential Validation Fails During Discovery	8-5
Discovery Process Hangs	8-5
SNMP Configuration Missing	8-6
Set Up SNMP Subscription for Exadata Storage Servers	8-6
Set Up SNMP Subscription for Cisco Ethernet Switch Targets	8-8
Set Up SNMP for Power Distribution Unit (PDU) Targets	8-9
Time Out Error During SNMP Subscription	8-9
Review Logs	8-9
EMCLI Discovery Issues	8-10
System Infrastructure Targets in Pending Status	8-10
Discovery Status Summary States "Completed with errors"	8-11
Target Discovered but Association Not Created	8-11
Component not Available or Accessible Before Discovery	8-11
Trouble Using ExaCLI during Discovery	8-11
Input File Errors	8-12
Unclear Message Shown on the Deployment Procedure Output	8-12
Troubleshooting the Exadata Database Machine Schematic File	8-13
Exadata Database Machine Management Troubleshooting	8-13



Exadata Derived Association Rules	8-14
Target Status Issues	8-14
Metric Collection Issues	8-14
Status: Pending Issues	8-15
Cellsys Targets	8-15
Database Machine Target or Any Associated Components	8-15
Monitoring Agent Not Deployed for IPv6 Environments	8-15
Monitoring: Error Fetching Data for Grid and CellSys Targets IORM Page Charts	8-16
Not able to receive SNMP traps on Exadata Storage Servers using IPv6	8-16

Index



Preface

Oracle Enterprise Manager provides the tools to effectively and efficiently manage your Oracle Exadata Database Machine. With a consolidated view of the Exadata Database Machine, Oracle Enterprise Manager provides a consolidated view of all the hardware components and their physical location with indications of status. Oracle Enterprise Manager also provides a software view of the databases residing on it and their resource consumption on compute nodes and Exadata Storage Servers.

This document provides the installation and administration instructions to set up Oracle Enterprise Manager to monitor and manage your Oracle Exadata Database Machine.

Audience

This system monitoring installation guide is for users who perform administrative and problem-resolution tasks on Oracle Exadata Database Machine.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc.

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Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
monospace	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.



1 Introduction to the Plug-in

This chapter provides a general overview of the Oracle Exadata plug-in, including supported hardware and software. The following topics are discussed:

- Oracle Exadata Plug-in Features
- Oracle Exadata Database Machine Supported Hardware and Software

Oracle Exadata Plug-in Features

Highlights of the Oracle Exadata plug-in include the following features:

- Monitoring and Notification Features
- Hardware Support Features
- Target Discovery Features
- Exadata Storage Server Grid Home Page and Server Home Page Features
- Exadata Performance Page Features
- Exadata Metrics Features

Monitoring and Notification Features

With the Oracle Exadata plug-in, and related Systems Infrastructure and Virtual Infrastructure plug-ins, you can monitor Exadata Database Machine targets through Enterprise Manager Cloud Control 13c. These plug-ins provide seamless integration with supported Exadata hardware and software so that you can receive notifications on any Exadata Database Machine target. Features include:

- Monitoring of the Exadata Database Machine as an Enterprise Manager target.
- Monitoring of the Exadata Database Machine target, including the Exadata Storage Server's I/O Resource Management feature within Enterprise Manager.
- Support SNMP notification for Exadata Database Machine components.
- Support dashboard report creation from Enterprise Manager Cloud Control, including a simplified configuration of the service dashboard.
- Support of client network host names for compute nodes.
- Enhanced InfiniBand network fault detection and InfiniBand schematic port state reporting.
- Modification of Enterprise Manager monitoring agents as needed for all Exadata Database Machine components.
- IORM for multi-tenancy database (CDB/PDB) environment:
 - CDB-level I/O Workload Summary with PDB-level details breakdown.
 - I/O Resource Management for Oracle Database 12c and above.



- Exadata Database Machine-level physical visualization of I/O Utilization for CDB and PDB on each Exadata Storage Server.
- Integration link to Database Resource Management UI.
- Support discovery of locked down Exadata Storage Servers.
- Since the release of EM 13c, the Exadata Plug-in is able to leverage the enhanced hardware monitoring features offered by the newly introduced *Oracle Systems Infrastructure Plug-in*. Users can view a photo-realistic schematic of the various hardware (including rack) and monitor the faults on individual hardware components.

Hardware Support Features

You can use the Oracle Exadata plug-in to optimize the performance of a wide variety of Exadata Database Machine targets, including:

- Oracle SuperCluster, including:
 - Configurations:
 - * LDOM: Control domain, IO/guest domain
 - Zone: Global, non-global
 - Discover, monitor, and manage Exadata Database Machine-related components residing on SuperCluster Engineered System
 - See Oracle SuperCluster Support for more details.
- Multi-Rack support:
 - Supports discovery use cases: Initial discovery, add a rack
 - Side-by-side rack schematic
- Support for Storage Expansion Rack hardware.
- Full partition support:
 - Logical splitting of an Exadata Database Machine Rack into multiple Database Machines.
 - Each partition is defined through a single OneCommand deployment.
 - Compute nodes are not shared between partitions.
 - Multiple partitions connected through the same InfiniBand network.
 - Compute nodes in same partition share the same Cluster.
 - Ability to specify a customized DBM name during discovery of the target.
 - User can confirm and select individual components for each DBM.
 - Flexibility to select none, some, or all of the InfiniBand switch as part of monitored network, including the ability to add switches post discovery.
 - Flexibility to select some or all of the Exadata Storage Servers to be shared among Exadata Database Machines.
- Support for Exadata Extended (XT) Storage: Since XT storage servers do not have flash drives, Oracle Enterprise Manager Cloud Control will automatically suppress all the flash-related monitoring functionalities, and present only those IO Resource Management settings that are appropriate for XT storage. Exadata X8



systems configured with XT storage are automatically recognized by Oracle Enterprise Manager Cloud Control during discovery, and the corresponding Exadata Storage Server targets automatically adapt to the underlying storage server type.

- Support for the increasing types of Exadata Database Machine targets. See Oracle Exadata Database Machine Supported Hardware and Software for a complete list of supported hardware.
- InfiniBand Switch Sensor fault detection, including power supply unit sensors and fan presence sensors.

Target Discovery Features

The target discovery process is streamlined and simplified with the Oracle Exadata plug-in. Features include:

- Automatically push the Exadata plug-in to agent during discovery.
- Discovery prerequisite checks updates, including:
 - Check for critical configuration requirements.
 - Check to ensure either databasemachine.xml or catalog.xml files exist and are readable.
 - Prevent discovered targets from being rediscovered.
- Credential validation and named credential support.
- Ability to apply a custom name to the Exadata Database Machine target.
- Support discovery using the client access network.
- Automate SNMP notification setup for Exadata Database Machine components.
- Support discovery of compute nodes with client network host names.
- Enterprise Manager Cloud Control Exadata Discovery Wizard lets you discover Exadata Database Machine targets using 13c.
- An existing Exadata Database Machine target with *12c target types* can be converted to *13c target types*. For more information, see Convert Database Machine Targets with *12c* Target Types to *13c* Using the Console for more information.

Note:

Exadata Database Machine targets are configured with OOB default thresholds for the metrics. No additional template is provided by Oracle.

Exadata Storage Server Grid Home Page and Server Home Page Features

The Exadata Storage Server Grid home page and Server home page provides the following features:

- Provides a fine-grained performance summary for flash and hard disk.
- Provides usage statistics to highlight flash cache and Smart Scan efficiency.



- Provides a detailed summary of flash space usage.
- Provides metrics for:
 - I/O time distribution by flash and hard disk.
 - IORM wait per database.

Exadata Performance Page Features

The Performance page provides the following features:

- Side-by-side comparison of flash and hard drive performance.
- Performance comparison between multiple Exadata Storage Servers.
- Performance utilization for flash and hard drive to identify workload reaching hardware limit.
- Provides Exadata Storage Server performance charts to help with diagnosing performance issues when I/O reaching hardware limits.

Exadata Metrics Features

Metrics reports are critical to manage your Oracle Exadata Database Machine effectively. With the metrics, you can determine where additional resources are needed, when peak usage times occur, and so forth.

- Enhanced metric scalability in large environment to reduce time out by reducing calls.
- Reduce metric collection error for the Exadata HCA metric. Improvements to combine the HCA port data collection in a single call to reduce chances of time out.

Oracle Exadata Database Machine Supported Hardware and Software

The following sections describe the supported hardware and software by the Oracle Exadata plug-in:

- Exadata Database Machine Configuration Support
- Oracle SuperCluster Support
- Supported Component Versions
- Supported Operating Systems
- Oracle Exadata Database Machine Hardware Not Supported

Exadata Database Machine Configuration Support

Enterprise Manager Cloud Control 13*c* is supported on the following Exadata Database Machine configurations:

- Hypervisor Support
- Multi-Rack Support



- Partitioned Support
- IPv6 Support

Hypervisor Support

Exadata Database Machine Monitoring and Management supports both Xen and KVM Hypervisors when used in certified Exadata configurations.

Multi-Rack Support

Enterprise Manager supports managing multiple connected racks of Oracle Database Machine of the supported machine types listed above (Hypervisor Support). Also, the following two racks can be monitored in a multi-rack as these cannot exist as a standalone single rack:

- Storage Expansion Rack
- Compute Node Expansion Rack

Partitioned Support

The following partitioned configurations are supported:

- Partitioned Exadata Database Machine the logical splitting of a Database Machine Rack into multiple Database Machines. The partitioned Exadata Database Machine configuration must meet the following conditions to be fully supported by Enterprise Manager Cloud Control 13c:
 - Each partition is defined through a single OneCommand deployment.
 - Exadata Storage Servers and compute nodes are not shared between partitions.
 - Multiple partitions are connected through the same InfiniBand network.
 - Compute nodes in same partition share the same Cluster.

The expected behavior of a partitioned Exadata Database Machine includes:

- The target names for the Exadata Database Machine, Exadata Grid, and InfiniBand Network will be generated automatically during discovery (for example, Database Machine dbm1.example.com, Database Machine dbm1.example.com_2, Database Machine dbm1.example.com_3, etc.). However, users can change these target names at the last step of discovery.
- All Infiniband Switches need to be selected as part of the Exadata Database Machine targets for every partition. Inifiniband Switches will not be added automatically to subsequent Exadata Database Machine targets of other partitions. The KVM, PDU, and Cisco switches can be individually selected for the Database Machine target of each partition.
- User can confirm and select individual components for each Database Machine.

IPv6 Support

Enterprise Manager supports monitoring and managing Exadata environments configured with IPv6. For more details, see IPv6 support status on Exadata Database Machine (Doc ID. 2056895.1), available in My Oracle Support.



Oracle SuperCluster Support

Only Oracle SuperCluster with software Version 1.1 with DB Domain on Control LDOM-only environments are supported. Earlier versions of Oracle SuperCluster can be made compatible if you update to the October 2012 QMU release. You can confirm this requirement by looking at the version of the compmon pkg installed on the system (using either pkg info compmon or pkg list compmon commands to check). You must have the following minimum version of compmon installed:

pkg://exa-family/system/platform/exadata/ compmon@0.5.11,5.11-0.1.0.11:20120726T024158Z

The following hardware configurations are supported:

- Oracle SuperCluster:
 - T4-4
 - T5-8
 - M6-32
 - M7
 - M8
 - M12-2S

Note: Enterprise Manager Systems Infrastructure plug-in doesn't support firmware monitoring through eXtended System Control Facility (XSCF).

The following software configurations are supported:

- LDOM
 - Control Domain
 - IO/Guest Domain
- Zone
 - Global
 - Non-Global

The following software versions are supported:

- Oracle SuperCluster V1.1 and above
- Oracle SuperCluster V1.0.1 + October QMU

Supported Component Versions

For information on supported component versions of Exadata, refer to the following notes on My Oracle Support:

- Exadata System Software and Hardware Versions Supported by Oracle Enterprise Manager Plug-ins (Doc ID 1626579.1). This note provides information on the required Oracle Enterprise Manager and plug-in versions to support the specific versions of Exadata Software and generations of Exadata Hardware.
- Required Enterprise Manager versions for Exadata Cisco Catalyst switches (Doc ID 2449150.1)



 Exadata Database Machine and Exadata Storage Server Supported Versions (Doc ID 888828.1)

Supported Operating Systems

The following operating systems (where OMS and agent is installed on) are supported by the Oracle Exadata plug-in 13.5.1:

- Management Server plug-in (all OMS-certified platforms):
 - IBM AIX on POWER Systems (64-bit)
 - HP-UX Itanium
 - Linux x86 and x86-64
 - Microsoft Windows x64 (64-bit)
 - Oracle Solaris on SPARC (64-bit)
 - Oracle Solaris on x86-64 (64-bit)
- Agent Plug-ins for Exadata and Supercluster
 - Exadata Plug-in + SI plug-in + VI Plug-in for Exadata
 - Exadata Plug-in + SI Plug-in for SSC
 - Linux x86-64
 - Oracle Solaris on x86-64 (64-bit)
 - Oracle Solaris on SPARC (64-bit)

Oracle Exadata Database Machine Hardware Not Supported

The following Oracle Exadata Database Machine hardware configurations are **not** supported for Enterprise Manager Cloud Control Exadata plug-in 13.x:

- V1 hardware
- V2 hardware

Note:

V2 machines discovered in Enterprise Manager Cloud Control 12c are still supported in 13c. However, discovery of V2 machines in Enterprise Manager Cloud Control 13c is not supported.



2 Prerequisites

This chapter provides the prerequisites for Exadata Database Machine discovery. The following topics are discussed:

- Create a Database Server ILOM Service Processor User
- Create an ExaCLI or RESTful API User
- Create SNMPv3 Users
- Verify Software Versions
- Verify Names Resolution
- Verify Firewall Configuration
- User Roles
- Install Oracle Management Agent
- Manually Deploy Exadata and Related Plug-ins
- Prerequisites for Discovery Using EMCLI
- Prerequisites for Discovery and Monitoring Using Non-root User

Create a Database Server ILOM Service Processor User

For the Enterprise Manager Agent to communicate with an ILOM service processor, there must be a specific user ID established on the ILOM service processor.

Note:

Adding the specific user ID requires administrator level privilege on the ILOM service processor.

The specific ILOM user ID can be added in the ILOM service processor web interface, ILOM CLI, or with the <code>ipmitool</code> command. This example uses ILOM CLI.

For security reasons, the password to the ILOM service processor root user ID does not appear in the ILOM CLI commands in this example.

1. Log in to the Service Processor as root:

ssh root@[Service Processor IP]
Password:

2. Change to the users directory:

cd /SP/users

3. Create the oemuser user and password:



```
# create oemuser
Creating user...
Enter new password: ********
Enter new password again: ********
```

Created /SP/users/oemuser

4. Change to the new user's directory and set the role:

```
# cd oemuser
/SP/users/oemuser
```

```
set role='cro'
Set 'role' to 'cro'
```

- 5. Test the ILOM user ID created in step 3 by listing the last 10 system events:
 - For Exadata X2 through X4:

```
# ipmitool -I lan -H <ilom_hostname> -U oemuser -P <oemuser password> -L
USER sel list last
10\
```

For Exadata X5 and above (requires the -I lanplus command option):

```
# ipmitool -I lanplus -H <ilom_hostname> -U oemuser -P <oemuser
password> -L USER sel list last 10
```

6. Repeat steps 1 through 5 for the rest of the compute node ILOM service processors in your Oracle Database Machine.

Create an ExaCLI or RESTful API User

Enterprise Manager can monitor Exadata Storage Servers using cellcli, exacli, or RESTful API. In order to monitor and/or manage Exadata Storage Servers through exacli or the RESTful API, a user must be created and provided for Exadata Database Machine discovery. For more information on exacli or RESTful API user creation, see the Cell node sections in both Example 9-9 and Example 9-10 in Creating Users for Use with ExaCLI in Oracle Exadata Database Machine Maintenance Guide. These examples provide the steps to create both the celladministrator user and the cellmon user. Review the following best practice guidelines/requirements to determine if the celladministrator user is required:

- As a best practice of using the least privileged user for an operation, always create and use the cellmon user for the monitoring credentials.
- Create the celladministrator user only if one or both of these activities are required:
 - Set up of SNMP subscriptions for the Exadata Storage Servers
 - IORM administration
- During discovery, for the Exadata Storage Server credentials, the following are the best practice recommendations/requirements:
 - Supply the cellmon user credentials if selecting exacli or RESTful API for monitoring
 - If setting up SNMP subscriptions, supply the celladministrator credentials for the SNMP setup (the celladministrator credential is required)



Note:

If SNMP subscriptions are not configured, then Enterprise Manager will not monitor key events such as hardware failures.

• While making IORM change through Enterprise Manager, use the celladministrator credential.

Create SNMPv3 Users

If SNMPv3 will be used for Oracle Exadata Database Machine monitoring, ensure that the necessary SNMPv3 users are created on the components prior to discovering the Exadata to fully leverage monitoring through Enterprise Manager.

- Create SNMPv3 Users on Compute Nodes and Storage Servers
- Create SNMPv3 Users on Cisco Ethernet Switches
- Create an SNMPv3 User in IB Switches
- Enable SNMPv3 on PDUs
- Create an SNMPv3 user on PDUs

Note:

Oracle does not recommend to use MD5 as the AuthProtocol while creating SNMPv3 user for security reasons.

Create SNMPv3 Users on Compute Nodes and Storage Servers

The commands required to create SNMPv3 users on compute nodes and storage servers are similar, but make use of different command line interfaces and object names. In the following examples, run cellcli to get to the interactive prompt if on a storage server, and run dbmcli to get to the interactive prompt on a compute node. Specify the appropriate object name, cell and dbserver for compute node. The instructions differ between Exadata System Software releases. Please see the details for the respective Exadata System Software version in the sections below.

Note:

For additional information on these commands, please see the following references:

- For information on CellCLI and the alter cell command, see Using the CellCLI Utility in the Oracle Exadata System Software User's Guide.
- For information on DBMCLI and the alter dbserver command, see Using the DBMCLI Utility in the Oracle Exadata Database Machine Maintenance Guide.



Create Individual SNMPv3 Users on Exadata 19.3 and Above

Exadata System Software version 19.3 and above supports maintaining SNMPv3 users individually. Use the following command to create an SNMPv3 user.

```
CLI> alter <cell|dbserver> snmpuser.<username>
=(authprotocol=SHA,authpassword=<password>,privprotocol=AES,privpasswor
d=<password>)
```

In the above command,

- name: The user name
- * is the only allowed value for the password
- **authProtocol**: The authentication protocol. The supported protocol is SHA. The system prompts for the authentication password. The authentication password must have 8 to 12 alphanumeric characters.
- privProtocol: Encryption protocol. The options supported are none, AES, and DES. The default value is none when privProtocol attribute is not specified. The system prompts for an encryption password if the encryption protocol is specified. The password must be exactly 8 alphanumeric characters long, and is case sensitive.

To change the password for an existing user:

```
CLI> alter <cell|dbserver> snmpuser.<username>
=(authprotocol=SHA,authpassword=<newpassword>)
```

To delete a user:

CLI> alter <cell|dbserver> snmpuser.<username> =''

Create All SNMPv3 Users on Exadata 19.2. and Below

Exadata System Software versions 19.2 and below require maintenance of SNMPv3 users as a complete set. Use the following command to create an SNMPv3 user.

Note:

Be sure to include the details of all SNMPv3 users while creating a new user as the set will be replaced with this command.

```
CLI> alter <cell|dbserver> snmpUser=((name=<username>,
authProtocol=SHA, authPassword=<password>, privProtocol=DES,
privPassword=<password>)
[,<repeat with details as necessary for additional users>])
```



Create SNMPv3 Users on Cisco Ethernet Switches

The below commands configure an SNMP user with authentication and privacy parameters on the Cisco Ethernet switches running NX-OS including the admin switch, and if this is a Exadata X8M, the RoCE switches.

Starting with Enterprise Manager 13.5 Release Update 13, while configuring SNMP, Enterprise Manager does not support AUTH protocol DES and PRIV protocol MD5 in Cisco Ethernet switches running NX-OS.

The passphrase can be any case-sensitive, alphanumeric string up to 64 characters.

switch# configure terminal switch(config)# switch(config)# snmp-server user <username> auth sha <passphrase> priv aes-128 passphrase

The below command displays information about one or more SNMP users.

switch(config) # show snmp user

Once all the configuration changes are done, the below command will save the configuration in persistent memory .

```
switch(config) # copy running-config startup-config
```

Create SNMP Community on Cisco Ethernet Switches

The below commands configure an SNMP community on the Cisco Ethernet switches running NX-OS including the admin switch, and if this is a Exadata X8M, the RoCE switches.

```
switch# configure terminal
switch(config)#
switch(config)# snmp-server community <community> ro
```

The below command displays information about one or more SNMP communities.

switch(config) # show snmp community

Ensure that the ACL is not assigned to the community string.

Once all the configuration changes are done, the below command will save the configuration in persistent memory .

switch(config) # copy running-config startup-config

Create an SNMPv3 User in IB Switches

If the Exadata to be discovered is an IB Exadata, follow the below commands to create an SNMPv3 user on the IB switches.



Log in to the ILOM CLI of the switch as ilom-admin user.

Create the SNMPv3 user account by using the following create command:

```
> create /SP/services/snmp/users/<v3user>
privacyprotocol=<privacvy_protocol> privacypassword=<privacy_password>
authenticationprotocol=<authentication_protocol>
authenticationpassword=<authentication_password>
```

For example,

```
> create /SP/services/snmp/users/v3adminuser privacyprotocol=AES
privacypassword=mypassword1 authenticationprotocol=SHA
authenticationpassword=mypassword2
```

The user is created as part of the discovery flow of the switch. This is required only if the you want to explicitly add an SNMPv3 user.

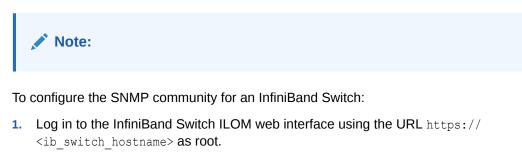
To edit the SNMPv3 user account, run the following set command:

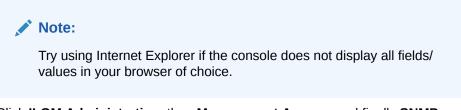
```
> set /SP/services/snmp/users/<v3user>
privacyprotocol=<privacy_protocol>
privacypassword=<privacy_password>
authenticationprotocol=<authentication_protocol>
authenticationpassword=<authentication_password>
```

Run the following command to display information about one or more SNMP users:

```
> show -d properties /SP/services/snmp/users/<username>
```

Create SNMP Community for InfiniBand Switch Targets





- 2. Click ILOM Administration, then Management Access, and finally SNMP.
- 3. Ensure the following values are set:



```
State=Enabled
Port=161
Protocols=v1,v2c,v3
```

If you need to make changes, make sure you click Save.

 Click ILOM Administration, then Management Access, then SNMP, and finally the Communities link. The page scrolls to the SNMP Communities table. In the SNMP Communities table, click Add.

A new window opens.

5. Type the community name into the **Community Name** field. Select the permissions from the Permission drop-down menu. Click **Save**.

The community is created, and the window closes.

- 6. Click Alert Management.
- 7. If not already listed, for each Agent that monitors the InfiniBand Switch target, select an empty alert (one that has the Destination Summary 0.0.0.0, snmp v1, community 'public') and click Edit. Provide the following values:

```
Level = Minor
Type = SNMP Trap
Address = [agent compute node hostname]
Destination Port = [agent port]
SNMP Version = v1
Community Name = public
```

Click Save.

Enable SNMPv3 on PDUs

Follow the below steps to enable SNMPv3 on the PDUs.

- 1. Access the PDU metering unit from a system on the network.
- 2. Click on the Net Configuration link and log in as an admin user.
- 3. Select the SNMP-Access tab.
- 4. Click the SNMP v3 Enable checkbox to enable SNMP v3.
- 5. Click Submit.

Create an SNMPv3 user on PDUs

Follow the below steps to create an SNMPv3 user on the PDUs.

- 1. Access the PDU metering unit from a system on the network.
- 2. Click on the Net Configuration link and log in as an admin user.
- 3. Select the SNMP-Access tab.
- In the SNMPv3 table, perform the following
 - a. Enter the SNMPv3 UserName.
 - b. Select the Security Level auth / priv.
 - c. Select SHA as the Auth Algorithm.
 - d. Enter the Auth Password.



- e. Select AES as the Privacy Algorithm.
- f. Enter the Privacy Password.
- g. Select Enable.
- 5. Click Submit.

Create SNMP Community on PDUs

Follow the below steps to create an SNMP community on the PDUs.

- **1**. Access the PDU metering unit from a system on the network.
- 2. Click on the **Net Configuration** link and log in as an admin user.
- 3. Select the SNMP-Access tab.
- 4. In the NMS (SNMPv1/v2) table, perform the following
 - a. Enter the SNMP IP address or host name of the first monitoring agent.
 - b. Select the privacy level for read-write community as private or public.
 - c. Select the privacy level for read-only community as private or public.
 - d. Select the type of **access** from the menu.
 - e. Select Enable.
- 5. Click Submit.

Verify Software Versions

Verify the following software versions:

- Exadata Storage Server Software
- InfiniBand Switch
- Cisco Ethernet Switch
- PDU Firmware
- Grid Infrastructure/DB Cluster

Exadata Storage Server Software

See Oracle Exadata Database Machine Supported Hardware and Software for specific supported Exadata Software releases. To verify the software version on the Exadata Storage Server, ssh to the Exadata Storage Server as the root, celladmin, or cellmonitor user. Run:

```
# cellcli -e 'list cell detail'
```

Look for releaseVersion in the output.

InfiniBand Switch

To verify the version of the InfiniBand switch firmware in your environment:



- 1. Log on to the management interface for the InfiniBand Switch (using SSH).
- 2. Run the following command:

```
# nm2version
```

The output should be similar to this:

nm2version
Sun DCS 36p version: 2.2.13-2

This example shows a supported configuration for deploying the plug-in to monitor.

3. If the nm2version command returns output similar to this:

```
# nm2version
NM2-36p version: 1.0.1-1
```

Then you must upgrade your InfiniBand switch firmware. Follow the instructions listed in My Oracle Support (MOS) Document 888828.1

Cisco Ethernet Switch

Use the show version command to list the BIOS version, NXOS version, and the model details.

Log on to the management interface for the Cisco Switch (using SSH). Run the following command:

#show version

Here's an example output to the command:

```
Software
BIOS: version 05.38
NXOS: version 7.0(3)I7(8)
BIOS compile time: 06/12/2019
NXOS image file is: bootflash:///nxos.7.0.3.I7.8.bin
NXOS compile time: 3/3/2020 20:00:00 [03/04/2020 04:49:49]
```

Hardware

```
cisco Nexus9000 C9336C-FX2 Chassis
Intel(R) Xeon(R) CPU D-1526 @ 1.80GHz with 24571608 kB of memory.
Processor Board ID FD0230701AK
```

PDU Firmware

The PDU firmware version must be 2.10 or later. The current version can be obtained by logging into the web interface of the PDU. On the left side of the screen, click **Module Info** to view the PDU firmware version.

Software updates for the PDU are available at:

https://updates.oracle.com/Orion/PatchDetails/process_form?patch_num=12871297



Grid Infrastructure/DB Cluster

Grid Infrastructure/DB Cluster is required to be up and running before discovery.

Verify Names Resolution

The Enterprise Manager OMS server(s) require direct network access to each of the compute nodes. If the names of the compute nodes are not registered in the OMS nodes' DNS, then they will have to be manually entered in the /etc/hosts file for each OMS.

Each compute node should be verified to be able to resolve the hostnames of the ILOM servers, PDU's, Exadata Storage Servers, and InfiniBand and Cisco switches. Again, if the names of those components are not registered in DNS, then entries can be added to the /etc/hosts file of each compute node.

To manage the Exadata Database Machine components from Enterprise Manager Cloud Control 13*c*, it is necessary for your local machine to be able to resolve the host name of Cloud Control 13*c*.

To access any of the Exadata Database Machine components directly from your local machine, it is also necessary for your local machine to be able to resolve the names of those components.

Verify Firewall Configuration

To verify the firewall configuration:

1. Enable ping

In many secure network environments, it is normal for the ping service to be disabled. Enterprise Manager uses ping to establish the basic availability and status of the Exadata Database Machine components.

- The compute nodes need to have the ping service and port enabled from the OMS Server(s).
- All other Exadata Database Machine components (ILOM servers, PDU's, Exadata Storage Servers, InfiniBand switches, and Cisco switch) need to have the ping service and port enabled from the compute nodes (where the agents are running).

Note:

The ping traffic overhead is minimal. The agent pings the targets every five minutes.

2. Open Database Ports

The database listener ports must be opened for the Enterprise Manager OMS server(s). Note that Exadata Database Machine databases will use SCAN listeners; so, ports will need to be opened for the base compute node, the compute node virtual IP, and scan listeners addresses.



For example, if an Exadata Database Machine quarter rack has been configured with two compute nodes - exadbnode1.example.com and exadbnode2.example.com - and the listeners are using port 1521, then port 1521 will have to be opened to the Enterprise Manager Server for the following addresses:

- The compute node hostnames exadbnode1.example.com and exadbnode2.example.com
- The virtual IPs for each compute node exadbnodel-vip.example.com and exadbnodel-vip.example.com
- The scan listener hostname scan-exadatadb
- 3. Open Enterprise Manager Upload Port

The Enterprise Manager Cloud Control 13c agents require access to the Enterprise Manager Servers upload service, normally configured on port 4889 for HTTP uploads and 4900 for HTTPS. To verify the ports assigned, run the following command on the OMS server command line.

\$ emctl status oms -details

These ports will need to be opened for each of the compute nodes.

4. Open Agent Ports

The OMS server(s) will need to be able to connect to the Enterprise Manager Cloud Control 13c Agent HTTP/HTTPS port on each compute node. The Agent port defaults to 3872. If port 3872 is not available, the next available port starting from port 1830 is used.

To identify the port used:

• Run the following command on the compute node command line:

\$ emctl status agent

- Alternatively, you can look for the value of the EMD_URL property in the emd.properties file the following directory: <AGENT_HOME>/agent_inst/sysman/ config
- 5. Open SSH Ports (port 22)

The Enterprise Manager Cloud Control 13c Agents require ssh access to the Exadata Database Machine components they monitor. As the Agents will run on the compute nodes the ssh ports, 22, on each of the Exadata Storage Servers, ILOMs, PDUs, InfiniBand switches, and Cisco switch will need to be opened for each of the compute nodes.

6. Allow UDP Traffic (SNMP Ports) (Port 162)

All Exadata Database Machine components need to be able to send SNMP traps to the Agents running on the compute nodes. SNMP uses the UDP protocol so the Agent port and port 162 need to be opened for UDP traffic between the Exadata Storage Servers, ILOMs, InfiniBand Switches, Cisco Switch, and the Agent.

Table 2-1 Firewall Ports

Component	Ping service and port	SNMP*	SSH (port 22) Notes
PDU	From remote agent	Yes	Yes



Component	Ping service and port	SNMP*	SSH (port 22)	Notes
Compute node ILOM	From remote agent	Yes	Yes	1. Remote agent needs to be able to SSH to dom0.
				2. Need SNMP port open on dom0.
dom0	From remote agent	Yes	Yes	
Exadata Storage Server	From remote agent	Yes	Yes	
InfiniBand Switch	From remote agent	Yes	Yes	
Cisco Switch	From remote agent	Yes	Yes	
OMS			Yes	Upload http/https port - usually 3872
Agent				The OMS server(s) will need to be able to connect to the Enterprise Manager Cloud Control Agent HTTP/HTTPS port on each compute node. The Agent port defaults to 3872. If port 3872 is not available, the next available port starting from port 1830 is used.

Table 2-1 (Cont.) Firewall Ports

User Roles

To manage the Exadata Database Machine in Enterprise Manager, you should consider creating Enterprise Manager roles and assigning them to the appropriate Enterprise Manager users. Creating these roles restricts the privileges that each user has, for example in deleting the plug-in or accessing reports. See Oracle Exadata Database Machine Administration .

Install Oracle Management Agent

Enterprise Manager Exadata discovery supports the use of either management network hostname or client network hostname for the compute nodes. When installing the Oracle Management Agent on the compute nodes, you should use the same hostname as used in Oracle Clusterware.

You can identify the hostname of the nodes in the cluster by running the olsnodes command on one of the compute nodes. It is recommended that a fully qualified hostname, including the domain name, be used when specifying an Oracle Management Agent hostname.



Oracle Management Agents need to be installed on each compute node and must not be installed on any other Exadata Database Machine components. For physical Exadata, the agents should be installed on each compute node. For virtual Exadata, the agents should be installed on each domU (virtual machine), and not on the dom0 (hypervisor).

For information on installing agents, refer to Installing Oracle Management Agents in *Cloud Control Basic Installation Guide*.

Manually Deploy Exadata and Related Plug-ins

Exadata and Systems Infrastructure plug-ins are the default plug-ins and are available for use. The. Virtual Infrastructure plug-in must be manually deployed in OMS as well as agent before starting the discovery process for Virtual Exadata.

You may need to manually deploy the Exadata and related plug-ins to the agents on each of the compute nodes when upgrading an existing agent plug-in installation. Deploy the Exadata, Systems Infrastructure, and for virtual Exadata the Virtual Infrastructure plug-ins manually if an older version of the plug-in(s) has been deployed to the agent already and you would like to upgrade to the latest version of the plug-in(s) deployed on the OMS.

To determine if the Exadata, Systems Infrastructure, and Virtual Infrastructure plug-ins are deployed on each compute node and what versions they are, you have two options:

From a terminal window, run the following command:

```
emctl listplugins agent
```

Note:

The emctl listplugins agent command must be run on the compute node using the emctl in the agent installation directory.

• From Enterprise Manager Cloud Control, click the **Setup** menu (upper right corner), **Extensibility**, and then **Plug-ins**.

To manually deploy the Exadata and related plug-ins:

- 1. From the Enterprise Manager home page, click the **Setup** menu (upper right corner), **Extensibility**, and then **Plug-ins**.
- 2. On the *Plug-ins* page, select the plug-in of choice from the Name list.

Note:

Check *Exadata Storage Software Versions Supported by the Oracle Enterprise Manager Exadata Plug-in* (Doc ID 1626579.1) on My Oracle Support for the latest supported plug-ins. Oracle recommends that you deploy the latest version of the Exadata and related plug-ins to the agent.

- **3.** To deploy the plug-in on Management Servers first, follow the instructions in Downloading, Deploying, and Upgrading Plug-Ins in *Cloud Control Administrator's Guide*.
- 4. To deploy the plug-in on the Agent, click **Deploy On**, then **Management Agent**.



5. On the *Deploy Plug-in on Management Agent* pop-up, click **Add**. A search pop-up will appear to allow you to search for targets to add. In the Target Type drop-down, select **Agent**, then click **Search**.

Select a Target name from the results list and click **Select**. Repeat for each agent target.

- 6. After you have added the agents, click **Next** on the *Deploy Plug-in on Management Agent* screen to review and verify the agent information.
- 7. Click **Deploy** to deploy the plug-in to the agents.
- 8. Once the plug-in has been deployed to all agents, a confirmation screen will appear. Click **OK** to dismiss the pop-up or **Show Status** to display the status of the agent in the Enterprise Manager *Deployment Activities* screen.

Prerequisites for Discovery Using EMCLI

The EMCLI based database machine discovery is performed through a deployment procedure which consumes an input file that contains all the required information like monitoring agents, configuration, components, and credentials. OMS and the monitoring agents should be *Enterprise Manager 13.4 Release Update 4* or above.

Complete the following prerequisites tasks before you can discover the Exadata Database Machine targets using EMCLI:

- Create Named Credentials for All the Target Types
- Set Up SSH Key Authentication
- Create the Input File
- Optional Verification of the Prerequisites

Create Named Credentials for All the Target Types

The value for the credential parameter in the input file must be a named credential available in Enterprise Manager. The named credentials can be created using either EMCLI or by using the Enterprise Manager UI.

To create a named credential from the UI, navigate to **Setup > Security > Named Credential**.

To create a named credential using EMCLI, issue the command specified in the table in Named Credentials and Commands to Create Them. Named credential in the input file should follow the notation <CREDENTIAL_OWNER>:<NAMED_CREDENTIAL>. For example, credMap.schematicFileHostCred=SYSMAN:SCHEMATIC HOST CRED.

Named Credentials and Commands to Create Them

The following table lists the named credentials, and provides the sample command that you can run to create it:



Property Name and Description	Sample Command
credMap.schematicFileHostCred Credential of host where schematic file is present. This will be used to read schematic file and credential user should have read permission for schematic file. It's mandatory to place the schematic file in the discovery agent host. Target Type: host	<pre>Credential Type: HostCreds (username, password) emcli create_named_credential -cred_name='SCHEMATIC_HOST_CRED' -auth_target_type='host' -cred_type='HostCreds' -cred_scope='global' -target_type='host' - attributes="HostUserName:sample;HostPassword: XXXXXXXX"</pre>
	Credential Type: HostSSHCreds (public, private key)
	<pre>emcli create_named_credential -cred_name='SCHEMATIC_HOST_SSH_CRED' -cred_scope=global -cred_type=HostSSHCreds - auth_target_type=host - attributes="USERNAME:XX;SSH_PVT_KEY:pvt;SSH_P UB_KEY:pub" -input_file="pvt:<path_to_prv_ FILE_EMCLI_INSTALL_BOX>; pub:<path_to_pub_file_emcli_install_box>"</path_to_pub_file_emcli_install_box></path_to_prv_ </pre>
	The private and public key file path is on the host where EMCLI is executed.

Property Name and Description	Sample Command
credMap.agentCred These were the credential used to	Credential Type: HostCreds (username, password)
install the agents. These credentials are	emcli create named credential
required to set up passwordless SSH	-cred name='AGENT HOST CRED'
between the agent and Exadata	-auth target type='host'
Storage Server.	-cred type='HostCreds' -cred scope='global'
Target Type: host / oracle_emd	-target type='host'
	-
	attributes="HostUserName:sample;HostPassword
	XXXXXXXX"
	Credential Type: HostSSHCreds (public, private key)
	emcli create_named_credential
	-cred_name='AGENT_HOST_SSHCRED'
	-cred scope=global
	-cred type=HostSSHCreds
	-auth target type=host
	-
	attributes="USERNAME:XXXX;SSH PVT KEY:pvt;SS
	PUB KEY:pub"
	_input file="pvt: <path prv<="" td="" to=""></path>
	FILE EMCLI INSTALL BOX>;
	pub: <path box="" emcli="" file="" install="" pub="" to="">"</path>
	The private and public key file path is on the host where EMCLI is executed.
credMap.computenodellomCred Compute node ILOM credential is	Credential Type: ilom_creds (username, password)
required to promote ILOM access point.	emcli create named credential
Target Type: oracle_si_server_map	-cred name='CN ILOM CRED'
	-auth target type='oracle si server map'
	-cred type='ilom creds'
	-cred scope='global'
	-attributes="username:XXXXX;password:XXXXXXX
	Credential Type: ilom_key_auth_creds (private key file, passphrase)
	emcli create named credential
	-cred name='CN ILOM SSH CRED'
	-auth target type='oracle si server map'
	-cred type='ilom key auth creds'
	-cred_scope='global'
	<pre>- attributes="username:XXXXX;privatekeyfile:<pi">- attributes="username:XXXX;privatekeyfile:<pi">- attributes="username:XXX;privatekeyfile:<pi">- attributes="username:XXX;privatekeyfile:<pi">- attributes="username:XXX;privatekeyfile:<pi">- attrib</pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pi"></pre>
	IVATE KEY PATH ON AGENT BOX>"

The private key file path is on the agent box.

Property Name and Description	Sample Command	
credMap.computenodeAdminCred Compute node admin credential is required to setup SNMP subscription on	Credential Type: HostCreds (username, password)	
compute node.	emcli create_named_credential	
•	-cred_name='HOST_ADMIN_CRED'	
Target Type: host	-auth_target_type='host'	
	-cred_type='HostCreds'	
	-cred_scope='global'	
	-target_type='host' -	
	attributes="HostUserName:sample;HostPassword: XXXXXXXX"	
	Credential Type: HostSSHCreds (public, private key)	
	emcli create_named_credential	
	-cred_name='HOST_ADMIN_SSH_CRED'	
	-cred_scope=global	
	-cred_type=HostSSHCreds	
	-auth target type=host	
	attributes="USERNAME:X;SSH PVT KEY:pvtkey;SSH	
	PUB KEY:pubkey"	
	-input file="pvt: <path prv<="" td="" to=""></path>	
	FILE EMCLI INSTALL BOX>;	
	<pre>pub:<path_to_pub_file_emcli_install_box>"</path_to_pub_file_emcli_install_box></pre>	
	pub: <path_to_pub_file_emcli_install_box>" The private and public key file path is on the host where EMCLI is executed.</path_to_pub_file_emcli_install_box>	
Compute node SNMP credential is	The private and public key file path is on the host where	
Compute node SNMP credential is	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED'	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED' -auth_target_type='oracle_si_server_map'	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED' -auth_target_type='oracle_si_server_map' -cred_type='SNMPV3Creds'	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED' -auth_target_type='oracle_si_server_map' -cred_type='SNMPV3Creds' -cred_scope='global'	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED' -auth_target_type='oracle_si_server_map' -cred_type='SNMPV3Creds' -cred_scope='global' -attributes="authUser:XXXXX;authPwd:YYYY;	
credMap.computenodeSnmpCred Compute node SNMP credential is required for alerts. Target Type : oracle_si_server_map	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED' -auth_target_type='oracle_si_server_map' -cred_type='SNMPV3Creds' -cred_scope='global' -attributes="authUser:XXXXX;authPwd:YYYY;	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED' -auth_target_type='oracle_si_server_map' -cred_type='SNMPV3Creds' -cred_scope='global' -attributes="authUser:XXXX;authPwd:YYYY; privProtocol:AES;privPwd:ZZZZZ;authProtocol:S	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED' -auth_target_type='oracle_si_server_map' -cred_type='SNMPV3Creds' -cred_scope='global' -attributes="authUser:XXXXX;authPwd:YYYY; privProtocol:AES;privPwd:ZZZZZ;authProtocol:S HA;authPwd:WWWW" Credential Type: SNMPV1Creds (SNMP V1/V2) emcli create_named_credential	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED' -auth_target_type='oracle_si_server_map' -cred_type='SNMPV3Creds' -cred_scope='global' -attributes="authUser:XXXX; authPwd:YYYY; privProtocol:AES;privPwd:ZZZZZ; authProtocol:S HA; authPwd:WWWW" Credential Type: SNMPV1Creds (SNMP V1/V2) emcli create_named_credential -cred_name='CN_SNMP_CRED'	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED' -auth_target_type='oracle_si_server_map' -cred_type='SNMPV3Creds' -cred_scope='global' -attributes="authUser:XXXX; authPwd:YYYY; privProtocol:AES; privPwd:ZZZZZ; authProtocol:S HA; authPwd:WWWW" Credential Type: SNMPV1Creds (SNMP V1/V2) emcli create_named_credential -cred_name='CN_SNMP_CRED' -auth_target_type='oracle_si_server_map'	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED' -auth_target_type='oracle_si_server_map' -cred_type='SNMPV3Creds' -cred_scope='global' -attributes="authUser:XXXX; authPwd:YYYY; privProtocol:AES;privPwd:ZZZZZ; authProtocol:S HA; authPwd:WWWW" Credential Type: SNMPV1Creds (SNMP V1/V2) emcli create_named_credential -cred_name='CN_SNMP_CRED' -auth_target_type='oracle_si_server_map' -cred_type='SNMPV1Creds'	
Compute node SNMP credential is required for alerts.	The private and public key file path is on the host where EMCLI is executed. Credential Type: SNMPV3Creds emcli create_named_credential -cred_name='CN_SNMP_V3_CRED' -auth_target_type='oracle_si_server_map' -cred_type='SNMPV3Creds' -cred_scope='global' -attributes="authUser:XXXX; authPwd:YYYY; privProtocol:AES; privPwd:ZZZZZ; authProtocol:S HA; authPwd:WWWW" Credential Type: SNMPV1Creds (SNMP V1/V2) emcli create_named_credential -cred_name='CN_SNMP_CRED' -auth_target_type='oracle_si_server_map'	

Property Name and Description	Sample Command
credMap.computenodellomRestCred Compute node REST credential to	Credential Type: AliasCredential (Alias, password)
promote ILOM REST access point.	emcli create named credential
Target Type: oracle_si_server_map	-cred name=ILOM HTTP CREDS
	-cred scope=global
	-cred_type=AliasCredential
	-auth_target_type=oracle_si_server_map
	-attributes="Alias:root;Password:XXXXXXX"
credMap.ibllomCred	Credential Type: ilom_creds (username, password)
IB Switch ILOM admin credential is	
required to promote ILOM access point.	emcli create named credential
Target Type: oracle_si_netswitch	-cred name='IB ILOM CRED'
	-auth target type='oracle si netswitch'
	-cred type='ilom creds'
	-cred_scope='global'
	-attributes="username:XXXXX;password:XXXXXXX
	Credential Type: ilom_key_auth_creds (private key file, passphrase)
	emcli create_named_credential
	-cred_name='IB_ILOM_SSH_CRED'
	-auth_target_type='oracle_si_netswitch'
	<pre>-cred_type='ilom_key_auth_creds'</pre>
	-cred_scope='global'
	-attributes="username:XXXXXX;
	<pre>privatekeyfile:<private_key_path_on_agent_box>"</private_key_path_on_agent_box></pre>

The private key file path is on the agent box.

Property Name and Description	Sample Command
credMap.ibSnmpCred IB Switch SNMP credential is required	Credential Type: SNMPV1Creds
to promote SNMP access point.	emcli create named credential
Target Type: oracle_si_netswitch	-cred name='IB SNMP V1 CRED'
	-auth target type='oracle si netswitch'
	-cred type='SNMPV1Creds'
	-cred scope='global'
	-attributes="COMMUNITY:public"
	Credential Type: SNMPV3Creds
	emcli create_named_credential
	-cred_name='IB_SNMP_V3_CRED'
	-auth_target_type='oracle_si_netswitch'
	-cred_type='SNMPV3Creds'
	-cred_scope='global'
	-attributes="authUser:XXXX; authPwd:YYYY;
	privProtocol:AES;privPwd:ZZZZZ;authProtocol:S HA;authPwd:WWWWW"

Property Name and Description	Sample Command
credMap.cellMonitorCred Storage Server monitored using CellCLI	Credential Type: ExaCreds (CellCLI based monitoring)
 root user credential required to setup password less SSH between agent and Storage Server to monitor Storage 	emcli create_named_credential
	-cred_name='CELL_ROOT_CRED' -auth target type='oracle exadata'
Server.	-cred type='ExaCreds'
Or	-cred scope='global'
Storage Server monitored using ExaCLI/RESTAPI - monitoring	-target_type='oracle_exadata'
credential required to monitor Storage Server.	attributes="ExaUserName:root;ExaPassword:XXXX
Target Type: oracle_exadata	XXX"
	Credential Type: ExaSSHCreds (CellCLI based monitoring)
	emcli create_named_credential
	-cred_name=CELL_SSH_CREDS
	-cred_type=ExaSSHCreds
	-auth_target_type=oracle_exadata -
	attributes="USERNAME:root;SSH_PVT_KEY:pvtkey"
	-
	<pre>input_file="pvtkey:<key_available_at_emcli_in stall_box="">"</key_available_at_emcli_in></pre>
	The private and public key file path is on the host where EMCLI is executed.
	Credential Type: ExaCLICred (ExaCLI/RESTAPI based monitoring)
	<pre>emcli create_named_credential -cred_name='CELL_EXACLI_CRED' -auth_target_type='oracle_exadata'</pre>
	-auth_target_type='oracle_exadata' -cred type='ExaCLICred'
	-cred_cype='slobal'
	-target type='oracle exadata'
	2 _ 111 · · · · · _ · · · · · · · · · · ·

ssword:XXXXXXX"

attributes="ExaCLIUserName:celladmin;ExaCLIPa

Property Name and Description	Sample Command
credMap.cellSnmpCred Storage Server SNMP credential is	Credential Type: SNMPV1Creds
required to receive alert.	emcli create named credential
Target Type: oracle_exadata	-cred name='CELL SNMP V1 CRED'
	-auth target type='oracle exadata'
	-cred type='SNMPV1Creds'
	-cred_scope='global'
	-attributes="COMMUNITY: <community>"</community>
	Credential Type: SNMPV3Creds
	emcli create_named_credential
	-cred_name='CELL_SNMP_V3_CRED'
	-auth_target_type='oracle_exadata'
	-cred_type='SNMPV3Creds'
	-cred_scope='global'
	-attributes="authUser:XXXXX;authPwd:YYYY;
	privProtocol:AES128;privPwd:ZZZZZ;authProtoco
	l:SHA;authPwd:WWWWW"
	To specify the privacy protocol name, use AES128 or DES.

Property Name and Description Sample Command		
credMap.cellSnmpSetupCred Storage Server admin credential is	Credential Type: ExaCreds (CellCLI based monitoring)	
required to setup SNMP subscription.	<pre>emcli create_named_credential</pre>	
Target Type: oracle_exadata	-cred_name='CELL_ADMIN_CRED'	
	-auth_target_type='oracle_exadata'	
	-cred_type='ExaCreds'	
	-cred_scope='global'	
	-target_type='oracle_exadata'	
	-	
	attributes="ExaUserName:YYYYYY;ExaPassword:XX XXXXX"	
	Credential Type: ExaSSHCreds (CellCLI based monitoring)	
	emcli create named credential	
	-cred_name=CELL_ADMIN_SSH_CREDS	
	-cred_type=ExaSSHCreds	
	-auth_target_type=oracle_exadata	
	-	
	attributes="USERNAME:YYYYY;SSH_PVT_KEY:pvtkey "	
	-	
	input_file="pvtkey: <key_available_at_emcli_in STALL_BOX>"</key_available_at_emcli_in 	
	Credential Type: ExaCLICred (ExaCLI/RESTAPI based monitoring)	
	<pre>emcli create_named_credential</pre>	
	-cred_name='CELL_ADMIN_EXACLI_CRED'	
	-auth_target_type='oracle_exadata'	
	-cred_type='ExaCLICred'	
	-cred_scope='global'	
	-target_type='oracle_exadata'	
	attributes="ExaCLIUserName:celladmin;ExaCLIPa ssword:XXXXXXX"	



Sample Command	
Credential Type : cisco_creds (username, password, privilege password)	
<pre>emcli create_named_credential -cred_name='CISCO_IOS_CRED'</pre>	
<pre>-auth_target_type='oracle_si_netswitch' -cred_type='cisco_creds' -cred_scope='global'</pre>	
-	
attributes="username:XXXX;userpass:YYY;privpa ss:ZZZZ"	
Credential Type : cisco_key_auth_creds (username, privat key file, passphrase, privilege password)	
emcli create_named_credential	
-cred_name='CISCO_IOS_KEY_CRED'	
-auth_target_type='oracle_si_netswitch'	
<pre>-cred_type='cisco_key_auth_creds'</pre>	
-cred_scope='global'	
-attributes="username:XXXX;	
privatekeyfile: <prv_key_file_location_on_age< td=""></prv_key_file_location_on_age<>	
T_HOST>;	
privatekeypassphrase:YYYYYY;privpass:ZZZZ"	
The private key file path is on the agent host.	
Credential Type: SNMPV1Creds	
emcli create named credential	
-cred name='CISCO SNMP V1 CRED'	
-auth_target_type='oracle_si_netswitch'	
-cred_type='SNMPV1Creds'	
-cred_scope='global'	
-attributes="COMMUNITY:public"	
Credential Type: SNMPV3Creds	
emcli create_named_credential	
-cred name='CISCO SNMP V3 CRED'	
-auth_target_type='oracle_si_netswitch'	
-auth_target_type='oracle_si_netswitch' -cred_type='SNMPV3Creds'	
-auth_target_type='oracle_si_netswitch' -cred_type='SNMPV3Creds' -cred_scope='global'	
<pre>-auth_target_type='oracle_si_netswitch' -cred_type='SNMPV3Creds' -cred_scope='global' -attributes="authUser:XXXXX;authPwd:YYYY;</pre>	
-auth_target_type='oracle_si_netswitch' -cred_type='SNMPV3Creds' -cred_scope='global'	



Property Name and Description	Sample Command	
credMap.roceSwCred RoCE Switch credential is required to promote RoCE IOS access point	Credential Type : cisco_creds (username, password, privilege password)	
Target Type: oracle_si_netswitch	emcli create_named_credential -cred name='ROCE IOS CRED'	
	-auth_target_type='oracle_si_netswitch' -cred type='cisco creds'	
	-cred_scope='global'	
	- attributes="username:XXXX;userpass:YYY;privp ss:ZZZZ"	
	Credential Type : cisco_key_auth_creds (username, privat key file, passphrase, privilege password)	
	emcli create_named_credential -cred name='ROCE IOS KEY CRED'	
	-auth_target_type='oracle_si_netswitch' -cred type='cisco key auth creds'	
	-cred_scope='global'	
	-attributes="username:XXXX;	
	<pre>privatekeyfile:<prv_key_file_location_on_age box="" t="">;</prv_key_file_location_on_age></pre>	
	privatekeypassphrase:YYYYYY;privpass:ZZZZ"	
	The private key file path is on the agent box.	
credMap.roceSnmpCred This credential is required to promote	Credential Type: SNMPV1Creds	
ROCE SNMP access point.	emcli create_named_credential	
Target Type: oracle_si_netswitch	-cred_name='ROCE_SNMP_V1_CRED'	
	-auth_target_type='oracle_si_netswitch' -cred type='SNMPV1Creds'	
	-cred scope='global'	
	-attributes="COMMUNITY:public"	
	Credential Type: SNMPV3Creds	
	emcli create_named_credential -cred name='ROCE SNMP V3 CRED'	
	-auth_target_type='oracle_si_netswitch' -cred type='SNMPV3Creds'	
	<pre>-cred_scope='global' -attributes="authUser:XXXXX;authPwd:YYYY;</pre>	
	<pre>privProtocol:DES;privPwd:ZZZZZ;authProtocol: HA;authPwd:WWWWW"</pre>	
	, 	

Property Name and Description	Sample Command
credMap.pduHttpCred PDU HTTP credential is required to	Credential Type: http (username, password)
promote PDU. Target Type: oracle_si_pdu	<pre>emcli create_named_credential -cred_name='PDU_HTTP_CRED' -auth_target_type='oracle_si_pdu' -cred_type='http' -cred_scope='global' -attributes="username:YYYYY;password:XXXXX"</pre>

credMap.pduSnmpCred PDU SNMP credential is required setup SNMP subscription. Target Type: oracle_si_pdu	Credential Type: SNMPV1Creds emcli create_named_credential -cred name='PDU SNMP CRED'
	<pre>-auth_target_type='oracle_si_pdu' -cred_type=' SNMPV1Creds' -cred_scope='global' -attributes="COMMUNITY:public" Credential Type: SNMPV3Creds</pre>

```
emcli create_named_credential
-cred_name='PDU_SNMP_V3_CRED'
-auth_target_type='oracle_si_pdu'
-cred_type='SNMPV3Creds'
-cred_scope='global'
-attributes="authUser:XXXX;authPwd:YYYY
;privProtocol:AES;privPwd:ZZZZZ;authProtocol:
SHA;authPwd:WWWW"
```

Set Up SSH Key Authentication

To use SSH Keys for authentication during discovery, generate and install the public key on each target that must be discovered.

- Generate the SSH Key
- Add SSH Public Key to Each Target

Generate the SSH Key

Use *ssh-keygen* tool to generate the new authentication key pairs for SSH. Command to generate key pair (Public key and Private Key) based on RSA authentication algorithm:

ssh-keygen -f <FILE NAME> -t rsa -N ""

In the above command:

–f option to indicate file name



- -t option to indicate algorithm (rsa/dsa)
- -N option to indicate passphrase

The same key pair can be used on all the monitoring agent hosts by copying them. Alternatively, you can generate different key pair on each monitoring agent host.

Add SSH Public Key to Each Target

Follow these steps to install the SSH public key on the various targets that you want to discover:

- Add SSH Public Key to Exadata Storage Server and Exadata Compute Node
- Add SSH Public Key to ILOM
- Add SSH Public Key to Cisco Ethernet / RoCE Switch

Add SSH Public Key to Exadata Storage Server and Exadata Compute Node

Copy the public key to the Exadata Storage Server, Compute Node, and the monitoring Agent host using the following command:

ssh-copy-id -i <RSA_PUBLIC_KEY_LOCATION> oracle@host

Add SSH Public Key to ILOM

You can use the following steps for InfiniBand ILOM as well as Compute Node ILOM:

- 1. Log in to the ILOM as a user that has administration capabilities that will be used as part of Database Machine discovery.
- 2. Navigate to the directory location of the user's SSH key.
- 3. Add SSH public key to the user's account:

```
set load_uri=<transfer_method>://
<username>:<password>@<fully_qualified_hostname>/
<path to public key filename>
```

For example:

set load_uri=scp://adminuser:userpswd@192.0.2.1/keys/sshkey_1.pub

Add SSH Public Key to Cisco Ethernet / RoCE Switch

- **1.** Log in to the switch.
- 2. Enter the global configuration mode on the switch using the command:

configure terminal

3. Specify the public key for the user by pasting the entire content of the key in the specified location in the command:

<username> admin sshkey <paste_entire_public_key_content>



4. Save the configuration:

copy running-config startup-config

Create the Input File

Create the input file with the details of the configuration parameters, and named credentials. You can optionally add or remove components from the configuration by using the skipComponentList or addComponentList parameters.

Similarly, for Virtual Exadata Database Machine discovery, you can provide the component details in the input file.

The following tables provide the information about all the parameters that can be used in the input file:

- Configuration Parameters
- Named Credentials and Commands to Create Them
- Parameters for Adding or Skipping Components
- Parameters for Adding or Skipping Virtual Platform Components

Following is an example input file created by using the configuration parameters, named credentials, and additional components:

```
*****
#
        Discovery and Monitoring Agent
******
configMap.discoveryAgentUrl=https://cn01vm01.example.com:3442/emd/main/
configMap.monitorAgentUrl.0=https://cn01vm01.example.com:3442/emd/main/
configMap.monitorAgentUrl.1=https://cn02vm01.example.com:3442/emd/main/
**********
         Database Machine Configuration and required configuration
*****
# 0 For No, 1 for Yes
configMap.isRemoteAgent=0
configMap.isIPV6=0
# Identify if the network is roce or ib
configMap.networkType=roce
# Uncomment/update either the configMap.ibSwitchName or
configMap.roceSwitchName parameter depending on what type of switch you have
#configMap.ibSwitchName=sw-iba0.example.com
configMap.roceSwitchName=sw-rocea0.example.com
#directory must exist for file creation
configMap.outputFileLoc=/home/oracle/exadata discovery/output.txt
# Either CellCLI or ExaCLI or RESTAPI
configMap.cellMetricSrc=CellCLI
#These properties would be considered if Storage Server is monitored using
```



RESTAPI

configMap.HttpsProtocol=TLSv1.2

```
configMap.TrustSelfSignedCert=1
# 0 (no) or 1 (yes) to configure SNMP
configMap.computenodeSnmpSub=1
configMap.cellSnmpSub=1
#Location of the schematic file on discovery agent
configMap.schematicFileHost=cn01vm01.example.com
configMap.schematicFilePath=/opt/oracle.SupportTools/onecommand/
databasemachine.xml
*******
         TARGET CREDENTIALS
#
****
#Please provide named credentials for all target types of Database
Machine.
# Remote Agent or Compute Node Host Credential
credMap.agentCred=SYSMAN:AGENT HOST CRED
credMap.schematicFileHostCred=SYSMAN:AGENT HOST CRED
# CELL (Storage Server) Credentials
credMap.cellMonitorCred=SYSMAN:CELL ROOT CRED
credMap.cellSnmpCred=SYSMAN:CELL SNMP CRED
credMap.cellSnmpSetupCred=SYSMAN:CELL ROOT CRED
# Compute Node Credentials
credMap.computenodeIlomCred=SYSMAN:CN ILOM CRED
credMap.computenodeAdminCred=SYSMAN:CN ADMIN CRED
credMap.computenodeSnmpCred=SYSMAN:CN SNMP CRED
# PDU Credentials
credMap.pduSnmpCred=SYSMAN:PDU SNMP CRED
credMap.pduHttpCred=SYSMAN:PDU HTTP CRED
# CISCO Switch (Admin) Credentials
credMap.ciscoIosCred=SYSMAN:CISCO IOS CRED
credMap.ciscoSnmpCred=SYSMAN:CISCO SNMP CRED
# CISCO Switch (RoCE) Credentials
#credMap.roceSwCred=SYSMAN:ROCE SWITCH CRED
#credMap.roceSnmpCred=SYSMAN:ROCE SNMP CRED
# Infiniband Switch Credentials
credMap.ibIlomCred=SYSMAN:IBILOM ADMIN CRED
credMap.ibSnmpCred=SYSMAN:SI SWITCH SNMP CRED
**********
#
            Virtual Platform Config Data
***************
#Virtual Platform Credentials
#Uncomment/complete if this is a Virtual Database Machine (Virtual
targets are not yet discovered in EM)
vpTargetMap.vpCred=SYSMAN:VP CRED
#Please provide virtual platform targets information
```

Configuration Parameters

The following table lists the **mandatory** configuration parameters and their details that must be specified in the input file for EMCLI based discovery:

Parameter Name and Description	Allowed Value / Sample Value
configMap.discoveryAgentUrl Discovery agent URL on which schematic file is available.	Allowed Value: https:// <em_agent_target_name>:<em_agent_port>/ emd/main</em_agent_port></em_agent_target_name>
	Sample Value: configMap.discoveryAgentUrl=https:// agent1:1838/emd/main
configMap.monitorAgentUrI.0 configMap.monitorAgentUrI.1 Monitoring agent URL, one for primary and one for backup.	Allowed Value: https:// <em_agent_target_name>:<em_agent_port>/ emd/main</em_agent_port></em_agent_target_name>
	Sample Value: configMap.monitorAgentUrl.0=https:// agent01:1838/emd/main
	<pre>configMap.monitorAgentUrl.1=https:// agent02:1838/emd/main</pre>
configMap.isRemoteAgent This property indicates monitoring agent(s) is a remote one, that is installed outside of the Database Machine.	Allowed Value: 0 - Discovery is performed by a local agent 1 - Discovery is performed by remote agent
The purpose of a remote monitoring agent is to avoid consuming Database Machine resources for monitoring.	Sample Value: configMap.isRemoteAgent=0
configMap.isIPV6 This property is to indicate IP Protocol used for communication.	Allowed Value: 0 - IPV4 Exadata Database Machine (<i>Default</i>) 1 - IPV6 Exadata Database Machine Sample Value: configMap.isIPV6=0
configMap.schematicFileHost This property is to specify the host name on which schematic file available. On the same host, the discovery agent should also be present.	Allowed Value: Host name Sample Value: configMap.schematicFileHost=adm01.examp le.com



Parameter Name and Description	Allowed Value / Sample Value
configMap.schematicFilePath	Allowed Value:
This property is to specify the schematic file full	Full path of schematic file.
path on the host (host name specified for property configMap.schematicFileHost).	Sample Value:
······g·····p·················	configMap.schematicFilePath=/opt/
	oracle.SupportTools/onecommand/
	databasemachine.xml
configMap.ibSwitchName	Allowed Value:
This property is to indicate the InfiniBand Switch name if <i>configMap.networkType</i> parameter is set	Fully qualified InfiniBand Switch host name
to ib.	Sample Value:
This property is mandatory based on the network	configMap.ibSwitchName=sw-iba0.XXXX.YYY
type.	
configMap.roceSwitchName This property is to indicate the RoCE Switch name	Allowed Value:
if configMap.networkType parameter is set to	Fully qualified ROCE Switch host name
roce.	Sample Value:
This property is mandatory based on the network	configMap.roceSwitchName=sw- ROCEa0.XXXX.YYY
type.	ROCEAU.AAAA.III
configMap.cellMetricSrc	Allowed Value:
This property is to indicate Exadata Storage Server monitoring mechanism.	CellCLI / ExaCLI / RESTAPI
Cerver morntoning mechanism.	Sample Value:
	configMap.cellMetricSrc=RESTAPI
configMap.outputFileLoc	Allowed Value:
This property is to indicate the full path of the file	Full path to file on OMS host
on OMS host to log Deployment Procedure (DBMachineSystemCheck's) output.	Sample Value:
	<pre>configMap.outputFileLoc=/scratch/user/ dp output</pre>

The following table lists the **optional** configuration parameters and their details that you can specify in the input file for EMCLI based discovery:

Parameter Name and Description	Allowed Value / Sample Value
configMap.isStatic Database Machine discovery by default performs dynamic discovery by invoking IB commands and other commands. But, in some cases discovery may not be able to proceed with dynamic approach like IB Switch is not accessible, Failure in detecting rack type, etc.,	Allowed Value:
	0 - dynamic discovery be performed (Default)
	1 – static discovery
	Sample Value:
	configMap.isStatic=0
In this case static discovery would be useful. Static discovery depends on schematic file for identifying components.	



Parameter Name and Description	Allowed Value / Sample Value	
configMap.DBMachineName	Allowed Value:	
This property allows to define a custom name for Database Machine.	Any string can be specified as value for this property. If not specified discovery will automatically prepare a name for Exadata Database Machine as default.	
	Sample Value:	
	configMap.DBMachineName=DB Machine	
configMap.ExadataGridName	Allowed Value:	
This property allows to define a custom name for Exadata Grid.	Any string can be specified as value for this property. If not specified discovery will automatically prepare a name for Exadata Gric as default.	
	Sample Value:	
	configMap.ExadataGridName=Exadata Grid	
configMap.networkType	Allowed Value:	
This property is to indicate which network type is part of discovering Exadata Database	roce to indicate RoCE X8M	
Machine.	ib to indicate InfiniBand Network (<i>Default</i>)	
	Sample Value:	
	configMap.networkType=roce	
configMap.HttpsProtocol	Allowed Value:	
This property is to indicate communication protocol used for Exadata Storage Server communication. This property needs to specify	TLSv1.2 (Default)	
	Sample Value:	
when Storage Server is monitored using RESTAPI. Otherwise, this property is not required.	configMap.HttpsProtocol=TLSv1.2	
configMap.TrustSelfSignedCert	Allowed Value:	
This property is to indicate whether a self- signed certificate is used for communication	0 or 1 (Default)	
with Storage Server.	Sample Value:	
	configMap.TrustSelfSignedCert=1	
configMap.computenodeSnmpSub	Allowed Value:	
This property is to indicate whether SNMP Subscription for Compute Nodes is required.	0 - Skip SNMP Subscription (Default)	
	1 - Set up SNMP subscription	
	Sample Value:	
	configMap.computenodeSnmpSub=1	
configMap.ilomVersionSupportRest	Allowed Value:	
This property is to indicate whether to promote ILOM REST Access Point using the computenodellomRestCred credential.	true - Promote ILOM REST Access Point. When this property is set to true, you must also include the computenodellomRestCred property and its value in the input file.	
	false - Skip ILOM REST Access Point	
	Sample Value:	
	<pre>configMap.ilomVersionSupportRest=tru e</pre>	



Parameter Name and Description	Allowed Value / Sample Value	
configMap.cellSnmpSub	Allowed Value:	
This property is to indicate whether SNMP Subscription for Storage Servers is required.	0 - Skip SNMP Subscription (Default)	
	1 - Set up SNMP subscription	
	Sample Value:	
	configMap.cellSnmpSub=1	

Parameters for Adding or Skipping Components

The following **optional** properties can be used to skip or add the components as part of EMCLI based discovery of Exadata Database Machine:

Property Name	Description	Example
componentMap.skipCompo nentList	Use this property to list the components that must be excluded from Exadata Database Machine discovery.	componentMap.skipCompon entList.0=pdu1
		componentMap.skipCompon entList.1=pdu2
componentMap.addCompon entList	pon Use this property to add new components to an existing database machine as part of Exadata Database Machine discovery.	<pre>componentMap.addCompone ntList.0=cel01</pre>
		<pre>componentMap.addCompone ntList.1=cel02</pre>

Parameters for Adding or Skipping Virtual Platform Components

For Virtual Exadata Database Machine, the Virtual Platform targets can also be discovered as part of the EMCLI based Database Machine Discovery if not yet discovered in Enterprise Manager. The following input parameters can be used to specify the components:

Parameter Name and Description	Sample Value
vpTargetMap.name	vpTargetMap.name.0=hostvp1
List of virtual platform targets to be discovered.	vpTargetMap.name.1=hostvp2



Parameter Name and Description	Sample Value
vpTargetMap.vpCred	Credential Type: DMOvsBasicCreds
<pre>Target Type: oracle_si_virtual_platform</pre>	
	<pre>emcli create_named_credential</pre>
	-cred_name='VP_CRED'
	-
	auth_target_type='oracle_si_virtua l_platform'
	-cred_type='DMOvsBasicCreds'
	-cred_scope='global'
	-
	attributes="OVSUsername:root;OVSPa ssword:XXXXXXX"
	Credential Type: DMOvsSshKeyCreds
	emcli create_named_credential
	-cred_name='VPSSHCRED'
	-
	<pre>auth_target_type='oracle_si_virtua l_platform'</pre>
	-cred_scope='global'
	<pre>-cred_type='DMOvsSshKeyCreds' -</pre>
	- attributes="OVSUsername:root;OVSPa
	ssword:XXXXXXXX;
	PassPhrase:test;SshPrivateKey:pvtk
	ey;SshPublicKey:pubkey;"
	-
	<pre>input_file="pvtkey:<pvt_key_loc>;p</pvt_key_loc></pre>
	ubkey: <pub_key_loc> "</pub_key_loc>
	The private and public key file path is on the host where EMCLI is executed.

Optional Verification of the Prerequisites

To ensure that all the required parameters are provided in the input file, run a prerequisitecheck deployment procedure before submitting the Exadata Database Machine discovery deployment procedure. Use the input file that you created earlier in the prerequisite-check deployment procedure.

This prerequisite-check deployment procedure is optional because it is also executed as part of the discovery deployment procedure.

Run this EMCLI command to perform the prerequisite-check and collect the information about the targets related to the Exadata Database Machine:

```
emcli submit_procedure -name=DBMachineSystemCheck -input_file="data://
<input file absolute path>"
```



For more information on the deployment procedure for EMCLI based discovery of Exadata Database Machine, see Deployment Procedure for EMCLI.

Prerequisites for Discovery and Monitoring Using Non-root User

You can optionally perform discovery and monitoring operations using a non-root user.

Topics:

- Non-root User for Systems Infrastructure Remote Host Targets
- Non-root User for Virtual Platform Targets

Non-root User for Systems Infrastructure Remote Host Targets

To support the discovery through a non-root user, the list of commands used by the remote host and server OS metrics which require *sudo* privileges must be placed in the file /etc/sudoers.

Place the following commands in the sudoers file:

Use EMCLI to discover the remote host using a non-root user. Specify the dispatch URL as 'sudo-ssh://<IP/hostname>:22 by running the following EMCLI command:

Non-root User for Virtual Platform Targets

To be able to discover the virtual platform targets using the non-root user, you must first update the /etc/sudoers file with the list of commands used by the targets which



require *sudo* privileges. Next, update the non-root user monitoring credentials with the *sudo* attributes.

Xen Virtual Platform

Content for the /etc/sudoers file for Xen virtual platform target:

```
Cmnd_Alias OEM_MON_CMNDS = /usr/sbin/xl list*,/usr/sbin/xl info*,/usr/
sbin/xl
    network-list*,/usr/sbin/xl uptime*,/usr/sbin/xl
    vcpu-list*,/usr/sbin/dmidecode,/usr/sbin/xentop,/usr/bin/xenstore-
read,/usr/bi n/xenstore-list,/usr/bin/xenstore-ls,/sbin/ethtool
    <non-root-user> ALL=(ALL) NOPASSWD:OEM MON CMNDS
```

KVM Virtual Platform

Content for the /etc/sudoers file for KVM virtual platform target:

Update and save the monitoring credentials of the Virtual Platform target

Set the following sudo attributes:

- 1. Set Privilege Type to sudo.
- 2. Set Run as to root.
- 3. Set the Privilege Command to /usr/bin/sudo -S -u %RUN_AS% %COMMAND%. Verify the path of sudo.
- 4. Set Is Privileged User to Yes.
- 5. Unless the *requiretty* flag is explicitly un-set for the non-root user in the /etc/sudoers file, set Enable Pseudo Terminal to Yes.

Now, you can use the non-root user instead of the sudo username for target discovery.



3

Exadata Database Machine Discovery

This chapter provides instructions for discovery of the Oracle Exadata Database Machine through Enterprise Manager Cloud Control 13c.

The following sections describe how to discover the Exadata Database Machine and other supported targets:

- 1. Discovering an Oracle Exadata Database Machine
- 2. Discovering Grid Infrastructure and RAC
- 3. Switch from Using CellCLI to RESTful API

Discovering an Oracle Exadata Database Machine

This section describes various discovery flows that are supported in Enterprise Manager 13c.

- Discover the Oracle Exadata Database Machine Target Using the Console
- Discover the Oracle Exadata Database Machine Target Using EMCLI

Comparison between the two methods for discovery:

EMCLI	Console
 The Database Machine discovery using EMCLI helps to automate the discovery process through scripts where several Database Machines must be discovered offline or in background. It is accessible through classic programming language constructs, enabling tasks to be created and run either from the command-line or programatically. EMCLI enables you to access Enterprise Manager functionality from text-based consoles (shells and command-line windows) for a variety of operating systems. EMCLI is fully integrated with Enterprise Manager's security and user administration functions, enabling you to carry out operations using EM CLI with the same security and confidentiality as the Enterprise Manager console. For example, you can only see and operate on targets for which you are authorized. 	 Use the Console for an interactive experience of the discovery. The entire discovery process is packaged together and is available in the Enterprise Manager console. The discovery process is self-intuitive. You must only make sure to have the required information available to enter in the dialog boxes. This method is best suited for one-time set up.

Discover the Oracle Exadata Database Machine Target Using the Console

- Fresh Discovery of Oracle Exadata Database Machine Target
- Fresh Discovery of Exadata Database Machine on SuperCluster Systems
- Convert Database Machine Targets with 12c Target Types to 13c Using the Console



Fresh Discovery of Oracle Exadata Database Machine Target

This discovery flow shows the steps involved in discovering Database Machine targets. This flow is the recommended option for discovering Database Machine targets afresh.

An Oracle Exadata Database Machine can be deployed in a physical or virtual configuration. Enterprise Manager supports both of these configurations. There are additional steps required in order to discover a virtual Exadata Database Machine. These additional steps are addressed inline as necessary.

Discovering the Oracle Virtual Platform

If discovering a virtual Exadata, the Oracle Virtual Platform target must be discovered before discovering the Oracle Exadata Database Machine target. The steps below detail the discovery of the Oracle Virtual Platform target.

Note:

If you are using EMCLI to perform Exadata Database Machine discovery, the Oracle Virtual Platform targets can be discovered as part of that discovery without a separate discovery operation. See Discover the Oracle Exadata Database Machine Target Using EMCLI.

- 1. From the Enterprise Manager home page, select the **Setup** menu (upper right corner), **Add Target**, and then **Add Targets Manually**.
- 2. On the Add Targets Manually page, click Add Targets Using Guided Process.
- 3. Under the Guided Discovery column, select **Oracle Virtual Platform** and click **Add**.
- 4. On the Discover Oracle Virtual Platforms screen, do the following:
 - a. Select the agent installed on the first compute node domU (virtual machine) for the Monitoring Agent and select the second compute node *domU* (virtual machine) agent for the *Failover Monitoring Agent*.
 - **b.** For the *Credential Properties*, enter the user name for the root or non-root user and provide the password.
 - c. In the *Hostname and IP Address* section, click on the **Add** button and type in the fully qualified hostname for the *dom0* servers (one per line) and click **Add**.
 - d. Click Submit.



Default Monitoring Agent and Credentials	Discover Oracle Register Oracle Virtual Pt			rget credentials and/or monitoring ager	it can be specified for each farget. If set, these overric	e the defaults for that farget.	Submit Cance
* Manitoring Agent AbadX-m01 Locample C Bationer Monitoring Agent Monitoring Agent * Monitoring Agent Monitoring Agent	J Default Monito	ring Agent ar	d Credentials				
I doore floationing Ageet I footdoor float Vil accented is de docerent. Terrester i footdoor float Vil acce	Specify the default Moni	loring Agent and	Credentials for the	Oracle Virtual Platforms to be discover	ed		
Netric Execution Timeout (seconds) Privategod User Credential Properties Usersame ongt * Passoon Privategod User all (PAddress) Passoon * Privategod User all (PAddress) Privategod User all (PAddress) Pacefor the Natione and (PAddress) Privategod User all (PAddress) Pacefor the Natione and PAddress Agent & Credentials Monitoring Agent Metric Execution Timeout (seconds) Username Privategod User all (PAddress) Pacefor the National PAddress Agent & Credentials Monitoring Agent Metric Execution Timeout (seconds) Username Notal Acardis Ordential Privategod Username	* Mc	nitoring Agent	host3vm01.exar	nple.c 🔍			
Pininged User	Failover Mo	nitoring Agent	host4vm01.exa	mple.c 🔍			
Credential Properties Credential Properties Customer of the Oracle of	Metric Execution Time	out (seconds)		90 00			
Credential Properties * Descentiants * Descentiant * Descentiant	1	rivileged User	🖲 Yes 💿 I	10 0			
Vestration mode * Password • * Res * <	0	redential Type	Host Credential	s 💌			
Passance Image: Constraint and IP.Address Address Address Deprice the honorabit VM servers that need to be discovered. Image: Constraint and IP.Address Address Monitoring Agent Metric Execution Timeout (seconds) Username Indial Complex constraint Default Indial Complex constraint Default Indial Complex constraint Default Indial Complex constraint Default	Credential Propert	ies					
Rean Privilege None	* Username root						
	* Password						
Hostname and IP Address Decrify the hostname and IP Address Specify the hostname and IP Address Decrify the hostname and IP Address Most Decrify the hostname and IP Address Host Decrify the hostname and IP Address Host Decrify the hostname and IP Address Agent & Credentials Monitoring Agent Metric Execution Timeout (seconds) Username host Scample com Default Default Ender Ender	Run Privilege Nor	e 💌					
Specify the hosthame or IP address for the Oracle VIII serves that meed to be discovered. Address for the Oracle VIII serves that meed to be discovered. HostIP Address Agent & Credentials Monitoring Agent Metric Execution Timeout (seconds) Username hostI accumple.com Default Default Execution Timeout (seconds) Username	*				- m		
Add Oversital Default Remove Hoad/P Address Agent & Credentials Monitoring Agent Metric Execution Timeout (seconds) Username hoad/Sample.com Default Default Default Execution Timeout (seconds) Username			r the Oracle VM sen	vers that need to be discovered.			
host3.example.com Drifuit host4.example.com Default	*******						
hosfit example.com Default	Host/IP Address			Agent & Credentials	Monitoring Agent	Metric Execution Timeout (seconds)	Usemame
	host3.example.co	m		Default			
4 m	host4.example.co	m		Default			
	e				MT.		

5. After the discovery of the Oracle Virtual Platform target is complete, follow the steps in the next section to discover the Oracle Exadata Database Machine target.

Discovering the Oracle Exadata Database Machine

- 1. From the Enterprise Manager home page, select the **Setup** menu (upper right corner), **Add Target**, and then **Add Targets Manually**.
- 2. On the Add Targets Manually page, click Add Targets Using Guided Process.
- 3. From the Add Using Guided Process window, select **Oracle Exadata Database Machine** from the list and click **Add**.
- 4. On the Oracle Exadata Database Machine Discovery page, the following two options are presented. This document details the steps for discovering a new Exadata Database machine and components:
 - Discover a new Database Machine and its hardware components as targets. The table will update to show the target types and the credentials required for discovery.
 - Discover newly added hardware components in an existing Database Machine as targets. Select a Database Machine from the drop-down menu. The table will update to show the target types and the credentials required for discovery. The subsequent dialogs in the discovery flow will be similar to those depicted in this section but will be restricted to only undiscovered components.

Select the task and click **Discover Targets**. The Exadata Discovery Wizard begins.

- 5. On the Discovery Inputs page, enter the following information:
 - For the Discovery Agents section:
 - Agent URL: Select an agent deployed on a physical compute node or if virtual Exadata on a domU (virtual machine) compute node. Click the search icon to select from available agents.
 - For the Schematic Files section:
 - Once you have specified the Agent URL, a new row (hostname and schematic file information) is automatically added. The default schematic file, databasemachine.xml, describes the hardware components of the Exadata Database Machine.
 - Click Set Credential to set the credentials for the host.



- Check and modify if necessary the schematic file location.
- Select the schematic file name from drop-down menu.

Note:

You only need to customize the Schematic file location if one of the following is true:

- The Schematic file is not in the default location.
- The Database Machine contains a Storage Expansion Rack.

The hardware components are specified in multiple schematic files.

Click Next.

6. The InfiniBand Discovery page looks different depending on whether the Oracle Exadata Database Machine has been identified as having an InfiniBand (IB) or RDMA over Converged Ethernet (RoCE) storage network. Screenshots and the details for each option are shown below.

If this is an IB Oracle Exadata, the following information is required,

- **IB Switch Host Name:** The host name for one of the IB switches for the Oracle Exadata. The IB Switch hostname is usually pre-populated.
- InfiniBand Switch ILOM host credential: The root or ilom-admin user name and password for the InfiniBand switch ILOM host. Click Next.

If this is Oracle Exadata X8M, no credentials are required at this point in the discovery flow. The InfiniBand Discovery page will display a message that the Database Machine to be discovered contains RoCE switches and no additional inputs are needed.

Click Next.

Note:

If this is Oracle Exadata X8M and the form displayed requests InfiniBand information, then it likely means there was an issue accessing the databasemachine.xml file specified in the previous step. Navigate back and correct this issue. Ensure the proper location and credentials are specified for the databasemachine.xml file and that the file exists.

7. On the Prerequisite Check page, Enterprise Manager will try to discover hardware components dynamically based on your environment. If any critical issues are encountered, then you can click **Back** to resolve them. Enterprise Manager will show the problem and its severity (Info, Warning, or Critical). Any warning issues or informational messages may also be displayed. These do not interfere with the discovery process.

Click Next.



- 8. On the Components page, the components below are pre-selected. You can deselect any unwanted component. Components include, but are not limited to, the following:
 - **Compute Node:** Select the hosts that are compute nodes in the Oracle Exadata Database Machine.
 - **Oracle Exadata Storage Server:** Select the Oracle Exadata Storage Servers that are part of this Oracle Exadata Database Machine target.
 - InfiniBand Switch: Displayed if this is an IB Oracle Exadata. Select the InfiniBand Switches that are part of the Oracle Exadata Database Machine. These also will be added as managed targets.
 - Ethernet Switch: Select the Ethernet switches that are part of the Oracle Exadata Database Machine. If this is an IB Oracle Exadata, select the admin switch. If this is Oracle Exadata X8M, select the admin and RoCE switches. The Ethernet switches will be added as managed targets.
 - Compute Node ILOM: Select the Integrated Lights Out Managers (ILOMs) of the compute nodes that are part of this Oracle Exadata Database Machine. These ILOMs will be added as managed targets.

Note:

A partitioned rack can list other components that should be deselected manually (for example, compute nodes).

0	0	0	0	- O	O	-			
Discovery Inputs	Infiniband Discovery	Prerequisite Check	Components	Monitoring Agents	Credentials	Revie	9W		
Database Mac	hine Discovery: C	Components			🖋 Set Target Properties	Back S	Step 4 of 7	Ne	Ca
		ed by examining the networ le first time you visit the pac		ration files. Select the differ	rent types of components that a	are part of I	Database I	Machine	e. No
Compute Nodes		io moturno jou noituro pa <u>s</u>	ju.						
					aged targets before the Oracle	Exadata D	atabase Ma	achine t	arget
	Monitoring of the selected (Compute Node Servers thro	ough their ILOM will als	o be enabled as part of the	discovery process.				
Server Name	•								
host1vm01.exa									
host2vm01.exa									
host3vm01.exa	•								
host4vm01.exa	mole com								
	imple.com								
Oracle Exadata	Storage Server	e part of this Oracle Exadat	a Database Machine ta	rraet					
Oracle Exadata Select the Oracle Exad	Storage Server	e part of this Oracle Exadat Management IP	a Database Machine ta	arget.					
Oracle Exadata Select the Oracle Exad	Storage Server lata Storage Servers that an ge Server Name		a Database Machine ta	arget					
Oracle Exadata Select the Oracle Exad Exadata Storag	Storage Server lata Storage Servers that ar ge Server Name nple.com	Management IP	a Database Machine ta	arget.					
Oracle Exadata Select the Oracle Exad Exadata Storag celadm01.exar	Storage Server lata Storage Servers that ar ge Server Name mple.com mple.com	Management IP 10.110.10.1	a Database Machine ta	arget.					
Oracle Exadata Select the Oracle Exad Exadata Storag celadm01.exar celadm02.exar	Storage Server lata Storage Servers that ar ge Server Name nple.com nple.com nple.com	Management IP 10.110.10.1 10.110.10.2	a Database Machine ta	arget.					
Oracle Exadata Select the Oracle Exad Exadata Storag celadm01.exar celadm02.exar celadm03.exar	Storage Server lata Storage Servers that ar ge Server Name nple.com nple.com nple.com	Management IP 10.110.10.1 10.110.10.2 10.110.10.3	a Database Machine ta	arget.					
Oracle Exadata Select the Oracle Exad Exadata Storag celadm01.exar celadm02.exar celadm03.exar celadm04.exar	Storage Server lata Storage Servers that an ige Server Name nple.com nple.com nple.com nple.com	Management IP 10.110.10.1 10.110.10.2 10.110.10.3	a Database Machine ta	arget.					
Oracle Exadata Select the Oracle Exad Exadata Storag celadm01.exar celadm02.exar celadm03.exar celadm04.exar	Storage Server lata Storage Servers that an ige Server Name nple.com nple.com nple.com nple.com	Management IP 10.110.10.1 10.110.10.2 10.110.10.3	a Database Machine ta	irget.					
Oracle Exadata Select the Oracle Exad Exadata Storag celadm01.exar celadm02.exar celadm03.exar celadm04.exar Infiniband Switc Select the Infiniband s	Storage Server lata Storage Servers that ar ge Server Name mple.com mple.com mple.com mple.com	Management IP 10.110.10.1 10.110.10.2 10.110.10.3 10.110.10.4	Machine target. If this E)B Machine is partitioned o	r this is a SuperCluster, you sh			and swi	itches
Oracle Exadata Select the Oracle Exad Exadata Storag celadm01.exar celadm02.exar celadm03.exar celadm04.exar Infiniband Switc Select the Infiniband s	Storage Server lata Storage Servers that ar ge Server Name mple.com mple.com mple.com mple.com h witches that are part of this superCluster when you dis	Management IP 10.110.10.1 10.110.10.2 10.110.10.3 10.110.10.4	Machine target. If this E)B Machine is partitioned o	r this is a SuperCluster, you sh are the same set of Infiniband s			and swi	itches
Oracle Exadata Select the Oracle Exad Exadata Storag celadm01.exar celadm02.exar celadm03.exar celadm04.exar Infiniband Switce Select the Infiniband s in this DB Machine or 5	Storage Server lata Storage Servers that an ge Server Name nple.com mple.com mple.com h witches that are part of this SuperCluster when you dis ich Name	Management IP 10.110.10.1 10.110.10.2 10.110.10.3 10.110.10.4	Machine target. If this E)B Machine is partitioned o				and swi	itches

hostsw-ibs0.example.com

Ethernet Switch

Select the Ethernet switches that are part of this Oracle Exadata Database Machine target.



Click Next.

9. By default, the agents are automatically assigned to the targets. To add more monitoring agents:

In the **Monitoring Agents** page, click **Select Agents** > in the pop-up window, select the required agents for each target on the Exadata Database Machine. Use the Ctrl key to select multiple agents.

Note:

A Warning will be thrown if only one agent is used as monitoring and backup agents. Click **Select Agents** and add more agents, if available.

tabase Machine Discov	ery: wonitoring Agents		Back	Step 5 of 7	Next	Cano
	natically assigned agents to your targets. You can choose to overrid lists below. Click Reset to return all targets to automatic assignmen					
		Sele	ct Agent	s Reset		
Target Name	Monitoring Agent	Backup Monitoring Agent				
DB Machine dbm01.example.com	https://host3vm01.example.com:3872/emd/main/	https://host4vm01.example.com:3	872/emd	/main/ 💌		
Exadata Storage Server Name	Monitoring Agent	Backup Monitoring Agent				
celadm02.example.com	https://host3vm01.example.com:3872/emd/main/	https://host4vm01.example.com:3	872/emd	/main/ 💌		
celadm03.example.com	https://host3vm01.example.com:3872/emd/main/	https://host4vm01.example.com:3	872/emd	/main/ 💌		
celadm04.example.com	https://host3vm01.example.com:3872/emd/main/	https://host4vm01.example.com:3	872/emd	'main/ 💌		
Infiniband Switch Name	Monitoring Agent	Backup Monitoring Agent				
hostsw-iba0.example.com	https://host3vm01.example.com:3872/emd/main/	https://host4vm01.example.com:3	872/emd	/main/ 💌		
hostsw-ibb0.example.com	https://host3vm01.example.com:3872/emd/main/	https://host4vm01.example.com:3	872/emd	/main/ 💌		
hostsw-ibs0.example.com	https://host3vm01.example.com:3872/emd/main/	https://host4vm01.example.com:38	372/emd/	main/ 💌		
Ethernet Switch Name	Monitoring Agent	Backup Monitoring Agent				
hostsw-adm0.example.com	https://host3vm01.example.com:3872/emd/main/	https://host4vm01.example.com:3	872/emd	/main/ 💌		
Compute Node Server ILOM Name	Monitoring Agent	Backup Monitoring Agent				
name						

Click Next.

- 10. On the Credentials page, set the credentials for all components within the Oracle Exadata Database Machine (for example, the Storage Server, PDU, InfiniBand Switch, and so forth). Click Set Credential to set the credential for the component. If the users and passwords are the same for all components of the type, choose Same for all and enter the user and password combination.
 - Depending on the component, you may need to provide additional information. For example, in the Oracle Exadata Storage Server Credentials window, you must enter the SNMP Credentials as well as the monitoring Credentials.
 - The recommended monitoring mechanism for the Oracle Exadata Storage Servers is RESTful API. An ExaCLI user is required to use the RESTful API. For details on how to create the necessary ExaCLI user, refer to Creating Users for Use with ExaCLI in Oracle Exadata Database Machine Maintenance Guide.



- SNMP subscriptions are required for EM to receive alerts for hardware and software failures from Exadata components. Each component credential screen provides fields for SNMP configuration. The recommendation for SNMP subscriptions is to use SNMP v3 for all subscriptions. For IPv6 environments, only SNMPV3 credentials are supported.
- The SNMP community string is like a password. It is sent along with each SNMP Get-Request, and allows or denies access to the device. Please check with your network administrator to get the appropriate community string details for your environment.
- For the Compute Node Server ILOM Credentials, you can additionally specify the named credentials for monitoring using RESTful API. Click Test Connection to verify the proper working of the SSH and RESTful API credentials. The ILOM version for REST monitoring must be *5.0.1 or higher*. Also, for REST monitoring, ensure to use the latest Exadata plug-in release update on the agent side. You can create a Compute node REST credential to promote ILOM REST access point by navigating in the Enterprise Manager as follows: Click Setup in the Enterprise Manager home > Click Security > Click Named Credential > Enter the details for the REST credentials.

The table below provides sample guidance on the recommended values for the credentials.

Component	Credential	Monitoring Mechanism	SNMP Subscription	Notes
Agent	oracle (or the user who owns the agent installation)			•
Oracle Exadata Storage Server	celladministrator	RESTful API	SNMP V3	
Infiniband Switch	root / ilom-admin		SNMP V3	This component will not be present when discovering RoCE based systems
Compute Node Server ILOM	root	SSH / Enhanced monitoring using RESTful API	SNMP V3	In case of enhanced ILOM monitoring using RESTful API, both <i>root</i> and <i>admin</i> user credentials are supported.
PDU	admin		SNMP V3	

Table 3-1 Credential Details



Component	Credential	Monitoring Mechanism	SNMP Subscription	Notes
Ethernet Switch	admin		SNMP V3	In a RoCE based system, these credentials will be used for the Management switch discovery as well as the RoCE switch discovery. If the passwords are different between the Management and RoCE switches, passwords can be specified by switch.

Table 3-1 (Cont.) Credential Details

0	0	0	0	0		
Discovery Inputs	Infiniband Discovery	Prerequisite Che	ck Components	Monitoring Agents Credentials	Review	
Database Mac	hine Discovery:	Credentials			E	ack Step 6 of 7 Next Cance
Agent				Compute Node Server	LOM	
needed to set up SSH	user equivalence betwee	n the agents and the	ent users and passwords are Exadata Storage Server targets	Specify credentials for all the Compu be saved in Enterprise Manager as n		nts Out Managers (ILOM). They w
nonitored by the agen unless you save them		argets. They will not I	be saved in Enterprise Manager	Set Credential 🔻		
Set Credential	•			ILOM Name		*Credential
Agent URL			*Credential	host3-ilom.example.com		root/******, root/******, v3u
https://host3vm	01.example.com:3872/e	emd/main/	oracle/*****	host4-ilom.example.com		root/******, root/******, v3u
https://host4vml	01.example.com:3872/e	emd/main/	oracle/*****	PDU		
	Storage Server monitoring		dentials for all Exadata Storage	Specify the HTTP credentials and S Manager as monitoring credentials. Set Credential		
Set Credential	•			PDU Name		*Credential
	a Conjer Nome	Monitoring	*Credential	pdua0.example.com		admin/******, v3user/******
Exadata Storag	je server name	Mechanism		ndubil example com		admin/****** v3user/*****
celadm02.exan		RESTful API	celadministrator/******, v	pdub0.example.com		admin/******, v3user/******
	mple.com			pdub0.example.com		admin/******, v3user/******
celadm02.exan	mple.com mple.com	RESTful API	celadministrator/******, v			
celadm02.exan	mple.com mple.com mple.com	RESTful API RESTful API	celadministrator/******, v celadministrator/*******, v	Ethernet Switch Specify the Cisco IOS and SNMP c		
celadm02.exan celadm03.exan celadm04.exan infiniband Swi	mple.com mple.com mple.com i tch Lights Out Manager (ILO)	RESTful API RESTful API RESTful API	celadministrator/*****, v celadministrator/*****, v celadministrator/*****, v	Ethernet Switch Specify the Cisco IOS and SNMP c Enterprise Manager as monitoring cre		
celadm02.exan celadm03.exan celadm04.exan infiniband Swi	mple.com mple.com mple.com it Ch Lights Out Manager (ILOh be saved in Enterprise	RESTful API RESTful API RESTful API	celadministrator/******, v celadministrator/******, v celadministrator/******, v	Ethernet Switch Specify the Cisco IOS and SNMP o Enterprise Manager as monitoring orr Set Credential		t switches. They will be saved i
celadm02.exan celadm03.exan celadm04.exan celadm04.exan specify the Integrated specify the Integrated switches. They will	mple.com mple.com mple.com itch Lights Out Manager (ILO) be saved in Enterprise tration tasks.	RESTful API RESTful API RESTful API	celadministrator/*****, v celadministrator/*****, v celadministrator/*****, v	Ethernet Switch Specify the Cisco IOS and SNMP o Enterprise Manager as monitoring or Set Credential		switches. They will be saved i
celadm02.exan celadm03.exan celadm04.exan Infiniband Swi Specify the Integrated switches. They will credentials for adminis	mple.com mple.com itch Lights Out Manager (LLO) be saved in Enterprise tration tasks.	RESTful API RESTful API RESTful API	celadministrator/*****, v celadministrator/*****, v celadministrator/*****, v	Ethernet Switch Specify the Cisco IOS and SNMP o Enterprise Manager as monitoring or Set Credential		switches. They will be saved i
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celadm02.exan celadm03.exan celadm04.exan Infiniband Swi Specify the Integrated writches. They will credentials for adminis Set Credential Infiniband Swite	mple.com mple.com mple.com itch Lights Out Manager (LO) be saved in Enterprise tration tasks. Ch Name ample.com	RESTful API RESTful API RESTful API	celadministrator/***** v celadministrator/***** v celadministrator/***** v celadministrator/***** v MP credentials for all infiniband ing credentials and preferred	Ethernet Switch Specify the Cisco IOS and SNMP o Enterprise Manager as monitoring or Set Credential		switches. They will be saved i

Click Next.

11. On the Review page, verify each section is correct. The following figure shows an example of an accurate review.

	0	0	0	0				
Discovery Inputs Infiniband D	Discovery Prerequisite Check	Components	Monitoring Agents	Credentials	Review			
Database Machine Disc	overy: Review				Back St	ep7of7 Next	Submit	Can
Verify the following information. You o System Target	can click Back to revise the inputs or	click Submit to complete	the discovery process.				45	
The following system targets will be a names, make sure that 1) the system Machine.								et
Target Name	Target Type	Monitor	ing Agent		Backup Monito	ring Agent		
DB Machine dbm01.example.co	Oracle Exadata Databas	e Machine https://h	ost3vm01.example.com:3872/	emd/main/	https://host4vm(01.example.com	n:3872/emd	/mair
Exadata Grid dbm01.example.co	om Oracle Exadata Storage	Server Grid Agent no	t needed for repository target		Agent not neede	d for repository t	arget	
Rack								
The following racks will be added as i	members of the Database Machine t	arget.						
Target Name								
DB Machine dbm01 Rack (none								
DB Machine domon Rack (none	:)							
)							
Compute Nodes/Servers		atabase Machine target.						
Compute Nodes/Servers		atabase Machine target. Monitoring Age		Backu	p Monitoring Age	ent		
Compute Nodes/Servers The following compute nodes will be a	added as members of the Exadata D	Monitoring Age			p Monitoring Ag e /host4vm01.exam		emd/main/	
Compute Nodes/Servers The following compute nodes will be a Server Name	added as members of the Exadata D ILOM Name	Monitoring Age https://host3vml	nt	in/ https:/		ple.com:3872/e		
Compute Nodes/Servers The following compute nodes will be a Server Name host3vm01.example.com host4vm01.example.com	added as members of the Exadata D ILOM Name host3-ilom.example.com host4-ilom.example.com	Monitoring Age https://host3vml	nt 01.example.com:3872/emd/mai	in/ https:/	/host4vm01.exam	ple.com:3872/e		
Compute Nodes/Servers The following compute nodes will be a Server Name host3vm01.example.com	added as members of the Exadata D ILOM Name host3-ilom.example.com host4-ilom.example.com ErVer rs will be added as members of the	Monitoring Age https://host3vml https://host3vm	nt D1.example.com:3872/emd/mai D1.example.com:3872/emd/ma	in/ https:/	/host4vm01.exam	ple.com:3872/e		
Compute Nodes/Servers The following compute nodes will be a Server Name host3vm01.example.com host4vm01.example.com Oracle Exadata Storage Serve The following Exadata Storage Serve	added as members of the Exadata D ILOM Name host3-ilom.example.com host4-ilom.example.com ErVer rs will be added as members of the	Monitoring Age https://host3vml https://host3vm	nt D1.example.com:3872/emd/mai D1.example.com:3872/emd/ma t.	in/ https:/	/host4vm01.exam	ple.com:3872/e ple.com:3872/e		
Compute Nodes/Servers The following compute nodes will be in Server Name host3vm01.example.com host4vm01.example.com Oracle Exadata Storage Serve SNMP will be set up automatically on f	added as members of the Exadata D ILOM Name host3-ilom.example.com host4-ilom.example.com erver s will be added as members of the Exadata Storage Servers.	Monitoring Age https://host3vmi https://host3vmi Database Machine targe Monitoring Age	nt D1.example.com:3872/emd/mai D1.example.com:3872/emd/ma t.	in/ https://in/ https://	/host4vm01.exam /host4vm01.exam	ple.com:3872/e ple.com:3872/e ple.com:3872/e	emd/main/	
Compute Nodes/Servers The following compute nodes will be a Server Name host3vm01.example.com host4vm01.example.com Oracie Exadata Storage Ser SMM will be set up automatically on f Exadata Storage Server Name	Added as members of the Exadata D ILOM Name host3-ilom.example.com host4-ilom.example.com erver r will be added as members of the Exadata Storage Servers. Management IP	Monitoring Age https://host3vmi https://host3vmi Database Machine targe https://host3vmi	nt 31.example.com:3872/emd/mai 31.example.com:3872/emd/ma 1. 1.	n/ https:// in/ https:// Backu n/ https://	/host4vm01.exam /host4vm01.exam	ple.com:3872/e ple.com:3872/e ent pple.com:3872/e	emd/main/ emd/main/	

Click Submit.

- 12. After the Database Machine components are discovered, a Target Creation Summary page displays to show all discovered targets and components. If there are any errors, the Status column will display a red flag. Place your cursor over the flag for a pop-up window for additional information about the error.
- **13.** Perform post-discovery verification before you begin using Enterprise Manager. See Post-Discovery Configuration and Verification.

Fresh Discovery of Exadata Database Machine on SuperCluster Systems

You can use the Exadata plug-in to discover and monitor an Oracle SuperCluster system.

You can monitor only the Database and Exadata components of the Oracle SuperCluster installed on LDOM and Zones. To monitor specific LDOM or virtualization configurations at the operating system level, please use Oracle Enterprise Systems Infrastructure Plug-in 13c.

The SuperCluster discovery wizard provided by "Systems Infrastructure Plug-in" is mainly responsible for discovery of the SuperCluster Hardware targets including ZFS server (For details please refer superCluster discovery document from *emsi* plug-in). It is recommended that the users should go through this flow first and then perform the Exadata Database Machine Discovery.

You can use the Exadata plug-in to discover and monitor an Oracle SuperCluster system. You can monitor *only* the Database and Exadata components of the Oracle SuperCluster installed on LDOM and Zones. To monitor specific LDOM or virtualization configurations at the operating system level, please use Oracle Enterprise Manager Ops Center.

To discover the Oracle SuperCluster as an Exadata Database Machine:



- 1. See Discovering and Promoting Oracle Solaris Zones in Oracle® Enterprise Manager Cloud Control Administrator's Guide for completing the prerequisite of pushing the agent to the control domain and zones.
- 2. Open a Service Request (SR) and upload the following files from your first LDOM:

```
/opt/oracle.SupportTools/onecommand/onecommand.params
/opt/oracle.SupportTools/onecommand/config.dat
```

Note:

Make a backup of your /opt/oracle.SupportTools/onecommand directory as you will overwrite it with the new configurations.

- Oracle Support will provide you the file(s) generated based on the information provided in your configuration files. Copy all files into your /opt/ oracle.SupportTools/onecommand directory.
- Ensure that READ permissions are open for all files in this directory as well as in the /opt/oracle.SupportTools/em directory. The agent must be able to read these files during discovery.
- Run Self Update from Enterprise Manager to download the Solaris SPARC agent software on the OMS. Apply that download to the OMS to make it available for deployment:
 - a. From Enterprise Manager, click Setup, then Extensibility, and finally Self Update. Click Agent Software.
 - b. Select Oracle Solaris on SPARC (64-bit).
 - c. If the status is Available, then click **Download** from the Actions menu.
 - d. Once downloaded, you must Apply it to the OMS from the same Self Update page.

For more details on Self Update in Online or Offline mode, see *Updating Cloud Control* in *Oracle*® *Enterprise Manager Cloud Control Administrator's Guide*.

- 6. Install an agent on each of the Database nodes of the Oracle SuperCluster:
 - a. From Enterprise Manager, select **Setup**, then **Add Target**, and finally **Add Targets Manually**.
 - b. Select Add Host Targets (selected by default) and click Add Host.
 - c. Continue with the installation wizard and ensure that you run root.sh on each node once installation is completed.
- 7. Configure the database nodes for Database Machine discovery.

This step is needed to set descriptions of each Database node by updating the Database node IP address, Host Channel Adapter ID, and management host name in the InfiniBand configurations using set_nodedesc.sh. Enterprise Manager Agents look for this information when discovering the Database Machine.

Run:

ibnetdiscover | grep your_db_nodes

If no output is not returned, then run the following command to set the node descriptions from all database nodes:



- # /bin/ib_set_node_desc_ssc.sh
- Discover Exadata Database Machine from Enterprise Manager using Manual Discovery wizard. This discovery process is the same as any other Exadata Database Machine target. See Discovering an Oracle Exadata Database Machine.
- 9. Discover the HA RAC Cluster and the cluster databases and configure each target as usual.
- **10.** Perform post-discovery verification before you begin using Enterprise Manager to monitor the Exadata Database Machine. See Post-Discovery Configuration and Verification.

Convert Database Machine Targets with 12*c* Target Types to 13*c* Using the Console

To convert an Exadata Database Machine discovered by Enterprise Manager 12c or by Enterprise Manager 13c with 12c target types to be monitored by Enterprise Manager 13c:

- 1. From the Database Machine menu, select Convert 12c Member Targets.
- 2. Select a Conversion Option.
 - (Default) Delete 12c targets and their historical data. This option halts all monitoring of legacy targets and deletes the historical data. This options allows for a clean start for all Enterprise Manager 13c target monitoring.
 - Retain 12c targets and their historical data. This option preserves the historical data for legacy targets.

Once you have selected a conversion option, click Next.

 Set the Credentials. For the conversion, you must set the credentials for the Exadata Database Machine components to be converted. These are a subset of the components that comprise the Exadata. For further details on recommended settings, see the table Table 3-1 and the related details in the corresponding step in Discovering the Oracle Exadata Database Machine.

Conversion Option Credentials	Review				
Database Machine Conversion: Cr	edentials		Back S	tep 2 of 3 Next	Cance
nfiniband Switch Specify the Integrated Lights Out Manager (ILOM) cred witches. They will be saved in Enterprise Manager as in a dministration tasks. Set Credential		Compute Node Server ILOM Specify credentials for all the Compute Node Se be saved in Enterprise Manager as monitoring or Set Credential	redentials.	,	They wil
Infiniband Switch Name	*Credential	ILOM Name		Credential	
InfiniBand-switch1.example.com	Required, Not Set	ilom1.example.com	F	equired, Not Set	
InfiniBand-switch2.example.com	Required, Not Set	PDU			
InfiniBand-switch3.example.com	Required, Not Set	PDU Specify the HTTP credentials and SNMP creden	tiele fer ell DDI le . Theu wi	Ibe equad in Ente	mina
		Manager as monitoring credentials.	uais for all PDOS. They will	i be saved in chite	aprise
Ethernet Switch		Set Credential 👻			
Specify the Cisco IOS and SNMP credentials for all the Enterprise Manager as monitoring credentials.	Ethernet switches. They will be saved in	PDU Name	•	Credential	
Set Credential V		pdu1.example.com	F	equired, Not Set	
Ethernet Switch Name	*Credential				
Ethernet1	Required, Not Set				

Once you have set the credentials, the Credentials page will update to show the credentials set for all components to be converted. Click **Next**.

4. **Review** the components to be converted in the following three sections.



- **Summary**: This section summarizes the number of targets to be converted and if any targets will have additional monitoring information available to you after the conversion.
- **Targets to be Converted**: This table shows all Enterprise Manager 12c targets to be converted to 13c target types for monitoring by Enterprise Manager 13c and provides the new target name information.
- **Targets Not Impacted by Conversion**: All components of the Exadata Database Machine do not need to be converted to be monitored by Enterprise Manager 13c. This list identifies those components that to not need to be converted. These components are already monitored by Enterprise Manager 13c using 13c target types.

Click **Submit** to begin the conversion.

5. A **Processing** pop-up window will appear which shows you the status of the conversion and a summary of the success or failure of the components to be converted.

Processing		
Converting Targets - In Progress.		
	0.01	1000/
/ Hide	0%	100%
Step 1: Prerequisite check Done		
Step 2: Converting targets Attempt to convert 9 targets now Converting 12c target (Oracle Enginee Target Creation: Failed Reason: Identifier not set in parent e	2	· · ·
Converting 12c target (Oracle Enginee	ered System Cis	co Switch) to 13c target 🗨
This operation cannot be cancelled. Closi	ng the browser v	window may cause the process to fail.
Close this dialog when process complete	S	

Do not close this window until the processing is complete!

You can select the option to close the window after the processing is complete, or click **Done**.

6. Once processing is complete, a **Conversion Results** page provides a summary of the components converted and details of each component that succeeded or failed to be converted:



	ets that have been converted ets that failed to convert. 3.	successfully: 6				
• 2 Targets will h	nave additional monitoring mec	hanism				
IB Network ib	-network.example.com will be	e monitored as IB Fabri	c.			
Details						
Conversion Status	12c Target Name	12c Target Type	New Target Name	New Target Type	Delete Target After Conversion	Comments
8	Ethernet1	Oracle Engineer	Ethernet1	Systems Infrastr	No	Target Creation: Failed Reason: Identifier no
8	Ethernet2	Oracle Engineer	Ethernet2	Systems Infrastr	No	Target Creation: Failed Reason: Identifier no
~	ilom1.example.com	Oracle Engineer	ilom1.example.com	Systems Infrastr	No	Conversion succeeded.
~	ilom2.example.com	Oracle Engineer	ilom2.example.com	Systems Infrastr	No	Conversion succeeded.
8	pdul.exomple.com	Oracle Engineer	pdul.exomple.com	Systems Infrastr	No	Target Creation: Failed Reason: Identifier no
v	pdu2.example.com	Oracle Engineer	pdu2.exemple.com	Systems Infrastr	No	Conversion succeeded.
a	ib-switch1.exemple.com	Oracle Infiniband	ib-switch1.example.com	Systems Infrastr	No	Conversion succeeded.
~	ib-switch2.example.com	Oracle Infiniband	ib-switch2.exemple.com	Systems Infrastr	No	Conversion succeeded.
•	1 10 10 1		1.10.10	- · · · ·		· · · · ·

From this page, click **Convert Remaining 12c Targets** to repeat the conversion process for those components that failed to be converted. Click **Launch New Database Machine Home Page** to view the updated home page with all converted components monitored by Enterprise Manager 13c.

Discover the Oracle Exadata Database Machine Target Using EMCLI

EMCLI based discovery is customizable, enabling you to add or skip components in the event of component outage and select the monitoring agents. EMCLI Database Machine Discovery is idempotent, subsequent executions will make the best effort to discover any previously undiscovered targets (components) and will ignore any targets that have already been discovered and configured.

The discovery works for both physical and virtual Exadata Database Machines (IB/RoCE) using local or remote agent.

Ensure to complete the prerequisite tasks to discover the Database Machine target using EMCLI. For the list of prerequisites to complete, see Prerequisites for Discovery Using EMCLI.

- Submit the Deployment Procedure for the Discovery
- View the Discovery Status
- Convert 12c Type Database Machine Targets to 13c Using EMCLI

Submit the Deployment Procedure for the Discovery

Log in to EMCLI and run the following command to discover Oracle Exadata Database Machine:

```
emcli submit_procedure -name=DBMachineDiscovery -input_file="data://
<input file absolute path>"
```

In the above command:



- DBMachineDiscovery: This is the deployment procedure used for the discovery of Oracle Exadata Database Machine using EMCLI. See Deployment Procedure for EMCLI.
- input_file_absolute_path: Full path of the input file that you created in the prerequisite steps. See Create the Input File.

To receive notification regarding the discovery DP status, use the -notification flag as shown below:

```
emcli submit_procedure -name=DBMachineDiscovery -
input_file="data://<input_file_absolute_path>" -
notification="scheduled, action required, running";
```

Deployment Procedure for EMCLI

The Deployment Procedure (DP) **DBMachineDiscovery** is used for the discovery of Oracle Exadata Database Machine using EMCLI. This DP is composed two DPs:

- **DBMachineSystemCheck**: This DP takes the input file that you created while performing the prerequisite tasks and performs a set of prerequisite-checks. After the success of prerequisite-checks, this DP generates an output log file which is consumed by the next DP.
- DBMachineSystemCreation: This DP consumes the output log file generated by the DP for prerequisites-check, and performs Exadata Database Machine discovery. As a result, the steps such as creation of targets, associations, and promotion of targets are completed.

View the Discovery Status

You can monitor the status of the submitted deployment procedure using the EMCLI command or through the Enterprise Manager UI.

- Check the Deployment Procedure Status Using EMCLI
- Check the Deployment Procedure Status Using Console

In case of errors during discovery, resolve the error based on the deployment procedure output information.

See EMCLI Discovery Issues.

Check the Deployment Procedure Status Using EMCLI

After you submitted the discovery deployment procedure, the execution ID is displayed in the command line as shown below:

```
emcli submit_procedure -name="DBMachineDiscovery" -input_file=data:"/
home/user jane/dpInput/emcli discover dp1 vir remote"
```

Schedule not specified, defaults to immediate. 6979503EF41F2447E05338C8F70A1796 Deployment procedure submitted successfully



Use the execution ID to query the status and display it in a specific format. For example, if the execution ID is 69818CF4995E0C88E05338C8F70AA2C3:

```
emcli get_instance_status -instance=69818CF4995E0C88E05338C8F70AA2C3 -xml -
details -showJobOutput -tailLength=50
```

An example out of the above command in xml format:

```
</step>
<step isEnabled="true" name="promoteTargets" stepType="">
<GUID>promoteTargets</GUID>
<errorModeString>stop</errorModeString>
<typeStep>Step</typeStep>
<status></status>
<startedOn>2018-04-10 08:56:28.0</startedOn>
<lastUpdatedOn>2018-04-10 08:58:16.0</lastUpdatedOn>
<completedOn>2018-04-10 08:58:16.0</completedOn>
```

Check the Deployment Procedure Status Using Console

The status and progress of the discovery can be viewed using the Enterprise Manager console.

From the main **Enterprise** menu, click **Provisioning and Patching** > click **Procedure Activity**. The following status information is displayed:

- Target discovery status: Success or Failure
- In case of failure, the reason for it, and additional information to correct it.

Resolve the issues displayed in deployment procedure output and re-submit the discovery through Enterprise Manager CLI or Enterprise Manager console to discover Exadata Database Machine or the remaining components of the database machine.

Convert 12c Type Database Machine Targets to 13c Using EMCLI

To convert an Exadata Database Machine discovered by Enterprise Manager 12c or by Enterprise Manager 13c with 12c target types to be monitored by Enterprise Manager 13c:

1. Create an input file by entering the information about the database machine target. Following is an example input file:

```
#------Input File credentials example------
# Config Map
configMap.dbmTargetName=<DB Machine Target Name>
configMap.retainOldTargets=false
# Credentials
credMap.ibIlomCred=<IB Switch ILOM Credentials>
credMap.ibSnmpCred=<IB Switch SNMP Credentials>
credMap.pduHttpCred=<PDU Credentials>
credMap.pduSnmpCred=<PDU SNMP Credentials>
credMap.ciscoIosCred=<CISCO Switch IOS Credentials>
credMap.ciscoSnmpCred=<CISCO Switch SNMP Credentials>
```



```
credMap.computenodeIlomCred=<Compute Node ILOM Credentials>
credMap.computenodeAdminCred=<Compute Node Admin Credentials>
credMap.computenodeSnmpCred=<Compute Node SNMP Credentials>
credMap.computeSnmpOpt=false
credMap.agentCred=<Agent Credentials>
```

In the above example, the following parameters are used:

- configMap.dbmTargetName: The name of the Database Machine Target that you want to convert
- configMap.retainOldTargets: You can retain 12c targets and their historical data after the conversion. By default, this is set to false. This option halts all monitoring of legacy targets and deletes the historical data. Alternatively, you can set it to true to halt the monitoring of legacy targets and retain their historical data.
- credMap.ibIlomCred: IB switch ILOM credentials
- credMap.ibSnmpCred: IB switch SNMP credentials
- credMap.pduHttpCred: PDU credentials
- credMap.pduSnmpCred: PDU SNMP credentials
- credMap.ciscoIosCred: CISCO switch IOS credentials
- credMap.ciscoSnmpCred: CISCO switch SNMP credentials
- credMap.computenodeIlomCred: Compute node ILOM credentials
- credMap.computenodeAdminCred: Compute node Admin credentials. Provide this when credMap.computeSnmpOpt is set to true.
- credMap.computenodeSnmpCred: Compute node SNMP subscription credentials. Provide this when credMap.computeSnmpOpt is set to true.
- credMap.computeSnmpOpt: Compute node SNMP subscription flag. By default, this is set to false. If the flag is set to true, then after the conversion of ILOM, the respective ILOM SNMP is subscribed.
- credMap.agentCred: Agent credentials for compute node SNMP subscription.

For more information about the credentials, see Named Credentials and Commands to Create Them.

2. Run the following EMCLI command to start the conversion of the Database Machine target from 12c type to 13c by specifying the path of the input file:

```
emcli submit_procedure -name=Convert12cTo13cDatabaseMachine -
input_file=<input_file_path> -notification="scheduled, action
required, running";
```

After running the command, note the deployment procedure (DP) number. You will need this to check the status of the conversion in the console.

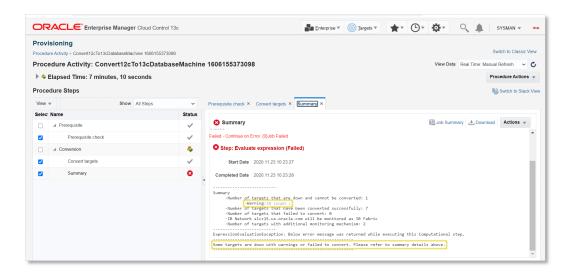
 To check the status of the deployment procedure in the console, in the Enterprise menu, click Provisioning and Patching > click Procedure Activity. The page lists all the deployment procedures.



- Click the link corresponding to the deployment procedure you started in step 2. This displays the **Procedure Activity** page for your deployment procedure.
- Under Procedure Steps, click View > click Expand All. You will now be able to view all the steps in the procedure like Prerequisite, Conversion, and Summary. The status of each step is displayed in the same section. To view more details of each step, click on it.

In case of failure in any of the steps, a detailed diagnostic is performed and information is available for you to apply the fix. After you apply the fix, re-run the EMCLI command specified in step 2 and repeat the steps after.

In the example below, you can view the summary of the conversion which indicates that one of the targets cannot be converted:



Discovering Grid Infrastructure and RAC

The process for discovering Grid Infrastructure (Cluster) and Real Application Cluster (RAC) related targets including Oracle High Availability Service and Cluster targets as well as ASM, database, listener, and related targets on Exadata is the same as on other platforms. See Discovering and Adding Database Targets in the *Oracle Enterprise Manager Cloud Control Administrator's Guide* for more information.

Switch from Using CellCLI to RESTful API

You can at any time lock down an Exadata Storage Server and switch to ExaCLI or RESTful API for monitoring/administration. It is recommended that you use RESTful API.

Ensure that the RESTful API user is created by following the steps in Create an ExaCLI or RESTful API User.

For more information about ExaCLI, see Using the ExaCLI Utility in Exadata Database Machine Maintenance Guide.

Topics:

Update the Monitoring Configuration Using Console



 Update the Monitoring Configuration Using EMCLI for Switching from CellCLI to RESTful API

Update the Monitoring Configuration Using Console

For each Exadata Storage Server, provide the RESTful API monitoring credentials in the monitoring configuration.

1. From the Exadata Storage Server menu, select **Target Setup**, then select **Monitoring Configuration**.

The Monitoring Configuration dialog box opens.

- 2. Set the value of Monitoring Mechanism to:
 - 1 for ExaCLI
 - 2 for RESTful API
- 3. Set Trust Self-signed Certificate to 1.

Monitoring Configuration	OK Cancel				
* Cell Name	XXXXXX01				
ILOM IP Address	XXX.XXXX.XXXX.XXX				
ILOM SNMP Port (Default: 161)	161				
* Management IP Address	XXX.XXX.XXX.XXX				
SNMP Engine ID	0xXXXXXXXXXXXXXXXXX				
Https Protocol (Default: TLSv1.2)	TLSv1.2				
Monitoring Mechanism (0(CellCLI),1(ExaCLI),2(RESTful API))	2				
Trust Self-signed Certificate (Default: 1)	1				
Monitoring					
Oracle has automatically enabled monitoring for this target's avail You can edit the metric thresholds from the target's homepage.	lability and performance, so no further monitoring configuration is necessary.				

Click OK.

4. From the main Setup menu, click Security, click Monitoring Credentials, and select Exadata Storage Server targets.

For each Exadata Storage Server, enter the RESTful API monitoring credentials.

Click Save.

Update the Monitoring Configuration Using EMCLI for Switching from CellCLI to RESTful API

If you have a large set of storage servers, then starting with Enterprise Manager 13.5 *Release Update 11*, you can use EMCLI to provide the monitoring credentials through a single input file for updating the overall monitoring configuration. This method is supported only if you want to switch to RESTful API.

Topics:

EMCLI Command Syntax



- Input File Parameters
- Sample Input File

EMCLI Command Syntax

The following EMCLI command submits the deployment procedure *UpdateCellMonitorMechanism* and provides the monitoring configuration details through the input file *config_file_path*:

```
emcli submit_procedure -name=UpdateCellMonitorMechanism -
input file="<config file path>"
```

Example command:

```
emcli submit_procedure -name=UpdateCellMonitorMechanism -
input_file="data:/u01/oracle/exa_discovery/emcli_cell_mon_creds_conversion"
```

For more details about the submit_procedure command, see submit_procedure in *Command Line Interface*.

Input File Parameters

The following parameters must be provided in the input file for the deployment procedure:

File Parameter	Mandato ry Paramet er	Description		
dbMachineMap.dbMachineNam e.N	Yes	The database machine name whose Storage Servers monitoring mechanism must be updated with a common REST API named credential.		
		<i>N</i> is the index number of the database machine. For example, <i>dbMachineMap.dbMachineName.0</i> . The index number starts with <i>0</i> and increments with each new added database machine name.		
dbMachineMap.agentNamedCr eds.N	Yes	The agent named credentials corresponding to each database machine. As with database machine name, <i>N</i> is the index number of the database machine.		
		For example, if <i>dbMachineMap.dbMachineName.0=myDatabase01</i> , then after using the same index number, the corresponding agent named credentials for the database machine may be <i>dbMachineMap.agentNamedCreds.0=sysman:DB01_CREDS</i> .		
dbMachineMap.restNamedCre ds	Yes	The REST API named credentials for Exadata Storage Server. The format for specifying it:		
		<em_user>:<rest_named_creds></rest_named_creds></em_user>		
dbMachineMap.monitoringMe chanism	No	The default and only accepted value is 2 which indicates RESTful API.		
dbMachineMap.selfSignedCe No rtificate		The default value is 1 which indicates <i>Self-signed Certificate</i> . The other allowed value is 0.		
dbMachineMap.securityProt No ocol		The default value is <i>TLSv1.2</i> .		



Sample Input File

In the following example, the database machines with index numbers 0 and 1 have database names myDatabase01 and myDatabase02, and agent named credentials sysman:DB01_CREDS and sysman:DB02_CREDS correspondingly.

```
dbMachineMap.dbMachineName.0=myDatabase01
dbMachineMap.dbMachineName.1=myDatabase02
dbMachineMap.agentNamedCreds.0=sysman:DB01_CREDS
dbMachineMap.agentNamedCreds.1=sysman:DB02_CREDS
dbMachineMap.restNamedCreds=sysman:rest_creds
dbMachineMap.monitoringMechanism=2
dbMachineMap.selfSignedCertificate=1
dbMachineMap.securityProtocol=TLSv1.2
```



4

Post-Discovery Configuration and Verification

Once the Oracle Exadata Database Machine has been discovered through Enterprise Manager Cloud Control 13*c*, complete the following post-discovery verification:

- Verify SNMP Subscription of the Oracle Management Agent to Exadata Storage Server
- Verify SNMP Configuration for InfiniBand Switch Targets
- Verify the Cisco Ethernet Switch SNMP Configuration
- Verify the PDU SNMP Configuration
- Convert SNMP V2 to V3 at Scale for All Hardware Components in Exadata

Additionally, verify that all the components of Exadata Database Machine are discovered, up, and running. Also, ensure that the components are placed in the rack slots.

It is recommended that you review the logs to verify the successful completion of the discovery process. For the list of logs that you can review and their locations, see Review Logs.

If you encounter issues during discovery, then to troubleshoot them, see Discovery Troubleshooting and EMCLI Discovery Issues in the troubleshooting section.

Verify SNMP Subscription of the Oracle Management Agent to Exadata Storage Server

Exadata Storage Server SNMP configuration is performed using the cellcli command and can be run in batch using dcli from a compute node.



Note:

- During the discovery process, you can optionally provide the necessary root credentials to subscribe for SNMP traps from Exadata Storage Servers. If you have done so, then you can skip the remaining steps of this section and proceed with Verify SNMP Configuration for InfiniBand Switch Targets.
- While the public string is used for the SNMP examples in the following sections, it is supported to use any valid SNMP community string.
- Use SNMP V3 subscriptions for IPv6-based Exadata Storage Server targets because of limitations in the SNMP V1 protocol.
- The SNMP receivelet listens on a single address and port for all monitored targets. The port is the UDP port with the same number as the TCP port used in the EMD URL.

By default, the SNMP receivelet listens on all addresses; if the property SnmpRecvletListenNIC is set in the emd.properties file, the receivelet will attempt to resolve the value as either a name or IP address, and listen on only that address.

This parameter is independent of AgentListenOnAllNICs and EMD_URL because in some installations, the Agent may need to communicate with the OMS and with managed targets on different networks.

Using the **ALTER CELL** Command

While using the ALTER CELL command, all existing subscribers must be specified along with the new subscriber being added. Any existing subscribers not specified will be removed from the configuration. Similarly, you can also modify the notificationPolicy Or notificationMethod attributes.

While using the ALTER CELL command, the host= and community= attribute values should be quoted, and type= is NOT quoted.

If you are using the DCLI utility to set up SNMP configuration, then any command containing punctuation, which will be interpreted by the local shell, must be enclosed with double quotation marks. If the command includes the following characters, then outer quotation marks and escape characters are required:

- \$ (dollar sign) ' (quotation mark) < (less than)
- > (greater than)
- () (parentheses)

The backslash (\) is the escape character that allows the characters to be passed to the *cellcli* utility without being interpreted by the remote shell.

Exadata Storage Server supports SNMP v1/v2 and v3 version based alert notifications to the subscribers. To receive alerts in the SNMPv3 version, the monitoring agents must be added to the **snmpsubscriber** list using a snmpuser.



cellcli command to create a snmpuser:

```
# alter cell snmpuser = ((name=XXXXX, authprotocol=sha, authpassword=*,
privprotocol=AES, privpassword=*));
```

In the above command:

- **name**: User name
- Use only * for the password values in the command.
- **authProtocol**: Authentication protocol. The supported protocol is **SHA**. The authProtocol must be specified for the snmpuser attribute. The system prompts for the authentication password. The authentication password must have 8 to 12 alphanumeric characters.
- privProtocol: Encryption protocol. The protocol options are none, AES, or DES. When the privProtocol attribute is not specified, the default value is none. The system prompts for an encryption password if the encryption protocol is specified. The password is exactly 8 alphanumeric characters, and they are case sensitive.

cellcli command to subscribe the monitoring agents for receiving SNMPv1 alert notifications:

```
# alter cell
snmpsubscriber=((host=<Agent Host>,port=<Agent Port>,community=****))
```

cellcli command to subscribe the monitoring agents for receiving SNMPv3 alert notifications:

```
# alter cell snmpsubscriber=((host=<Agent_Host>,port=<Agent_Port>,
snmpUser=XXXXXXX, type=v3))
```

In the above two commands:

- Agent_Host: Exadata Storage Server monitoring agent installed host
- Agent_Port: Exadata Storage Server monitoring agent port
- snmpUser is the one that is created using snmpuser attribute on Exadata Storage Server.

Check Current SNMP Configuration

Check the current SNMP configuration using the following cellcli commands:

1. To list the current subscribers for SNMP:

cellcli -e list cell attributes snmpSubscriber

When correctly configured, this command should list the primary and backup agents for the Exadata Storage Server target, for example:

```
# cellcli -e "list cell attributes snmpSubscriber"
((host=[hostname.mycompany.com],port=3872,community=public),
(host=[hostname2.mycompany.com],port=3872,type=v3, snmpuser=v3user))
```

If the required monitoring agents are not added to the SNMP subscribers list, then add the subscription. See Set Up SNMP Subscription for Exadata Storage Servers.

- 2. To list the currently configured notification methods:
 - # cellcli -e list cell attributes notificationMethod



The possible values of the notificationMethod attribute are snmp, mail, none, or a combination of snmp and mail. Specify the combination as notificationMethod='mail, snmp'. The default value of the attribute is mail. For example, when the configuration is set for a combination of snmp and mail, then the command returns the following response:

```
# cellcli -e list cell attributes notificationMethod
snmp,mail
```

3. To list the currently configured notification policy for SNMP:

cellcli -e list cell attributes notificationPolicy

Possible values are any or all of **Critical**, **Warning**, and **Clear**. When correctly configured, this command should return Critical, Warning, Clear, for example:

```
# cellcli -e list cell attributes notificationPolicy
Critical,Warning,Clear
```

If SNMP configuration is not available, then configure it. See SNMP Configuration Missing in the troubleshooting section.

Configure SNMP Values Using dcli (optional)

The SNMP configuration commands can be run using dcli to perform the configuration in batch on all Exadata Storage Servers:

1. Set the snmpSubscriber value:

```
$ dcli -g cell_group -l root "cellcli -e \"alter cell
snmpSubscriber=((host='[host name]',port=[port]),(host='[host
name]',port=[port]))\""
```

Where [host name] and [port] values are Agents monitoring your Exadata Storage Server targets.

2. Set the notificationMethod value:

\$ dcli -g cell_group -l root "cellcli -e \"alter cell
notificationMethod='snmp,mail'\""

3. Set the notificationPolicy value:

```
$ dcli -g cell_group -l root "cellcli -e \"alter cell
notificationPolicy='Critical,Warning,Clear'\""
```

Verify SSH Connectivity Using cellcli

To begin monitoring using cellcli, open a new terminal and verify whether the SSH connectivity was successfully established:

\$ ssh -1 cellmonitor <cell_ipaddress> cellcli -e 'list cell detail'

- If you are not prompted for any password, then you can assume that the connectivity is established.
- If you are asked to confirm whether you want to continue connecting, specify **Yes**.



Remove a Subscription

To remove the subscription, use the ALTER CELL command again by excluding the host name that you want to remove from the snmpsubscriber list.

Verify SNMP Configuration for InfiniBand Switch Targets

The SNMP configuration for Enterprise Manager monitoring of InfiniBand Switches is done automatically as part of the Enterprise Manager guided discovery process. It is good practice, however, to verify that SNMP configuration has been successful.

Note:

- During the discovery process, you can optionally provide the necessary root credentials to set up SNMP trap for the InfiniBand Switch. If you have done so, then you can skip the remaining steps of this section.
- ilom-admin is the preferred user when discovering an InfiniBand Switch target for full monitoring. root user can also be used for full monitoring. If the switch is discovered using root or ilom-admin user, the community string provided during discovery is added to the switch, if it doesn't exist already.
- During SNMP V3 discovery, the V3 user added by the (discovery) user during discovery is added to the switch if the discovery is performed using root or the ilom-admin user.

To verify the InfiniBand Switch SNMP configuration for Enterprise Manager monitoring:

snmpget -v 1 -c <community_string> <hostname_of_IB_switch>
1.3.6.1.4.1.42.2.70.101.1.1.9.1.1.5

For example:

```
$ snmpget -v 1 -c public my_IB_switch.my_company.com
1.3.6.1.4.1.42.2.70.101.1.1.9.1.1.5
SNMPv2-SMI::enterprises.42.2.70.101.1.1.9.1.1.5 = INTEGER: 1
```

Note:

If the Timeout message is displayed as output for the above command, then it means that the InfiniBand Switch is not yet configured for SNMP. To configure SNMPv3 user and SNMP community, see Create an SNMPv3 User in IB Switches and Create SNMP Community for InfiniBand Switch Targets in the prerequisites section.



Note:

To remove the subscription, follow steps 1 to 5 in Create SNMP Community for InfiniBand Switch Targets (step 3 is not needed). In step 5, set the Agent compute node host name to **0.0.0.0** and the port to **0**.

Verify the Cisco Ethernet Switch SNMP Configuration

Run the snmpwalk command line utility or equivalent tool to verify the Cisco Switch configuration.

Run the following commands to fetch and display the data from the Cisco switch:

```
$ snmpget -v 1 -c <community_string> <hostname_of_cisco_switch>
1.3.6.1.4.1.9.2.1.56.0
$ snmpget -v 2c -c <community_string> <hostname_of_cisco_switch>
1.3.6.1.4.1.9.2.1.56.0
```

Note:

If a timeout message is displayed as an output for the above command, then it means that the Cisco Switch is not yet configured correctly.

If the Cisco Ethernet Switch SNMP configuration is missing, then see Set Up SNMP Subscription for Cisco Ethernet Switch Targets in the troubleshooting section.

Verify the PDU SNMP Configuration

Use the snmpwalk command line utility or equivalent tool to verify the PDU configuration.

Run the following command to fetch and display the data from PDU:

```
snmpget -v 1 -c <community_string> <hostname_of_pdu>
1.3.6.1.4.1.2769.1.2.3.1.1.1.0
```

Note:

If a timeout message is displayed as an output for the above command, then it means that the PDU is not yet configured correctly.

If the PDU SNMP configuration is missing, then see Set Up SNMP for Power Distribution Unit (PDU) Targets in the troubleshooting section.



Convert SNMP V2 to V3 at Scale for All Hardware Components in Exadata

Migrate the already discovered Exadata environments configured with SNMP v2 to use SNMP v3 without having to rediscover or manually perform the related operations.

1. To query the list of targets and their SNMP subscription status, create an input file by entering the information about the database machine target. Following is an example input file:

```
configMap.dbmTargetName=<DB Machine Target Name>
#
## Credentials
credMap.agentCred=<Agent Credentials>
credMap.computenodeIlomCred=<Compute Node ILOM Credentials>
credMap.computenodeSnmpV3Cred=<Compute Node SNMP V3 Credentials>
credMap.cellMonitorCred=<Storage Server Admin Credentials>
credMap.cellSnmpV3Cred=<Storage Server SNMP V3 Credentials>
credMap.pduHttpCred=<PDU Credentials>
credMap.pduHttpCred=<PDU SNMP V3 Credentials>
credMap.ciscoIosCred=<CISCO Switch IOS Credentials>
credMap.ciscoSnmpV3Cred=<CISCO Switch SNMP V3 Credentials>
```

```
credMap.ibIlomCred=<IB Switch ILOM Credentials>
credMap.ibSnmpV3Cred=<IB Switch SNMP V3 Credentials>
```

For the details about the values to provide for the parameters in the inputs file, see the table below.

2. Run the following EMCLI command to list all the targets in the Database Machine along with their SNMP subscription status:

```
emcli submit_procedure -name=DBMachineListSnmpSubscription -
input_file="<input_file_path>"
```

3. To set up SNMP V3 on all relevant targets in the Database Machine, create an input file by entering the information about the database machine target. Following is an example input file:

```
configMap.dbmTargetName=<DB Machine Target Name>
configMap.overridePassword=Y
configMap.overrideProtocols=Y
#
### Credentials
credMap.agentCred=<Agent Credentials>
```



credMap.computenodeIlomCred=<Compute Node ILOM Credentials>
credMap.computenodeAdminCred=<Compute Node Admin Credentials>
credMap.computenodeSnmpV3Cred=<Compute Node SNMP V3 Credentials>

```
credMap.cellMonitorCred=<Storage Server Admin Credentials>
credMap.cellSnmpV3Cred=<Storage Server SNMP V3 Credentials>
```

```
credMap.pduHttpCred=<PDU Credentials>
credMap.pduSnmpV3Cred=<PDU SNMP V3 Credentials>
```

```
credMap.ciscoIosCred=<CISCO Switch IOS Credentials>
credMap.ciscoSnmpV3Cred=<CISCO Switch SNMP V3 Credentials>
```

```
credMap.ibIlomCred=<IB Switch ILOM Credentials>
credMap.ibSnmpV3Cred=<IB Switch SNMP V3 Credentials>
```

For the details about the values to provide for the parameters in the inputs file, see the table below.

4. Run the following EMCLI command to set up SNMP V3 on all the targets:

```
emcli submit_procedure -name=DBMachineUpdateSnmpSubscription -
input_file="<input_file_path>"
```

Details of the parameters used in the input file:

Parameter	Mandatory	Description
configMap.dbmTargetName	Yes	Database Machine name whose SNMP monitoring mechanism needs to be updated
configMap.overridePassw ord	No	Flag to decide if the target's authorization and privacy protocols' password should be updated with the SNMP monitoring credentials provided in the input file. Default value N. This flag is applicable only for DBMachineUpdateSnmpSubs cription.
configMap.overrideProto cols	No	Flag to decide if the target's authorization and privacy protocols should be updated with the SNMP monitoring credentials provided in the input file. Default value N. This flag is applicable only for DBMachineUpdateSnmpSubs cription.
credMap.agentCred	Yes	Agent credentials for compute node SNMP subscription. Format: <em_user>:<agent_named_ creds></agent_named_ </em_user>



Parameter	Mandatory	Description
credMap.cellMonitorCred	No	Storage server Admin credentials. Format: <em_user>:<cell_admin_na med_creds> and must be of Type ExaCreds, ExaCLICred, or ExaSSHCreds.</cell_admin_na </em_user>
credMap.cellnodeSnmpV3C red	No	Storage server SNMP V3 credentials. Format: < <i>EM_USER</i> >:< <i>cell_snmp_na</i> <i>med_creds</i> > and must be of Type SNMPV3Creds.
credMap.ciscoIosCred	No	CISCO switch IOS credentials. Format: <em_user>:<cisco_named_ creds> and must be of Type cisco_creds, cisco_key_auth_creds, or cisco_private_key_auth_ creds.</cisco_named_ </em_user>
credMap.ciscoSnmpV3Cred	No	CISCO switch SNMP V3 credentials. Format: < <i>EM_USER</i> >:< <i>cisco_snmp_n</i> <i>amed_creds</i> > and must be of Type SNMPV3Creds.
credMap.computenodeAdmi nCred	No	Compute node Admin credentials. Format: < <i>EM_USER</i> >:< <i>compute_admi</i> <i>n_named_creds</i> > and must be of Type ssh_creds.
credMap.computenodeIlom Cred	No	Compute node ILOM credentials. Format: < <i>EM_USER</i> >:< <i>compute_ilom_</i> <i>named_creds</i> > and must be of Type ilom_creds, ilom_key_auth_creds, or ilom_private_key_auth_c reds.
credMap.computenodeSnmp V3Cred	No	Compute node SNMP V3 subscription credentials. Format: <em_user>:<compute_snm p_named_creds> and must be of Type SNMPV3Creds</compute_snm </em_user>
credMap.ibIlomCred	No	IB switch ILOM credentials. Format: <em_user>:<ib_named_cre ds> and must be of Type ilom_creds, ilom_key_auth_creds, or ilom_private_key_auth_c reds.</ib_named_cre </em_user>



Parameter	Mandatory	Description
credMap.ibSnmpV3Cred	No	IB switch SNMP V3 credentials. Format: < <i>EM_USER</i> >:< <i>ib_snmp_nam</i> <i>ed_creds</i> > and must be of Type SNMPV3Creds.
credMap.pduHttpCred	No	PDU credentials. Format: < <i>EM_USER</i> >:< <i>pdu_http_nam</i> <i>ed_creds</i> > and must be of Type http.
credMap.pduSnmpV3Cred	No	PDU SNMP V3 credentials. Format: < <i>EM_USER</i> >:< <i>pdu_snmp_na</i> <i>med_creds</i> > and must be of Type SNMPV3Creds.

5

Oracle Exadata Database Machine Administration

This chapter provides the information needed to administer your Oracle Exadata Database Machine through Oracle Enterprise Manager Cloud Control 13c. The following topics are discussed:

- Creating Roles to Manage the Plug-in
- Exadata Database Machine Topology
- Provisioning Virtualized Exadata Clusters
- Exadata Storage Server Metrics and Alert Settings
- Exadata Storage Server Management
- Managing the InfiniBand Fabric
- Flash Cache Resource Monitoring
- Exadata Database Machine Fault Monitoring
- Monitoring Exadata Database Machine Components
- Automatic Indexing for Database Nodes
- Evaluating Compliance of Exadata Targets
- Reporting

Creating Roles to Manage the Plug-in

To manage the plug-in, you need to create roles and administrators, and then assign roles to administrators. This restricts the privileges that each user has, for example in deleting the plug-in or accessing reports.

Note:

For security reasons, Oracle recommends that the SYSMAN account be used only as a template to create other accounts, and not used directly.

To manage the plug-ins, you must have the Self Update privileges. See Assigning Self Update Privileges to Users in *Cloud Administration Guide*. For information on creating custom roles, see Creating Custom Roles for Self Service Application Administrators and Users in *Cloud Administration Guide*.

To create roles to provide management rights to users:

- 1. Log in to the Enterprise Manager Cloud Control as the super administrator user.
- 2. Click Setup, then Security.



3. Select Roles.

On the Security page, a list of predefined roles is provided. These roles can serve as basis to define custom roles to suite specific site level requirements.

Note:

The predefined roles provided cannot be edited or deleted.

- 4. Select a role that closely matches the role you wish to create. Click Create Like.
- 5. On the Properties page, enter a name for the role you wish to create. You can optionally add a description.

Click Next.

6. On the Roles page, select the roles from the list of Available Roles. Click **Move** to add the role to Selected Roles.

Click Next.

7. On the Target Privileges page, select the privilege you want to grant to the new role.

Click Next.

8. On the Resource Privileges page, you can edit specific privileges to be explicitly granted. Click the **Manage Privilege Grant** edit icon to make the changes.

Click Next.

9. On the Administrators page, select the administrators from the list of Available Administrators that you want to grant the new role to. Click **Move** to add the administrator to Selected Administrators.

Click Next.

 On the Review page, a complete summary of the new role you have created is displayed. Click **Back** to go to previous screens to make changes. Click **Finish** to complete the role creation.

When the newly created administrator logs in, unlike SYSMAN, the administrator is restricted by the privileges set.

Exadata Database Machine Topology

Database Machine management simplifies monitoring and managing tasks by integrating all hardware and software components into one entity. You do not need to monitor each target individually, but instead you can view the whole Exadata Database Machine as a single target. You can view all critical issues in the system, monitor performance, and drill down to individual targets from the Database Machine target home page.

The following topology topics are presented in this section:

- Drilling Down to Individual Targets of Database Machine
- Viewing Virtual Exadata Targets
- Viewing Critical Hardware Information for the Database Machine



- Viewing Exadata Resource Utilization
- Viewing Database Machine Alerts
- Viewing Metrics
- Adding Exadata Database Machine Components Manually
- Removing an Exadata Database Machine Target
- Removing a Component of a Database Machine Target
- Updating the Exadata Database Machine Schematic Diagram

Use the Topology page of Database Machine to view the topology of the system by Cluster or by Database. Clusters are a complete software system starting with a RAC database, the underlying ASM, and CRS. Clusters define one logical entity that is interconnected. The Database Machine could include several clusters, one cluster, or could just be a number of individual databases. While hardware racks define the hardware topology of the Database Machine, clusters define the logical or system topology of the Database Machine.

You can view the Topology by Cluster or Database. Click an element in the Topology and view alert data associated with the element.

You can monitor all components of the Database Machine. Database Machine monitors all subcomponent targets, whether hardware or software. This includes the database, ASM, CRS, hosts, Exadata and the InfiniBand network.

To view the topology of an existing Database Machine target:

1. From the **Targets** menu, select **Exadata**.

Enterprise Manager displays the Oracle Exadata Database Machines and Cloud Services page showing all the available Exadata targets. From this page, you can add hardware components (such as Oracle Exadata Storage Servers, InfiniBand switches, Ethernet Switches, KVM switches, PDU, and compute node ILOM) in the Oracle Database Machine as managed targets.

- 2. From the Oracle Exadata Database Machines and Cloud Services page, select the Oracle Database Machine target whose topology you want to view.
- 3. From the Oracle Database Machine Home page, click the **Database Machine** menu, then select **Members** and then **Topology** from the drop-down menu.

Enterprise Manager Cloud Control displays the Configuration Topology page.

Drilling Down to Individual Targets of Database Machine

You can drill down immediately to a subcomponent target of the Database Machine (such as RAC, a database instance, or an Exadata Storage Server).

To drill down to individual targets:

1. From the Targets menu, select Exadata.

Enterprise Manager displays the Oracle Exadata Database Machines and Cloud Services page showing all the available Exadata targets.

2. From the Oracle Exadata Database Machines and Cloud Services page, select the Oracle Database Machine target whose components you want to view.

Enterprise Manager displays the Oracle Database Machine Home page showing an Overview, Schematic, and Incident section for the selected Database Machine.



- **3.** From the Oracle Database Machine Home page, use the left navigation panel to expand the list of available targets that comprise the Database Machine.
- 4. Click the target to which you want to drill down.

Viewing Virtual Exadata Targets

Once discovered, the Exadata plug-in shows the virtual machines monitored by Enterprise Manager Cloud Control:

Overview			
Racks 1	Exadata Cells 👚 3	Virtual Platforms 🕇 2	Network Switches 👚 3
Incidents 🖨 2 😣 2 🚹 0 🏲 0	Hardware Servers 👚 2	Hosts 🕇 2	PDU 🕹 2

Note:

The schematic diagram in the Database Machine home page is based on the content of the databasemachine.xml file found during discovery. The virtual platforms (Dom0) are displayed as compute nodes in the rack in the schematic diagram.

The Database Machine Software topology diagram will not display the physical Oracle Server, virtual Oracle Server targets (DomU), and Virtual Platform target (Dom0) targets. However, it will continue to show the host targets which are running in DomU.

The Software tab for the Exadata Database Machine target shows all clusters, ASM, and Database targets in the whole physical Database Machine grouped by clusters:

Target Name	Target Type	Status	Target Version
🔺 📱 DB Machine	Oracle Exadata Database Machine	†	
ASM	Cluster ASM	†	
🔺 🚍 cdb01	Cluster Database	1	19.4.0.0.0
Instances			
 cdb01_cdb011	Database Instance	1	19.4.0.0.0
 cdb01_cdb012	Database Instance	1	19.4.0.0.0
Pluggable Databases			
🔺 📕 cluster1	Cluster	1	19.0.0.0



Viewing Critical Hardware Information for the Database Machine

You can view critical metrics for all the hardware subcomponents of the Database Machine such as DB hosts, Exadata Storage Servers, InfiniBand switches and so on. These metrics vary for different component targets. For example, database server nodes and Exadata servers include the CPU, I/O, and storage metrics.

To view critical hardware-centric information for the entire Database machine:

1. From the Targets menu, select Exadata.

Enterprise Manager displays the Oracle Exadata Database Machines and Cloud Services page showing all the available Exadata targets.

- 2. From the Oracle Exadata Database Machines and Cloud Services page, select the Oracle Database Machine target whose hardware information you want to view.
- 3. From the Oracle Database Machine Home page, view the hardware schematic of the Database Machine.

Viewing Exadata Resource Utilization

Access the utilization graphs of compute and storage resources for cluster placement, database placement, database CPU utilization, database memory utilization, database I/O utilization, and disk group space allocation. From the Oracle Exadata Database Machine home page, select the type of resources and view the graphs accordingly.

- Compute Resources
 - Cluster Placement
 - Database Placement
 - Database CPU Utilization
 - Database Memory Utilization
- Storage Resources
 - Exadata Storage Servers
 - Exadata Storage Server Grid

Compute Resources

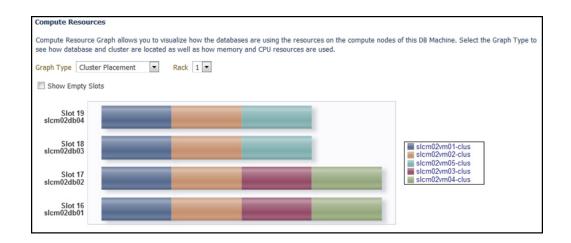
From Oracle Exadata Database Machine home page, click the Database Machine drop down > select Resource Utilization > click Compute Resources.

The following compute resource allocation graphs are available in virtualized Exadata. These graphs are dependent on the virtual machine hierarchy and metric data from the VI plug-in:

Cluster Placement

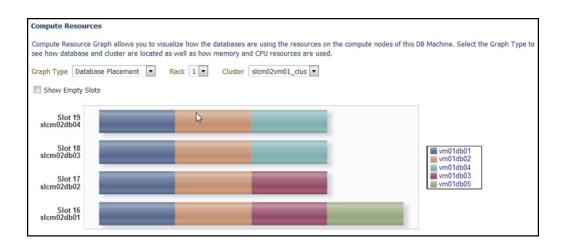
This graph shows the ClusterWare cluster placement on physical servers in a particular Exadata Database Machine rack. Since this is a placement graph, the widths of the data series reflect the number of clusters on the physical server that has the most number of clusters.





Database Placement

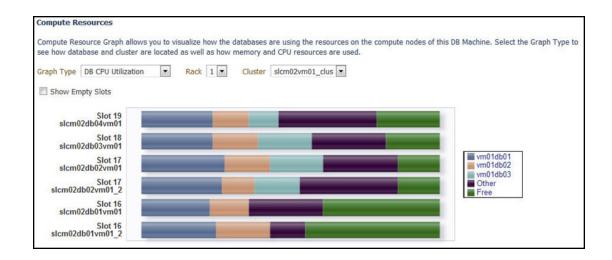
This graph shows the database placement on physical servers in a particular Exadata Database Machine rack for a particular DB cluster. Since this is a placement graph, the widths of the data series reflect the number of DB on the physical server that has the most number of databases for a particular DB cluster.



Database CPU Utilization

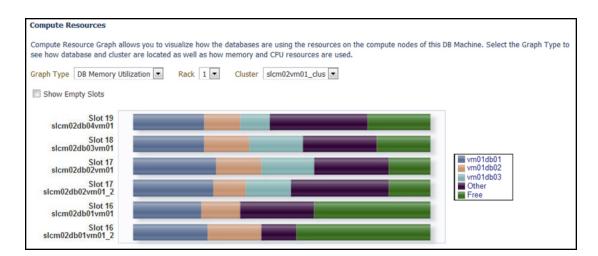
This graph shows the database CPU utilization per database per VM host for a particular DB cluster.





Database Memory Utilization

This graph shows the database memory utilization per database per VM host for a particular DB cluster.



Storage Resources

From Oracle Exadata Database Machine home page, click the Database Machine drop down > select **Resource Utilization** > click **Storage Resources**.

The following storage resource allocation graphs are available in virtualized Exadata for Exadata Storage Servers and Exadata Storage Server Grid:

Exadata Storage Servers

Exadata Storage Server home page has the following sections that provide graphs and detailed information about status and performance of the target:



Exadata Storage Server	•							Page Refreshed Oct 10	, 2019 12:42:35 A	AM PDT 👈
Overview		¢	Capacity							¢
Status 🕇			Disk Size			ASM Disk Group Cap	acity			
Health 🛩			0.00%		.00% 1.22%					
IORM Status Enabled				31.96%		DATAC1 1224 GB RECOC1 300 GB				
Release Version 18.1.9.0.0			68.04%		98,78%	ADG1C1 240 GB ADG2C1 80 GB	÷			
Performance		¢	Hard Disk (GB) 87	,819.78	Flash (GB) 11,923.25	Allocated	-			
		0	Allocated to Grid D	sks 🔳 Flash Cache Ke	вр					
IO Queue	Per Disk		Flash Cache Non-k	eep 📒 Flash Cache Un	used III Unallocated					
0.0015 0.0030 0.0045	0.0060 0.0075 0.00	90 0.0105	Flash Log	Metadata						
	Hard Drive	90 0.0105					Capacity			
Average Flash	Response Time		I/O Distribution by	Databases						40-
0.00 0.03 0.06 0.0		5 0.18	IORM Objective Auto		IORM Settings		1/0	Distribution for All Databases		0
m Flash Read			I/O Uti	ization (%)	Hard Drive I/O	Service Time (ms/requ	est)	Flash I/O Service Ti	me (ms/requ	uest)
Average Hard Driv	ve Response Time		NOCDB122		NOCDB122			NOCDB122		
0.00 0.02 0.04 0.06 0.0	8 0.10 0.12	0.14 0.16	ROC_2		ROC_2			ROC_2		
m	s	0.14 0.16	-		HUADB			HUADB		
Hard Disk Read	Hard Disk Write		HUADB							
I/O Activity		¢	HUBDB		HUBDB			HUBDB		
Utilization	Total		PSACDB		ASM			PSACDB		
	IO/Sec	MB/Sec	Others _		Others			Others		-
Flash Drive 0.2	153	3.5	0 20	40 60 80	0.0 0.1	0.2 0.3 0.4 0	5 0.6	0.0 0.1 0.2	0.3 0.4	0.5 0.
Hard Drive 0.1	94	4.1	Utilization Flash	40 60 80	IO Time H	ard Drive I/O Time ard Drive IORM Wait Time		IO Time Flash I/ IO Time Flash IC	D Time IRM Wait Time	

- **Overview**: Provides details of Exadata Storage Server availability status, health details, I/O Resource Manager status, and server version
- **Performance**: Provides hard drive and flash response time to IO requests, number of I/O's in the queue averaged per disk type.
- Capacity: Provides capacity details of different storage types available on the storage server
 - Total available capacity of Hard drive and Flash
 - Flash Cache space information about keep objects, non-keep objects, unused space. This section also provides information about the size of the flash used for logging.
 - Capacity information for ASM disk groups
- **I/O Activity**: Provides performance information like Utilization, Latency, and Throughput for that available storage drives. This section also provides Flash Cache read and write, Smart Scan I/O throughput, InfiniBand Network throughput, Smart Log Efficiency, and IORM Boost.
- I/O Distribution by Database: Displays information about databases that are ranked top 5 in I/O Utilization for the available storage drives. *other* is an aggregation of remaining databases. This section also displays the Hard Drive I/O Service Time and Flash I/O Service Time for top 5 databases and *other* databases.
- Incidents and Problems: Lists alerts for the target

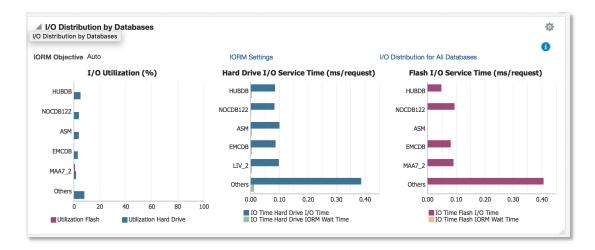
Database I/O Utilization

The Database I/O utilization graph shows the database I/O utilization per Exadata Storage Server of this Exadata Database Machine.

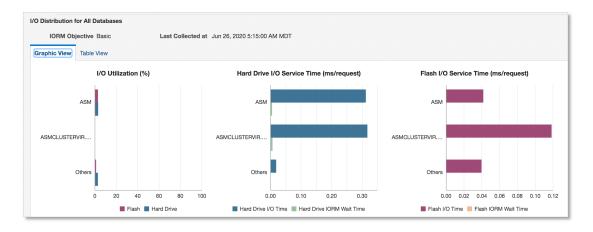
To access the Database I/O Utilization graph, from the Exadata Storage Servers home page, go to the section I/O Distribution by Databases > click I/O Distribution for All Databases.

I/O Distribution by Databases:





I/O Distribution for All Databases - Graphic View:



I/O Distribution for All Databases - Tabular View:

IORM Objective Basic Last Collected at Jun 26, 2020 5:15:00 AM MDT						
aphic View Table View	U.	O Utilization (%)	Hard Drive I/	O Service Time (ms/request)	Flash I/	O Service Time (ms/request)
Database	Hard Drive	Flash	Hard Drive I/O Time	Hard Drive IORM Wait Time	Flash I/O Time	Flash IORM Wait Time
	Hard Drive	riadii				
SM	3.008	2.8427	0.312	0.005	0.0417	0
ASM ASMCLUSTERVIR.SLCM0801				0.005	0.0417 0.1183	0

Workload Distribution by Databases

The Workload Distribution by Databases graphs show database workload performance on the hard drive and flash and the flash cache space usage.

To access the Workload Distribution by Databases graphs, from the Exadata Storage Servers home page, go to the section **I/O Distribution by Databases** > click **IORM Settings**.

To access the Flash Cache Space Usage graph, click the Flash Cache Space Usage tab.

Flash Cache Space Usage:

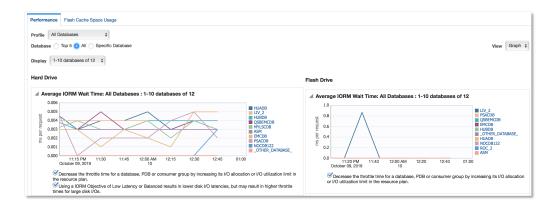


		Usage									
ofile All D	atabases	\$									
Current Fl	lash Cache Space Us	age for Top 5 Da	itabases								
70K 60K									Flash Cad	che Space (MB)	
50K							Database	Current Us	age Minimum Siz	ze Soft Limit	Fixed Si
문 40K							_OTHER_DATABASE_	59,95	8.19	0 0	
30K							EMCDB	13,91	0.72	0 0	
20K 10K							PSACDB	10,86	6.35	0 0	
OK	OTHER DATABASE	EMCDB		ACDB	OSBEMCDB	LIV 2	QSBEMCDB	10,60	6.03	0 0	
		EMCDB nimum Size 🔳 O			USBEMCDB I Fixed Size	LIV_2	LIV_2	10,45	3.78	0 0	
Historical	Flash Cache Space I	Jsage									
Show Spa	Flash Cache Space	All Database	0.1	Database	Show Flash Cache C	apacity 2:00 AM 12:1	0 1220	12:30 12:40	12:50	01:00	Jsage: Size (MB)

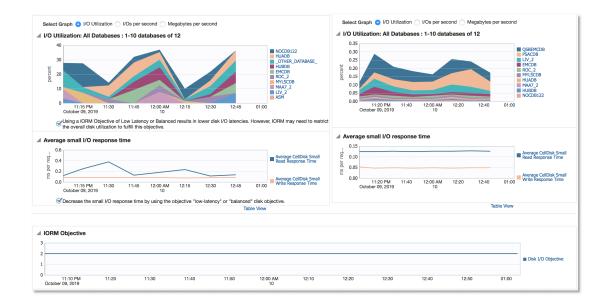
To view the graphs that correspond to the performance of hard drives and Flash, click the **Performance** tab.

This section provides database workload performance on Hard Drive and Flash. You can filter databases based on their workload performance rankings. You can view the graphs for the filters like top 5 databases, rank based pagination, or a specific database. You can drill down from database workload performance monitoring to pluggable database and consumer groups. Following are some of the example graphs:

IORM Wait Time for All Databases (Hard Drive and Flash Drive):



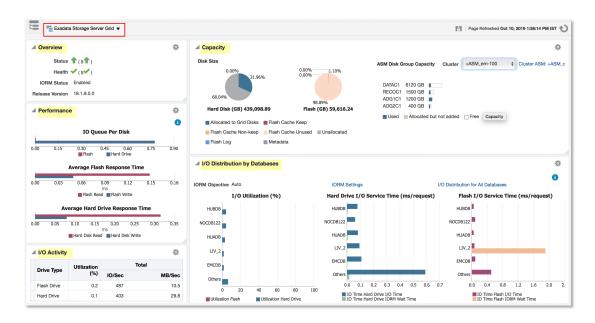
I/O Utilization and Average small I/O response time for All Databases (Hard Drive and Flash Drive):



Exadata Storage Server Grid

Exadata Storage Server Grid home page displays the aggregated status and performance data for all the Exadata Storage Servers. The sections are similar to those that are listed for individual Exadata Storage Server targets.

An example Exadata Storage Server Grid home page:



In the **Capacity** section of the Exadata Storage Server Grid home page, the ASM disk group capacity is displayed for the selected cluster.

You can view the I/O Utilization graph and Workload Distribution of Databases graph by clicking on the links I/O Distribution for All Databases and IORM Settings in the section I/O Distribution by Databases. The graphs that are displayed are the aggregated



information from the Exadata Storage Server member targets of the grid. For details of the graphs, see Database I/O Utilization and Workload Distribution by Databases.

Viewing Database Machine Alerts

You can view alerts on the Database Machine and drill down to details about each alert. These alerts may be performance/configuration metrics or hardware faults.

To view Database Machine alerts:

1. From the Targets menu, select Exadata.

Enterprise Manager displays the Oracle Exadata Database Machines and Cloud Services page showing all the available Exadata targets.

2. From the Oracle Exadata Database Machines and Cloud Services page, select the Oracle Database Machine target whose machine configuration information you want to view.

Enterprise Manager displays the Oracle Database Machine home page on which you can see all alerts associated with the current DB Machine.

Viewing Metrics

Metrics can be viewed at the component level of Exadata Database Machine. To view the Exadata Storage Server metrics:

 Navigate to the Oracle Exadata Storage Server home page by choosing the Oracle Exadata Storage Server target type from the All Targets page of Enterprise Manager.

Enterprise Manager displays the Exadata Storage Server Home page for the target you selected.

2. From the Exadata Storage Server drop-down menu, choose **Monitoring** and then **All Metrics**.

The All Metrics page allows you to view a wide variety of Exadata metrics. For a complete description of the Exadata metrics available, see the *Oracle® Enterprise Manager Oracle Database and Database-Related Metric Reference Manual.*

Adding Exadata Database Machine Components Manually

You can add Exadata Database Machine components manually using the following steps:

1. From the Setup menu, select Add Target, then select Add Targets Manually.

Enterprise Manager displays the Add Targets Manually page where you can choose the type of target you want to add.

- 2. From the Add Targets Manually section, choose Add Using Guided Process.
- 3. From the Add Using Guided Process box, choose **Oracle Exadata Database Machine** and click **Add**.
- From the Oracle Exadata Database Machine Discovery page, click on the option Discover newly added hardware components in an existing Database machine as targets. From the Select a Database Machine drop down list, select



the Database Machine that has the new components and then click **Discover Targets**.

- 5. Choose the monitoring agent using the search option.
- 6. Provide the proper Infiniband Switch Credentials and click Next.
- 7. A prerequisite check is run. Click Next.
- 8. A list of available components for this Database Machine will be displayed. Select the new component(s) that need to be added and click **Next**.
- 9. Select the monitoring agent and backup monitoring agent for the new component(s).
- 10. On the Credentials page, set the credentials for the new components and click Next.
- **11.** On the Review page, review all of the information and then click **Submit**.

Removing an Exadata Database Machine Target

To remove an Exadata Database Machine target, you can

- Remove all members of the Oracle Exadata Database Machine. If the member target is shared with another Database Machine target, then the member target will not be deleted and will continue to be monitored. In other words, the member targets will be deleted if they are associated with only this Database Machine target.
- Remove only system members of the Oracle Exadata Database Machine. The other member targets will not be deleted and will continue to be monitored. They can be associated to another Oracle Exadata Database Machine, if required.

Note:

You must remove the SNMP configuration on the InfiniBand switch, ILOM, Cisco switches (RoCE and Admin), and PDU **manually** if you remove these targets from Enterprise Manager.

SNMP unsubscription is performed automatically for the targets like Oracle Exadata Storage Servers and Oracle Exadata Compute Nodes based on the options selected.

To remove an Exadata Database Machine target:

- 1. From the Database Machine target menu, select **Target Setup**, then select **Remove Target**.
- 2. On the Remove page, select whether to remove all members or to remove only the system members.

If you choose to remove all members, then you also have an additional option to unsubscribe SNMP subscriptions for member Oracle Exadata Storage Servers and Oracle Exadata Compute Nodes. Specify the appropriate user credentials to unsubscribe the SNMP subscriptions.

3. Click Yes to initiate the remove job.



Note:

Host targets for the compute nodes and any targets that are also member targets of another Oracle Exadata Database Machine target will not be removed. System and non-system targets include:

System Targets:

- Oracle Exadata Database Machine
- Oracle Infiniband Fabric (*Enterprise Manager 13c target*)
- Oracle Exadata Storage Server Grid

Non-System Targets:

- Oracle Exadata Storage Server
- Oracle Exadata KVM
- Systems Infrastructure Switch
- Systems Infrastructure PDU
- Systems Infrastructure Rack
- Oracle Infiniband Switch (Enterprise Manager 13c target)
- Oracle Engineered System Cisco Switch (Enterprise Manager 13c target)
- Oracle Engineered System PDU (Enterprise Manager 13c target)
- Oracle Engineered System ILOM Server (Enterprise Manager 13c target)

Removing a Component of a Database Machine Target

If you need to remove a component of an Exadata Database Machine target, you can perform this task within Enterprise Manager Cloud Control 13*c*:

- 1. From the Database Machine home page's Target Navigation pane, right-click on the target item you wish to remove.
- 2. Select Target Setup, then Remove Target.
- 3. A warning page will display to confirm the target deletion. Click Yes to continue.

Updating the Exadata Database Machine Schematic Diagram

The schematic diagram illustrates the placement and status of the components of the Exadata Database Machine.

In some cases, the Exadata Database Machine schematic diagram is not displaying the components correctly. For example:

• You may have successfully discovered the Exadata Database Machine, but some components are not displaying correctly in the Exadata schematic diagram. Instead, an empty slot is shown in place of the component.



- The Exadata Database Machine schematic diagram shows the status of the component as "red/down" where as individual components would really show that they are up and running fine.
- You want to re-locate or rearrange the order of the components in the slots of Exadata Database Machine schematic diagram.

To accomplish these tasks, you will need to drop a component from the schematic diagram and add the correct one:

- Drop a Component from the Exadata Database Machine Schematic Diagram
- Add Components to the Exadata Database Machine Schematic Diagram

Drop a Component from the Exadata Database Machine Schematic Diagram

To drop a component from the Exadata Database Machine schematic diagram:

- **1**. From the Targets menu, select **Exadata**.
- 2. From the Oracle Exadata Database Machines and Cloud Services page, select the Oracle Database Machine target that you want to modify.

Enterprise Manager displays the Oracle Exadata Database Machine home page of the selected Database Machine.

- 3. On the Exadata Database Machine schematic diagram right click on the component you wish to remove, click **Remove Target**.
- 4. Ensure you have selected the correct component in pop-up dialog box and click OK.
- 5. The Exadata Database Machine schematic diagram will refresh to show the empty slot.

Add Components to the Exadata Database Machine Schematic Diagram

To add a component from the Exadata Database Machine schematic diagram:

- 1. From the Targets menu, select **Exadata**.
- 2. From the Oracle Exadata Database Machines and Cloud Services page, select the Oracle Database Machine target you want to modify.

Enterprise Manager displays the Oracle Database Machine home page of the selected Database Machine.

- 3. On the Exadata Database Machine schematic diagram, select the **Photo-Realistic** view option.
- Right-click on an empty slot of the photo-realistic diagram to display option the Place Target. A pop-up window Place Target into Rack is displayed. In the pop-up window, select the target to place it in the rack.
- 5. Once you see the component added in the slot you specify, click **Done** on the Exadata Database Machine schematic diagram.

Provisioning Virtualized Exadata Clusters

Provisioning involves repeatable, reliable, automated, unattended, and scheduled mass deployment of a RAC Cluster including virtual machines (VMs), Oracle Database (DB), Grid Infrastructure, and ASM on Virtualized Exadata.



Note: Exadata Virtualized Provisioning is only available for virtual Exadata configured with InfiniBand networking.

The Exadata plug-in's virtualization provisioning functionality provides the following capabilities:

- Creating a Database Cluster
- Scaling Up a Database Cluster
- Scaling Down a Database Cluster
- Deleting a Database Cluster

Creating a Database Cluster

To create a database cluster, select the servers on which you want to create the virtual machines (VM), and select the Exadata Storage servers that can be used by the virtual machines. Provide additional information like the credentials to access them, VM definition, software locations, operating system users and groups, and networking information to complete the setup.

1. From the Database Machine target menu, select **Provisioning**, then select **Create Cluster**.

The Exadata Provisioning Wizard will be displayed.

- 2. On the Exadata Provisioning: Cluster page, provide the information for:
 - **Cluster Definition**: Create a cluster name. Click **Show existing clusters** to display a list of database clusters already provisioned.
 - Virtual Machine Location: Select the servers on which you want to create the virtual machines. Select one or more from the Available Servers pane, then click the move button to move the selected server to the Selected Servers pane:

Virtual Machine Location		
Available Servers		Selected Servers
host2.example.com		host1.example.com
	>	
	>>	
	<	
	~	



• **Storage Definition**: Select the Exadata Storage Servers to be used by the virtual machines. Select one or more from the **Available Storage Servers** pane, then click the move button to move the selected server to the **Selected Storage Servers** pane:

Storage Definition Select the Exadata Storage Serv Available Storage Servers	ers to be	e used by the virtual machines. Selected Storage Servers
server2.example.com		server1.example.com
server3.example.com	>	
	»	
	<	
	~	

Click Next.

3. On the Credentials page, set the credentials for:

ompute Server (Dom0)			
cify root credential for each Server.	ale		
Server Name	Credential	Test Credential Status	
Compute_server1	Not Defined	Credential not set	
Compute_server2	Not Defined	Credential not set	
		e Server.	
t Credential 🔻 Test Credenti		e Server. Test Credential Status	
t Credential Test Credent	als		
tt Credential Test Credenti Cell Name Storage_server1	als Credential	Test Credential Status	
t Credential Test Credenti Cell Name Storage_server1 Storage_server2	als Credential Not Defined	Test Credential Status Credential not set	
tt Credential Test Credenti Cell Name Storage_server1 Storage_server2 Storage_server3 cify agent host credential for each mo	als Credential Not Defined Not Defined Not Defined not Defined	Test Credential Status Credential not set Credential not set	
Cell Name Storage_server1 Storage_server2 Storage_server3 cify agent host credential for each mo	als Credential Not Defined Not Defined Not Defined not Defined	Test Credential Status Credential not set Credential not set	Test Credential Status



 Compute Server: Set the credentials for the root user. From the Set Credentials drop-down, select All to apply the settings to all servers, or select one or more servers from the list and select Selected to apply the settings to only the selected servers.

In the Set Server Credential pop-up window, select an existing named credential or select **New** to create a new one.

Click **Test Connection** to verify that the credentials are properly set. If successful, the Test Credential Status will update to show Succeeded.

• **Exadata Storage Server**: Set the credentials for the Exadata Storage Server administrator.

In the Set Server Credential pop-up window, select an existing named credential or select **New** to create a new one.

Click **Test Connection** to verify that the credentials are properly set. If successful, the Test Credential Status will update to show Succeeded.

Agent: If Exadata Storage Server is monitored using RESTful API, then you
must provide the agent host users and passwords for all the agents. From the
Set Credentials drop-down, select an existing named credential or select New
to create a new one.

Click **Test Connection** to verify that the credentials are properly set. If successful, the Test Credential Status will update to show Succeeded.

Click Next to define the Virtual Machines.

4. On the Virtual Machines (VMs) page, provide the following information:

Note:

When available, the Exadata Provisioning Wizard will pre-populate the fields with the appropriate defaults. You can change this information to suit your environment.

- Virtual Machine Definition: In this region, provide the details to define the VM:
 - Virtual Machine Size: Select Small, Medium, or Large. Click Customize to adjust the number of CPU cores and available memory.
 - Root password: Create a password in the two password fields.
 - Verify the Prefix, DNS, and NTP fields.
 - Time Zone: select the appropriate time zone from the drop-down list.



Virtual Machine	efinition		
Virtual Machine Size	Small 🔻 CPU cor	res: 2 Memory: 16GB	Customize
Available resources	CPU cores: 12 Memory:	41GB Show details	
* Root password			
* Confirm root password			
Prefix	slcm02		
DNS	11.22.33.444	11.22.33.555	11.22.33.666
NTP	10.200.3.4	10.200.3.5	10.200.3.6
* Time Zone	(UTC-07:00) Denver - N	Iountain Time (MT)	•

- **Software Locations**: When available, the Exadata Provisioning Wizard will prepopulate the fields; otherwise, provide the following information:
 - Inventory Location
 - Grid Infrastructure Home
 - Database Home Location
 - Agent Installation Base Directory
 - Agent Port (optional)
 - Software Language (optional)

Software Locations		
* Inventory Location	/u01/app/oralnventory	
* Grid Infrastructure Home	11.2.0.4 BP13 💌	/u01/app/11.2.0.4/grid
* Database Home Location	11.2.0.4 BP13	/u01/app/oracle/product/11.2.0.4/dbhome_1
* Agent Installation Base Directory	/u01/app/oracle/agent	
Agent Port	3872	
Software Language	en	

- **Operating System Users and Groups**: Like the Software Location region, the Exadata Provisioning Wizard will pre-populate the fields except for the password fields. Otherwise, provide the following information:
 - User name: including the ID, password, and home directory.
 - DBA group name and ID.
 - OINSTALL group name and ID.



	System User	's and Grou	ips				
* User name	oracle	* ID	1001	* Password	* Confirm Password	* Home directory	/home/oracle
* DBA							
Group	dba	* ID	1002				
Name * OINSTALL							
Group	oinstall	* ID	1003				

Click Next to provide the Network details.

- 5. On the Network page, specify the IP address, name and domain used for the Admin, Client and Private network. Provide the details for the following information:
 - **Gateway and Domain Details**: The domain and subnet mask details should already be supplied by the Exadata Provisioning Wizard. Enter a valid IP address for the Admin and Client gateway.

If a private network is used, then select the **Custom** button and specify the gateway. Typically it is *eth0*, *eth1*, or *bondeth0*.

If the Admin or Client or both networks are configured to use VLAN tagging, then the VLAN IDs are detected and displayed.

- Virtual Machine 1: For the first virtual machine in the cluster, the Exadata Provisioning Wizard will auto-complete the Prefix and Start ID field. You can enter an optional Suffix. Enter a valid IP address.
- Generated Virtual Machine Name and IP: After you have entered the information for the first VM, click Generate to create the information for the other VMs in the cluster. You can always enter the details manually.

	Machine Name and IP om slcm02db06.us.oracle.com		
Admin Network Name	slcm0202.example.com	IP	255.0.0.1
Client Network Name	sicm0204. example.com	IP	255.0.0.3
VIP Name	slcm0206.example.com	IP	255.0.0.5
Private Network Name	slcm0208.example.com	IP	255.0.0.7

Once you have entered all the necessary information, click **Validate IP** at the top of the page to verify the IP addresses. Click **Next** to continue to the enter the details for Grid Infrastructure and to create the Initial Database.

- 6. On the Grid Infrastructure and Initial Database page, enter the details for:
 - **Grid Infrastructure**: Enter the details for the Cluster (SCAN name and port) and verify the Disk Group information. The Exadata Provisioning Wizard will pre-populate the details, but you can adjust them as needed.
 - Initial Database: Click the check box to Create Initial Database. Additional information for Database Identification and Administrator Credentials will be required.



Click **Advanced** to expand the region for additional details for Memory Parameters, Processes, and Character Sets:

⊿ Advanced				
Memory Parameters		Processes		
Memory Management Automatic Shared Memory Management		Spochy processes parameters. Processes 150 • •		
Total Physical Memory(MB)		Character Sets		
Percentage of Available Memory – + Total SGA(MB)	4914	Database Character Set		
Total PGA(MB)	1638	Setting character set to Unicode allows you to store information from multiple languages		
		National AL16UTF16 - Unicode UTF-16 Universal Character Set Sot		

Click **Next** to set the schedule.

- 7. On the Schedule page, the Exadata Provisioning Wizard will create the Deployment Instance value. Select a schedule start and notification options:
 - **Schedule**: Select to initiate the creation immediately or later. If you select later, then you will be prompted to select a date and time.
 - Notification: Select the notification statuses for which you will be notified.

Click **Review** to review the settings and initiate the job.

8. On the Review page, review the selection in the summary displayed. To change any section, return to the previous page and edit the selection.

Click Submit to begin the creation job.

Scaling Up a Database Cluster

You can scale up the compute ability of your database cluster by creating and adding more virtual machines to the cluster.

1. From the Database Machine target menu, select **Provisioning**, then select **Scale Up Cluster**.

The Exadata Provisioning Wizard will display.

2. On the Cluster page, enter the cluster name or click the Search icon to select a cluster from the list.

Select one or more from the **Available Servers** pane, then click the move button to move the selected server to the **Selected Servers** pane.

Click Next to set the credentials.

- 3. On the Credentials page, set the credentials for:
 - Compute Server: Set the credentials for the root user. From the Set Credentials drop-down, select All to apply the settings to all servers, or select one or more servers from the list and select Selected to apply the settings to only the selected servers.

In the Set Server Credential pop-up window, select an existing named credential or select **New** to create a new one.

Click **Test Connection** to verify that the credentials are properly set. If successful, the Test Credential Status will update to show Succeeded.

• Virtual Machines: Set the credentials for the DomU Host, DomU Root, Cluster ASM, and Cluster Database.



You have the option to use preferred credentials or to override the preferred credentials.

Click **Test Connection** to verify that the credentials are properly set.

Click Next.

- 4. On the Virtual Machines page, click **Next**.
- 5. On the Network page, specify the IP address, name and domain used for the Admin, Client and Private network. Provide the details for the following information:
 - **Gateway and Domain Details**: The domain and subnet mask details should already be supplied by the Exadata Provisioning Wizard. Enter a valid IP address for the Admin and Client gateway.

If a private network is used, then select the **Custom** button and specify the gateway. Typically it is *eth0*, *eth1*, or *bondeth0*.

If the Admin or Client or both networks are configured to use VLAN tagging, then the VLAN IDs are detected and displayed.

- Virtual Machine 1: For the first virtual machine in the cluster, the Exadata Provisioning Wizard will auto-complete the Prefix and Start ID field. You can enter an optional Suffix. Enter a valid IP address.
- Generated Virtual Machine Name and IP: After you have entered the information for the first VM, click Generate to create the information for the other VMs in the cluster. You can always enter the details manually.

	Machine Name and IP om slcm02db06.us.oracle.com		
Admin Network Name	slcm0202.example.com	IP	255.0.0.1
Client Network Name	sicm0204. example.com	IP	255.0.0.3
VIP Name	slcm0206.example.com	IP	255.0.0.5
Private Network Name	slcm0208.example.com	IP	255.0.0.7

Once you have entered all the necessary information, click **Validate IP** at the top of the page to verify the IP addresses.

Click **Next** to continue to schedule the scale up.

Note:

The step for Grid Infrastructure and Initial Database are skipped because they do not need to be set up again.

6. On the Schedule page, the Exadata Provisioning Wizard will create the Deployment Instance value. Select a schedule start and notification options:



- **Schedule**: Select to initiate the scale up immediately or later. If you select later, then you will be prompted to select a date and time.
- Notification: Select the notification statuses for which you will be notified.

Click **Review** to review the settings and initiate the scale up.

7. On the Review page, review the selection in the summary displayed. To change any section, return to the previous page and edit the selection.

Click Submit to begin the scale up.

Scaling Down a Database Cluster

To scale down a database cluster, the Virtual Machine is removed from the cluster:

1. From the Database Machine target menu, select **Provisioning**, then select **Scale Down Cluster**.

The Exadata Provisioning Wizard will display.

2. Enter the cluster name you want to scale down or click the Search icon to select an available cluster.

Once you have selected a cluster, you will be prompted to:

- Select nodes to delete.
- Verify or enter new named credentials for DomU (host, root, and Exadata Server) and for the Exadata Storage Server. Click **Test Credentials** to verify the credentials have been selected properly.

Click Next to schedule the scale-down job.

- 3. On the Schedule page, the Exadata Provisioning Wizard will create the Deployment Instance value. Select a schedule start and notification options:
 - **Schedule**: Select to initiate the scale down immediately or later. If you select later, then you will be prompted to select a date and time.
 - Notification: Select the notification statuses for which you will be notified.

Click **Review** to review the settings and initiate the scale down.

4. On the Review page, review the selection in the summary displayed. To change any section, return to the previous page and edit the selection.

Click Submit to begin the scale down.

Deleting a Database Cluster

You can delete an existing database cluster and free the compute and storage resources used by the cluster. In the provisioning wizard, select the cluster to delete and provide the credentials to access the Exadata Storage Server and the virtual machine hosts.

1. From the Database Machine target menu, select **Provisioning**, then select **Delete Cluster**.

The Exadata Provisioning Wizard will display.

 On the Cluster page, enter the cluster name you want to delete or click the Search icon to select an available cluster.

The page will update to show the nodes to be deleted



Verify or enter new named credentials for DomU (host, root, and Exadata Server) and for the Exadata Storage Server. Click **Test Credentials** to verify the credentials have been selected properly.

Click Next to schedule the delete job.

- 3. On the Schedule page, the Exadata Provisioning Wizard will create the Deployment Instance value. Select a schedule start and notification options:
 - **Schedule**: Select to initiate the scale down immediately or later. If you select later, then you will be prompted to select a date and time.
 - Notification: Select the notification statuses for which you will be notified.

Click **Review** to review the settings and initiate the delete job.

4. On the Review page, review the selection in the summary displayed. To change any section, return to the previous page and edit the selection.

Click Submit to begin the delete job.

Exadata Storage Server Metrics and Alert Settings

To access the settings for Exadata Storage Server metrics/alert:

- 1. From the Enterprise Manager home page, select **All Targets**. Select an Exadata Storage Server.
- 2. To change a setting, click **Monitoring**, then **Metric and Collection Settings** from the Exadata Storage Server menu. The default View option "Metrics with thresholds" is displayed. You can modify the following parameters:
 - Warning Threshold
 - Collection Schedule click the link to set a collection schedule.
 - Click the Edit icon Ø for advanced settings.
- 3. Click **OK** to save any changes.

Exadata Storage Server Management

This section provides introductory instructions for managing Exadata Storage Servers. The following topics are presented:

- About Exadata Storage Server
- Viewing an Exadata Storage Server Topology
- Performing Administration Tasks on Exadata Storage Servers
- Managing the I/O Resource
- Diagnosing Exadata Storage Server Alerts
- Accessing Oracle Support Workbench for Exadata Storage Server
- Removing a Component of a Database Machine Target



About Exadata Storage Server

An Exadata Storage Server is a highly optimized storage server that runs Oracle Exadata System Software to store and access Oracle Database data. Use the Exadata Storage Server Home page to manage and monitor the Oracle Exadata Storage Server as an Enterprise Manager Cloud Control target. You can discover and consolidate management, monitoring and administration of a single or a group of Oracle Exadata Storage Servers in a datacenter using Enterprise Manager.

Note:

As the Exadata Database Machine has evolved, there have been different names used to reference the Exadata Storage Server, including storage cell and cell server. Any reference with these names in this or related documentation refers to Exadata Storage Server.

Exadata Storage Servers can be discovered automatically or manually. The individual Exadata Storage Server is monitored and managed as an Enterprise Manager target and provides the exception, configuration and performance information.

Grouping of Exadata Storage Servers is used for easy management and monitoring a set of Storage Servers. You can group them both manually and automatically. The grouping function provides an aggregation of exceptions, configuration and performance information of the group of Exadata Storage Servers.

You can view performance analysis by linking Exadata performance both at the Exadata Storage Server level and group level to ASM and database performance. You can drill down to Exadata configuration and performance issues from both the database and ASM targets.

Storage Grid (for example, multiple database/ASM instances sharing the same Exadata Storage Server) is supported to the same extent as dedicated storage.

Viewing an Exadata Storage Server Topology

You can view the topology of an Oracle Exadata Storage Server target by following the steps below:

1. Navigate to the Exadata Storage Server home page by choosing the Exadata target for which you want to view the configuration.

Enterprise Manager displays the Exadata Storage Server Home page for the target you selected.

2. From the Target menu, choose **Configuration** and then **Topology**.

Enterprise Manager displays the Configuration Topology page for the selected Exadata Storage Server. The topology page provides a visual layout of the target's relationships with other targets. From this page you can:

- Do a target search filtered by target status/events/target type
- · Select from a set of relationships to represent in the graph
- Select annotations to display in the graph, such as alerts and link labels



- Select from a set of options: view navigator, expand or collapse all, toggle graph layout, reload topology
- Print
- Zoom via the slide control
- Pan via the navigator control
- Toggle the presentation from graph to table

When you hover over a node or group member, a popup displays detailed information about the entity. A link can appear in the popup to more detailed information such as customer documentation.

Performing Administration Tasks on Exadata Storage Servers

Note:

It is best practice to manage and configure Exadata Storage Servers consistently. Enterprise Manager provides the ability to perform Administration Tasks on all Exadata Storage Servers in an Exadata Database Machine from the corresponding Exadata Storage Server Grid target home page, or on individual Exadata Storage Server targets from the Exadata Storage Server target home page. To the maximum extent possible, consider managing from the Exadata Storage Server Grid target to manage the servers consistently, selecting a subset of servers if necessary. The instructions in this section can be used for either the Exadata Storage Server Grid or Exadata Storage Server targets.

To perform an administration operation on an Exadata Storage Server, such as executing a Exadata Storage Server command, follow these steps:

1. Navigate to the Exadata Storage Server home page by choosing the Exadata target for which you want to perform an administrative task from the All Targets page.

Enterprise Manager displays the Exadata Storage Server Home page for the target you selected.

2. Click Exadata Storage Server, and then select Administration.

From this menu you can choose either **Execute Cell Command,** or **Manage I/O Resource**.

3. Click Execute Cell Command.

The Command page of the Exadata Storage Servers Administration wizard appears. Enter a CELLCLI command as the administrative command to be executed on the Exadata Storage Server. You must read the Command Instructions before you enter a command. Only a single cellCLI command is allowed to execute. You must enter the command without the cellcli -e prefix, which is automatically appended when you submit the command. Finally, you cannot use the following characters: ; / ' < > / |.

4. Click **Next** to continue.



Enterprise Manager displays the Admin Credentials page. Select or enter the Administration credentials to execute the command. The credentials you enter are used when submitting the operation. You can choose between Preferred Credentials, Named Credentials, and New Credentials. You can also click **More Details** to view information about Credential Type, Last modified, Credential Name, Credential Owner, Last Modified Date, Last Modified By, and Preferred Credentials Set At.

5. Click Next.

Enterprise Manager displays the Schedule page. Use the Schedule page to schedule the administration task. Enter the Job Name and the Job Description, then provide the job information in the Schedule the Administration Job section. You can choose to begin the job immediately or enter the time you want the job to begin.

6. Click **Next** to continue.

The Summary page displays. Use the Summary page to ensure you have entered the correct values and then submit the command. The Summary page lists the Job Name, Description, Command to Execute, when the job is Scheduled, and the Selected Cell.

7. Click Submit Command to submit the job.

The Job Status page displays. Use the Job Status page to link to the Job Detail page of the administration task.

Managing the I/O Resource

Oracle Exadata Storage Servers are added as targets during the Exadata Database Machine discovery workflow (see Exadata Database Machine Discovery) and are grouped automatically under the group **Exadata Storage Server Grid**. Monitoring and Managing I/O Resource can be performed at Exadata Storage Server Grid and Exadata Storage Server target level. The information provided below is for Grid and Server target.

To access the IORM Performance page:

- 1. Select an Exadata Storage Server:
 - a. From the Targets menu, select **Exadata**.
 - b. Select a DB Machine from the list of Target Names.
 - c. In the Target Navigation pane, expand the Exadata Grid item and click one of the Exadata Storage Servers.
- 2. Once you have selected an Exadata Storage Server, click the Exadata Storage Server menu, select Administration, then Manage I/O Resource.

The IORM page has the following sections:

- **I/O Resource Manager Settings**: This section helps to view and update the IORM configuration of Exadata Storage Server. Use **Get Latest** button to view the latest Exadata Storage Server IORM configuration. Use the same section to edit and update the IORM configuration on Exadata Storage Server.
- **Database Resource Management(DBRM) Settings**: This section display the list of databases and their basic configuration, that are using Exadata Storage Server resources. From this page, you can launch the database resource management page.
- Workload Distribution by Databases: The IORM Monitoring section of the page provides a view of the performance statistics of Disk I/O (Wait, IOPS, MBPS, Utilization, Latency, and Objective charts). These statistics help to identify which databases and



consumer groups are using the available resources. They also help to adjust the IORM configuration (using IORM Settings section on the same page) as needed.

IORM Configuration includes IORM Objective and Inter-Database Plan.

For further details on managing I/O resources, refer to the *Managing I/O Resources* chapter in the *Oracle*® *Exadata Storage Server Software User's Guide*.

Add/Update IORM Configuration

To update the I/O Resource Manager (IORM) settings (for Exadata Storage Server software release 12.1.2.1.0 and later):

1. Navigate to the IORM page as described above. The image shows the I/O Resource Manager (IORM) Settings pane.

Note:

You can also update a single Exadata Storage Server. Expand the Exadata Grid group to view all Exadata Storage Servers associated with the group. Click the Exadata Storage Server you want to update.

The steps to update the IORM settings is the same for a single Exadata Storage Server or group of Exadata Storage Servers.

- Update the inter-database plan by editing existing values or add/remove directives to Inter-database plan using the Add/Remove buttons available on Inter-database table.
 - a. From the Database Name column, select a database from the drop-down menu or enter a database name.
 - b. Enter a value for the Hard Disk I/O Utilization Limit column.
 - c. Enter a value for the Database I/O Share column.
 - d. Enter minimum and maximum values (in MB) for the Flash Cache column.
 - e. Fill the remaining attributes like Type and Role.
- 3. In the Disk I/O Objective drop-down menu, select an objective from the list (Auto is the default):
 - **Low Latency** Use this setting for critical OLTP workloads that require extremely good disk latency. This setting provides the lowest possible latency by significantly limiting disk utilization.
 - **Balanced** Use this setting for critical OLTP and DSS workloads. This setting balances low disk latency and high throughput. This setting limits disk utilization of large I/Os to a lesser extent than Low Latency to achieve a balance between good latency and good throughput.
 - **High Throughput** Use this setting for critical DSS workloads that require high throughput.
 - **Auto** Use this setting to have IORM determine the optimization objective. IORM continuously and dynamically determines the optimization objective, based on the workloads observed, and resource plans enabled.



 Basic - Use this setting to disable I/O prioritization and limit the maximum small I/O latency.

Note:

If the *Auto* and *Balanced* objectives are not applicable (i.e., they have no impact on I/Os in Extreme Flash Exadata Storage Servers), they will not appear in the IORM page.

Click **Update**. The Exadata Storage Server Administration Wizard will appear prompting you for the information necessary to complete the Disk I/O Objective configuration:

a. On the wizard's **Command** page, the Cell Control Command-Line Interface (CellCLI) value should be as shown when the Disk I/O Objective selected is auto:

alter iormplan objective = 'auto'

Click Next.

b. On the wizard's **Admin Credentials** page, enter the user name and password for the selected Exadata Storage Servers.

Click Next.

c. On the wizard's Schedule page, enter a job name (required) and job description (optional). Select an option to start Immediately or Later. If you select the Later option, enter the time that you want the job to run.

Click Next.

d. On the wizard's **Review** page, verify that the settings are correct. To submit the command, click **Submit Command**.

After the job is successfully submitted, the Job Status page is displayed.

Click Return to return to the I/O Resource Manager (IORM) Settings pane.

- Click Get Latest to refresh the IORM configuration from Exadata Storage Server, which will include the updated Disk I/O Objective.
- 5. To confirm the Disk I/O Objective setting, for example if it was selected as auto, run the following command from the command line:

dcli -g cell group cellcli -e "list iormplan attributes objective"

Output should show the value auto:

```
cell01: auto
cell02: auto
cell03: auto
.
.
.
cell14: auto
```



The Inter-Database Plan

An inter-database plan specifies how resources are allocated by *percentage* or *share* among multiple databases for each Exadata Storage Server. The directives (rows) in an inter-database plan specify allocations to databases, rather than consumer groups. The inter-database plan is configured and enabled with the CellCLI utility at each Exadata Storage Server. Only one inter-database plan can be active on a Exadata Storage Server at any given time.

Percentage based Inter-database plan: Use **allocations** to specify percentage for I/O distribution for each database. With Percentage based plan, IORM can manage up to 32 databases. You can allocate resources across 8 different levels. A percentage based inter-database plan is similar to a database resource plan, in that each directive consists of an allocation amount and a level from 1 to 8. For a given percentage based plan, the total allocations at any level must be less than or equal to 100 percent. An inter-database plan differs from a database resource plan in that it cannot contain sub-plans and only contains I/O resource directives.

Share based inter-database plan: This is the recommended method for Interdatabase plans. Use share to specify the relative priority for a database. A higher share value implies higher priority and more guaranteed I/O resources. Each database is given a share value which is an integer between 1 and 32. Use the limit method to restrict the I/O utilization for a database to a specified utilization limit. The sum of the shares can be greater than 100. Share-based plans support up to 1024 directives within the Inter-database plan.

I/O Resource Management can provide predictable performance by guaranteeing space in Exadata Smart Flash Cache. For this use Flash Cache Space columns to specify space allocation for each database in Inter-database plan.

Specify the attributes values for each directive in Inter-database plan as per requirement.

Note:

If the Exadata Storage Server version is 11.2.3.1.0 or earlier, the Share, Percentage based inter-database plan radio buttons are not available. You can view only Percentage-based options (that is, the drop-down only displays the Basic, Advance options).

When considering an inter-database plan:

- If Oracle Exadata Storage Server is hosting only one database, then an interdatabase plan is not needed.
- If an inter-database plan is not specified, then all the databases receive an equal allocation.

Diagnosing Exadata Storage Server Alerts

Enterprise Manager listens for Exadata Storage Server alerts sent from the Exadata Storage Server Management Server; so, any hardware failure or Exadata Storage Server error will be reported in Enterprise Manager. For information about the error



messages you might encounter on the Exadata Database Machine, refer to the Error and Alert Messages in Oracle Exadata Database Machine Error Message Reference Guide.

Managing the InfiniBand Fabric

All InfiniBand Switches are discovered automatically during the database machine discovery workflow (see Exadata Database Machine Discovery) and are grouped automatically under the group **IBFabric@<switch-name>**.

Note:

InfiniBand Fabric target is not available for RoCE Exadata.

- 1. From the Enterprise Manager home page, select **Targets**, then **Oracle Exadata Database Machines and Cloud Services**.
- 2. In the Target Navigation pane, select InfiniBand Fabric from the list.
- 3. In the IB Fabric pane, you can view an overview and activity summary for all InfiniBand Switches.
- 4. Click **Refresh** for an On Demand refresh of the InfiniBand schematic. Updates reflect the real-time data.

The following topics address managing your InfiniBand network:

- InfiniBand/RoCE Switch Metrics
- Performing Administration Tasks on InfiniBand Networks
- Setting Up Alerts

InfiniBand/RoCE Switch Metrics

The Enterprise Manager Agent runs a remote SSH and remote SNMP GET call to collect metric data for the InfiniBand switch. InfiniBand metrics provides operational details such as:

- Status / Availability
- Port status
- Vital signs: CPU, Memory, Power, Temperature
- Network interface various data
- Incoming traffic errors, traffic Kb/s and %
- Outgoing traffic errors, traffic Kb/s and %
- Administration and Operational bandwidth Mb/s

The following metrics are available for your InfiniBand Fabric:

Switch Aggregated Status

The Aggregate Sensor takes input from multiple sensors and aggregates the data to identify problems with the switch that require attention. Whenever the sensor trips into an "Asserted" state (indicating a problem) or "Deasserted" (indicating that the problem is cleared) for a component on the switch, associated Enterprise Manager events will be generated.



Response

This is the main metric indicating availability of the InfiniBand/RoCE switch. It is collected every 60 seconds by default through the management interface of the switch.

Switch Configuration

This metric captures the switch configuration. The information collected is valuable only to Oracle Support, which will use it to assist in debugging situations.

Switch Basic Status

This metric gives basic status of the switch like Booted on, Locator light status, Power status and overall status of the switch.

Sensor Status

This metric gives the status of various sensors available in the switch like power supply, fan, motherboard, and cooling.

Switch Port Statistics

This metric provides information on number the of incoming and outgoing errors, incoming and outgoing octets.

Component State

This metric gives the state of various components in the switch like Fan, Motherboard, Power Supply and various InfiniBand and Ethernet ports.

Network Port InfiniBand performance

This metric gives performance data of each InfiniBand port.

Performing Administration Tasks on InfiniBand Networks

Note:

Administrative tasks are not allowed to be performed on RoCE switch.

To perform an administration operation on an InfiniBand Network, follow these steps:

1. Navigate to the Database Machine home page of the InfiniBand Network by choosing the Database Machine for which you want to perform an administrative task from the **All Targets** page.

Enterprise Manager displays the Database Machine Home page for the target you selected.

- 2. Navigate to **System Infrastructure Switch** home page for which you want to perform an administrative task.
- 3. Go to Administration, and select Switch Operations.



- 4. Select the administrative operation you want to execute (Enable/Disable port, Clear performance/Error counters, Switch LED on/off, Set up SNMP subscription). The available operations from which you can select are dependent on the target type and target you selected. Once you choose the operation, you may need to select a value that will appear after choosing the operation.
- 5. Click **Next** to continue.

Enterprise Manager displays the Credentials & Schedule page. Select or enter the credentials to execute the command. The credentials you enter are used when submitting the operation. You can choose between Preferred Credentials, Named Credentials, and New Credentials. Schedule the administration task. Provide the job information in the **Administration Job Schedule** section. You can choose to begin the job immediately or enter the time you want the job to begin.

6. Click **Next** to continue.

The Review page appears. Use the Review page to ensure you have entered the correct values and then submit the command. The Review page lists the Job Name, Description, Command to Execute, when the job is Scheduled, the Target Type, and the Selected Target.

7. Click Submit Command to submit the job.

When you click Submit Command, a popup is shown if the job is successful. You can go to the Job Detail Page or back to the page from where this wizard was launched.

Setting Up Alerts

After configuring the InfiniBand Switch targets to send SNMP alerts, set up alerts in Enterprise Manager Cloud Control.

- 1. Log in to Enterprise Manager Cloud Control.
- 2. Click Targets, then All Targets. All discovered targets will display.
- 3. In the All Targets page, click Systems Infrastructure Switch.
- 4. Click the target you are interested in. The target home page appears.
- 5. In the drop-down menu for the Systems Infrastructure Switch, select **Monitoring** and then **Metric and Collections Settings**.
- 6. In the *Metric and Collection Settings* page, you can modify metric threshold values, edit monitoring settings for specific metrics, change metric collection schedules, and disable collection of a metric.

You can modify the thresholds directly in the table or click the edit icon (pencil icon) to access the Edit Advanced Settings page. For more information on the fields displayed in this page and how the thresholds can be modified, click **Help** from the top-right corner of this page.

Flash Cache Resource Monitoring

The Oracle Exadata plug-in release 13.1.0.1.0 and later provides flash cache resource monitoring for Oracle Exadata Storage Servers. The following information is displayed in different sections and pages:

I/O Distribution by Databases: This section on the home page gives the latest performance statistics for the Top 5 databases based on their I/O Utilization.



I/O Distribution for All Databases: This page gives the latest performance statistics for all the databases in the order of I/O Utilization. This page provides both Graph View and Table View. To launch this page, from home page, go to the section **I/O Distribution by Databases** > Click **I/O Distribution for All Databases**.

Workload distribution by Databases: This tab on IORM page provides historical performance statistics by databases for both Hard Drive and Flash. You can specify Top 5 databases or specific databases to view their graphs.

Flash Cache Space Usage: This tab on IORM page provides historical statistics specific to Flash Cache Space Usage by databases.

To view the graphs, go to Storage Resources.

Exadata Database Machine Fault Monitoring

Oracle Enterprise Manager Cloud Control provides hardware fault monitoring for Oracle Exadata Database Machine. For a detailed list of the available hardware alert messages, see Hardware Alert Messages for Oracle Exadata Database Machine and Oracle Exadata Rack in Exadata Database Machine Error Message Reference Guide.

Monitoring Exadata Database Machine Components

Enterprise Manager collects details for the following components:

- Exadata Storage Servers
- Cisco/RoCE Switch (Systems Infrastructure Switch)
- ILOM Targets (Systems Infrastructure Server)
- Power Distribution Units (PDUs)
- InfiniBand Switch (Systems Infrastructure Switch)

Exadata Storage Servers

An Enterprise Manager Agent could collect Exadata Storage Server metrics through cellcli calls via ssh, ExaCLI or RESTful API. SNMP traps are sent to the Enterprise Manager Agent for subscribed alert conditions.

Monitoring with cellcli requires SSH equivalence to be set up between the agent user and the Exadata Storage Server monitor user on each Exadata Storage Server.

On the home page, rich storage data is collected, including:

- Aggregate storage metrics.
- Exadata Storage Server alerts via SNMP (PUSH).
- Capacities.
- Database-level metrics.

Cisco/RoCE Switch (Systems Infrastructure Switch)

An Enterprise Manager Agent runs a remote SNMP get call to collect metric data for the Cisco/RoCE switch, including details on:



- Status / Availability
- Port status
- Vital signs: CPU, Memory, Power, Temperature
- Network interface various data
 - Incoming traffic errors, traffic kb/s and %
 - Outgoing traffic errors, traffic kb/s and %
 - Administration and Operational bandwidth Mb/s

ILOM Targets (Systems Infrastructure Server)

An Enterprise Manager Agent runs remote SSH calls to each SI server target.

The following details are collected:

- Response availability
- Sensor alerts
 - Temperature
 - Voltage
 - Fan speeds
 - Configuration Data: Firmware version, serial number, and so forth.

Monitoring Systems Infrastructure ILOM Server Target Using Non-root User

Follow these steps to create the non-root user for monitoring the ILOM server target:

- **1.** Login to the ILOM server from the browser console.
- 2. Go to ILOM Administration. In the left side panel, click User Management.
- 3. In the Users section, click Add User. The Add User dialog box is displayed.
- 4. In the Add User dialog box, create the new ILOM non-root user. Provide user name, password, and enable the role permissions Console (c) and Read Only (o).
- 5. Save this new user and verify the user details.

Note:

When the non-root user is used, create the SNMPv3 user / SNMP v2 community string and SNMP subscription on the server manually to receive the SNMP traps.

Power Distribution Units (PDUs)

An Enterprise Manager Agent runs remote SNMP get calls and receives SNMP traps (PUSH) from each PDU. Collected details include:

- Response and ping status.
- Phase values.



InfiniBand Switch (Systems Infrastructure Switch)

An Enterprise Manager Agent runs remote SSH calls to the InfiniBand switch to collect metrics. The InfiniBand Switch sends SNMP traps (PUSH) for all alerts.

Monitoring requires ssh equivalence for the root or ilom-admin user for metric collections such as:

- Response
- Various sensor status
 - Fan
 - Voltage
 - Temperature
- Port performance data
- Port administration

Automatic Indexing for Database Nodes

The automatic indexing feature automates the index management tasks in database nodes with Oracle Database *19.3 or later*. Automatic indexing automatically creates, rebuilds, and drops indexes in a database based on the changes in application workload, thus improving database performance.

This feature includes the following options:

- Settings: On the Automatic Indexing Configuration Settings page, you can enable and disable automatic indexing, specify the retention period for unused indexes and automatic indexing logs, and specify the schemas to be included or excluded from using automatic indexing.
- Activity Report: On the Automatic Indexing Activity Report page, you can enter the following details and click Generate Report to view the details of the auto indexes generated in the database:
 - Report Format: Select the format in which you want the report to be generated.
 - Sections: Select the sections that you want displayed in the report. The Summary, Index Details, Verification Details, and Errors options are selected by default in the Sections field, and you can opt to remove any of these sections.
 - Time Period: Select the monitoring time period for which you want the report to be generated.

If you select the default options, namely the **HTML** report format and all the options in the **Sections** field for a specific time period, then the following sections are displayed in the **Report Summary**:

 Overview of Executions: This section displays the overall performance improvement factor as a result of the auto indexes, the number of times the auto index operations were completed, the number of times the auto index operations were interrupted, and fatal errors, if any. Note that the Overview of



Executions section is displayed irrespective of which other section is selected in the **Sections** field.

- For the **Summary** section option, the following bar graphs are displayed:
 - * Summary of Auto Indexes Actions
 - * Summary of Auto Indexes SQL Actions
 - * Summary of Manual Indexes
- For the **Errors** section option, the **Error Summary** pie chart is displayed.
- For the **Index Details** section option, the following sections are displayed:
 - * Index: Created
 - * Index: Dropped

You can click a row in the Index: Created and Index: Dropped sections to view more details such as the ID of the index that was created or dropped, the Key, and Type. You can also use the Download All Index Created Details and Download All Index Dropped Details options given in these sections to download the index details in a .csv format.

 For the Verification Details section option, the Verification Details section is displayed, which includes the details of the SQLs for which auto indexes were generated and used. You can click a row in this section to view more details such as SQL ID, SQL Text, and Improvement Factor.

If you select the **TEXT** report format in the **Report Format** field, then the same information is displayed in a plain text format and can be downloaded by clicking the**Text Download** option.

For information on managing auto indexes, see Managing Auto Indexes in Oracle Database Administrator's Guide.

Evaluating Compliance of Exadata Targets

Oracle Enterprise Manager 13c Release 5 Update 3 (13.5.0.3) integrates Oracle Autonomous Health Framework (AHF) EXAchk for Exadata Engineered Systems X8 and X8M. Oracle EXAchk is a lightweight and non-intrusive health check framework for stack of software and hardware components in Exadata.

Enterprise Manager provides a set of compliance standards and associated controls for overall health monitoring, automated risk identifications and proactive notification of issues for each Exadata System component and database instances.

In order to use AHF EXAchk Compliance Standards, there is no need for an Enterprise Manager plug-in. These EXAchk standards are available out-of-box. When AHF is upgraded, the associated EXAchk compliance standards are automatically updated to the corresponding version.

To monitor compliance of the Exadata targets, use the **Engineered Systems** tab in the **Compliance Dashboard**. See Evaluate Compliance in *Cloud Control Database Lifecycle Management Administrator's Guide*.

For more information on AHF EXAchk Compliance Standards, see AHF EXACHK Compliance Standards in Oracle Enterprise Manager Cloud Control Oracle Compliance Standards Reference.



Reporting

To monitor the performance of the database machine or the storage server by viewing the metrics and diagnostic data, access the support workbench or create a dashboard for access the database machine reports and capacity planning reports.

Topics:

- Accessing Oracle Support Workbench for Exadata Storage Server
- Accessing Oracle Analytics Server Reports
- Oracle Exadata Database Machine Dashboard Creation

Accessing Oracle Support Workbench for Exadata Storage Server

You can access the Oracle Support Workbench for the current Exadata Storage Server to access diagnostic data for problems and incidents related to the Exadata Storage Server.

To access the Support Workbench for a single Exadata Storage Server, follow these steps:

- From the Target menu of the Exadata Storage Server for which you want to access the Oracle Support Workbench, select Diagnostics, then select Support Workbench.
- If you are logging in to the Support Workbench for the first time, you must first initialize the Support Workbench properties. For first-time log in, the Initialize Support Workbench Properties window will be displayed.

Enter the Automatic Diagnostic Repository (ADR) Base Path:

ADR Location							
🛕 Changing the ADR Base path will create a new ADR repository on the new location. All data in your current ADR repository will be lost.							
* ADR Base Path	/pqa/joseaugu/linuxcs5/agentbase/agent_inst						
Relative ADR Home Path	ofm/oracle_dbmachine/oracle_dbmachine						
ADR Home Path	/pqa/joseaugu/linuxcs5/agentbase/agent_inst/diag/ofm/oracle_dbmachine/ora	acle_dbmachine					

The ADR Home Path is a target-specific, writable path on the agent where the generated package is to be stored. During initializing, it is not editable as it is generated automatically once the ADR base path is specified.

Click Create.

 Once the Support Workbench properties have been initialized, the Support Workbench page displays showing a list of any problems for the Database Machine:



=	Datab	ase Ma	chine 🔻							
			om > Support Work	bench						
	t Workb		jes (10)							
New Pr	oblems in La	st 24 Ho	iurs 4	All Active Pr	oblems 4	All Problems 13				
New Ind	idents in La	st 24 Ho	iurs 4	All Active In	cidents 4	All Incidents 4				
ew Tu	ast 24 Hou	s 👻	Report New Problem			Filter b	y problem key		Go	
2000-10	1	(and]						
View	Package									
		None	Show All Details Hic	de All Details						
Select .			Show All Details Hic Problem Key	de All Details Description	Number Of Incidents	Last Incident 💌	Last Comment	Active	Packaged	SR#
Select .	Al Select	ID			Number Of Incidents	Last Incident 💌 January 21, 2016 1:32:54 PM UTC	Last Comment	Active Yes	Packaged No	SR#
Select Select	Al Select Details	ID 13	Problem Key	Description	Number Of Incidents 1 1		Last Comment			SR#
Select Select	Al Select Details	ID 13 12	Problem Key Other 13	Description Cell Issues	1	January 21, 2016 1:32:54 PM UTC	Last Comment Set SR :	Yes	No	SR#

Accessing Oracle Analytics Server Reports

Access the Oracle Analytics Server to run the Exadata reports *Exadata Capacity Planning Details* and *Exadata vCPU Consumption Report* to understand the health and utilization of your Exadata portfolio.

- 1. To access the Exadata reports, you will need a Standalone Oracle Analytics Server. See Standalone Oracle Analytics Server in *Oracle Enterprise Manager Cloud Control Administrator's Guide*.
- 2. Expand the Exadata Reports tree.

The links to the following reports are displayed:

- **Capacity Planning Details**: The capacity planning report for Oracle Exadata Database Machine.
- **Exadata Cloud Service Capacity Planning Report**: The capacity planning report for Oracle Exadata Cloud. See Exadata Cloud Service Capacity Planning Report in *Oracle Enterprise Manager Cloud Control for Oracle Exadata Cloud*.

Note that the report for Oracle Exadata Cloud has a subset of applicable sections of the Capacity Planning Details report used for Oracle Exadata Database Machine, specifically: **Configuration**, **Global Summary**, **Storage Capacity Planning Details**, **CPU and Memory Capacity Planning Details**, and **IO Capacity Planning Details**.

- **Exadata vCPU Consumption Report**: Total daily vCPU consumption and daily vCPU consumption by compute node and virtual host for Exadata.
- 3. Click the link on the report to view it. In the resulting report page, you can optionally obtain the report in *PDF*, *HTML*, *RTF*, *Excel* or *PowerPoint* formats.

Exadata Capacity Planning Details

Capacity Planning Details report enables you to analyze and visualize the utilization and health of Exadata resources like storage, CPU, memory, IO and network. It also helps to plan for upcoming resource requirements.

Some of the benefits of monitoring your resources:

 Optimum Resource Usage: Helps you to fine tune the size and number of resources to ensure that you are getting optimum output



- Cost Efficiency: You pay for the exact amount of resources that you will use
- *Predictive Capacity Planning*: Based on the past performance of your configuration, you can plan your resources for future requirements
- *Improved IT Management*: Helps you to keep a close watch on the performance and health parameters of your resources

Exadata Machine Configuration

This section reports the name of the Exadata Database Machine for which the capacity planning report is generated. It also lists the various hosts and their corresponding host types associated with the configuration. The host type can be **Database Node** or **Storage Cell**.

Global Summary

This section summarizes the key metrics of your configuration for the time ranges like *Last 24 hours*, *Last 7 Days*, *Last 31 Days*, and *Last 365 Days*. The same key metrics are analyzed in greater details in the following sections of the report.

The metrics for *Last 24 Hours* time range are calculated based on the metric collection frequency.

The metrics for the *Last 7 Days* time range are calculated based on the hourly aggregated data.

The metrics for the *Last 31 Days* and *Last 365 Days* time ranges are calculated based on the daily aggregated data.

This is an example global summary of an Exadata Database Machine:

		Last 24 hours ¹				Last 7 Days ²			Last 31 Days ³			Last 365 Days ³				
	Maximum		Average		Maximum	ı	Average		Maximur	n	Average		Maximur	n	Average	
CPU	16.26%		8.92%		26.85%		16.89%		26.85%		11.79%		26.85%		11.79%	
Memory	78.22%		76.57%		79.73%		79.15%		79.73%		77.21%		79.73%		77.21%	
Network Interface - Gb/s	Receive	Transmit	Receive	Transmit	Receive	Transmit	Receive	Transmit	Receive	Transmit	Receive	Transmit	Receive	Transmit	Receive	Transmit
bondeth0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
bondib0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
docker0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
eth0	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00
eth2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
eth3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
eth4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
eth5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ib0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ib1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Storage Capacity Planning Details

As an administrator, you can use the *Storage Capacity Planning Details* section to diagnose and resolve issues in your storage systems, thus resulting in better performance of not only the storage systems but also the applications relying on them. This section displays the current and historical storage space usage information for all the disk groups.

The current space usage is reported based on the data that was last collected. The following parameters are tabulated for each disk group:

- Redundancy
- Used (%)
- Total Size (GB) Raw



- Free Space (GB) Raw
- Used Space (GB) Raw
- Total Size (GB) Usable
- Free Space (GB) Usable
- Used Space (GB) Usable

The historical report is generated based on the data available for the selected time range. The following parameters are tracked and plotted in a line chart along the y-axis against time which is on x-axis:

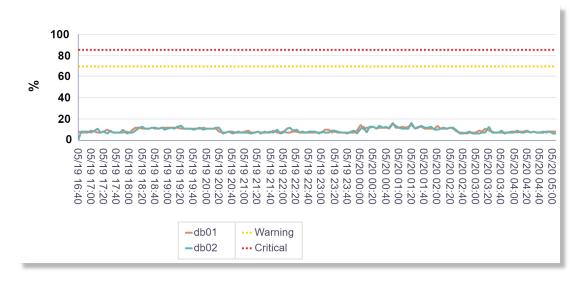
- Historical Space Usage By Disk Group (GB) Usable
- Historical Space Usage By Disk Group (%) Usable
- Historical Total Space Usage (GB) Raw
- Historical Total Space Usage (GB) Usable
- Historical Space Usage by the Top 5 Serviced Databases As seen daily

CPU and Memory Capacity Planning Details

Your CPU and Memory utilizations should not be at critical limits during normal load hours. You should determine CPU and Memory utilizations based on your application needs, including CPU and Memory cycles for peak usage. If your CPU and Memory utilizations are optimized at 100% during normal load hours, you have no **capacity** to handle a peak load. A mismatch between the capacity and the demands can result in unsatisfactory utilization of resources.

In the *CPU and Memory Capacity Planning Details* section, **CPU Utilization** and **Memory Utilization** parameters of each database node are measured and plotted in line charts for the time ranges *Last 24 Hours*, *Last 7 Days*, *Last 31 Days*, and *Last 365 Days*.

Following is an example of the CPU Utilization metric for the 24 hours time range:



Following is an example of the Memory Utilization metric for the 24 hours time range:





IO Capacity Planning Details

The *IO Capacity Planning Details* section displays the current and historical IO, throughput and disk utilization aggregated across all the storage servers for the selected Exadata Database Machine. It summarizes the amount of data being stored in the disks, the read/write throughput rate, and load handling in response to normal and peak demands. Use this section to optimize your disk resources and to plan for future demands.

The following parameters of **Cell Disk** and **Flash** are measured and plotted in line charts for the time ranges *Last 24 Hours*, *Last 7 Days*, *Last 31 Days*, and *Last 365 Days*:

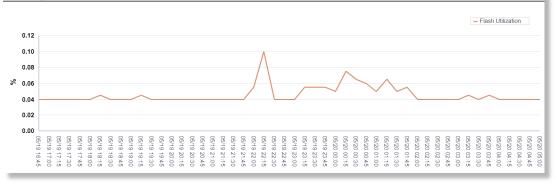
- Average Cell Disk Utilization
- Aggregate Cell Disk Read and Write throughput
 - Disk Read Throughput
 - Disk Read Throughput
- Aggregate Cell Disk IOPS
 - Read IOPS
 - Write IOPS
 - Total IOPS
- Average Cell Disk Load
- Average Cell Disk Response Time
- Average Flash Utilization
- Aggregate Flash Read and Write throughput
 - Flash Read Throughput
 - Flash Read Throughput
- Aggregate Flash IOPS
 - Read IOPS
 - Write IOPS



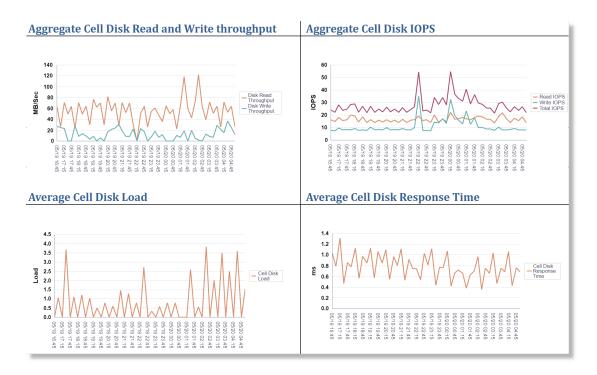
- Total IOPS
- Average Flash Load
- Average Flash Response Time

Following is an example of the average utilization of Flash over a 24-hour time range:

Average Flash Utilization



Following is an example of the various IO capacity metrics of a Cell Disk over a 24-hour time range:



Network Capacity Planning

The *Network Capacity Planning* section displays the **Bonded** (logical) interfaces and **Slave** (Physical) interfaces throughput. Network bonding corresponds to a single IP address and is the single logical bonded interface formed by aggregating multiple physical network interfaces. Use this section to determine the amount of network traffic handled at various loads.



The section displays the following *Transmit* and *Receive* throughputs in Gb/sec for bonded and slave interfaces measured and plotted in line charts for the time ranges *Last 24 Hours*, *Last 7 Days*, *Last 31 Days*, and *Last 365 Days*:

- Transmit Bonded Interfaces
- Receive Bonded Interfaces
- Transmit Slave Interfaces
- Receive Slave Interfaces

This section does not show the RDS protocol traffic metrics.

Exadata vCPU Consumption Report

Use the *Exadata vCPU Consumption Report* to track the vCPU usage of your virtualized Exadata Database Machine. Compare the vCPU consumption for different payloads and plan the vCPU allocations for future requirements.

The two parameters used in the report are *Exadata target name* and *time period*. The report is generated based on an Exadata target, and defined for the time ranges like 7 *Days*, *30 Days*, *90 Days*, *180 Days*, and *1 Year*, *2 years*, *3 years*, and *4 years*. The default time range is *30 Days*. If there is no data on a specific day, then the default value is *0*.

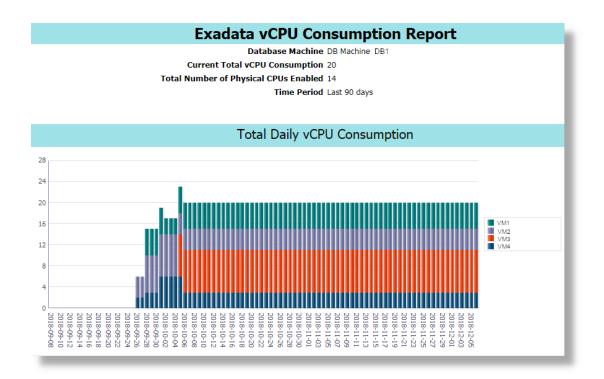
Report Summary: The summary includes the selected Exadata target name, selected time period, current total vCPU consumption, and total number of physical CPUs enabled. The last two values add all the current values together from each virtual machine.

The following metrics are generated in the report for the specific Database Machine:

Total Daily vCPU Consumption

Total vCPU consumption is reported based on the time period that you select. For example, if you select 30 days, the data for 30 days including the current date is reported. The details like Exadata target, compute nodes, and hosts are obtained from the Exadata target name and target association relationship. The CPU count is obtained from the historical host configuration metrics. Within a day, only the high value of the number of vCPUs is used for the daily CPU count. On the whole, the CPU count is aggregated by the virtual host for each day. The chart that displays the total vCPU consumption for the time period of 90 days is shown below:





Following is the total vCPU consumption table for a time period of 7 days:

Date 🗸	Total vCPU Count
Dec 14, 2018	18
Dec 13, 2018	12
Dec 12, 2018	12
Dec 11, 2018	0
Dec 10, 2018	0
Dec 9, 2018	0
Dec 8, 2018	0

Daily vCPU Consumption by Compute Node and Virtual Host

This table is similar to the table for total vCPU consumption, but without the aggregation of the count. The section presents the data grouped by compute nodes and host.

Following is the daily vCPU consumption of the listed compute nodes and their hosts:



Compute Node	Host	Date 🗸 🗸	vCPU Count
ComputeNode1	Host1	Dec 14, 2018	8
		Dec 13, 2018	5
		Dec 12, 2018	5
		Dec 11, 2018	0
		Dec 10, 2018	0
		Dec 9, 2018	0
		Dec 8, 2018	0
ComputeNode2	Host2	Dec 14, 2018	10
-		Dec 13, 2018	7
		Dec 12, 2018	7
		Dec 11, 2018	0
		Dec 10, 2018	0
		Dec 9, 2018	0
		Dec 8, 2018	0

Oracle Exadata Database Machine Dashboard Creation

You can create a Database Machine dashboard to monitor the performance and usage metrics of the Database Machine system, its sub-components, as well as all the database system components residing on the Database Machine.

- Exadata Database Machine Dashboard Creation
- Find All Database Machine Reports
- How to Make the Report "Public"

Exadata Database Machine Dashboard Creation

- **1.** Log in to Enterprise Manager.
- 2. From the Enterprise Manager home page, click the **Enterprise** menu. Select the **Job** submenu, then **Library**.
- 3. Select **Database Machine Services Dashboard** from the drop-down menu next to the Create Library Job option.



- 4. Click Go.
- 5. Enter a name of the job (for example, CREATE DBM DASHBOARD 1).
- Click Add and select the DBMachine target. After adding, make sure the target is selected by clicking on the check box next to it. Note that you can select more than one DBMachine and that a dashboard report will be created for each one.
- 7. Click the Parameters tab.

Three options are provided through the drop-down:

- Select Create if it is a new report.
- Select **Update** for updating an existing report with new components.
- Select Cleanup to remove services created by the Create job executed earlier.
- 8. Finally, click Save to Library to save the job.

A message indicating the job was created successfully should display along with a link to the running job.

You can monitor the job by clicking on the link corresponding to the job.

 To run the job, from the Job Library page, select the newly created job and click Submit. This will open the job to allow you to select the Targets to run against. Select the correct targets and click Submit.

Find All Database Machine Reports

To find all Database Machine reports:

- **1.** Log in to Enterprise Manager.
- 2. From the Enterprise Manager home page, click the **Enterprise** menu. Select **Reports**, then **Information Publisher Reports**.
- 3. Search for the report name. Dashboard report names, one for each Database Machine, are displayed in the following format:

[DBMachine Name]_DASHBOARD_REPORT

4. Click on the report to view the dashboard report.

How to Make the Report "Public"

The generated report is accessible only by the Enterprise Manager user who creates it. To make the report public:

- **1.** Select the dashboard report from the list of Information Publisher reports shown after following the steps mentioned above.
- 2. Click Edit.
- 3. Select the **Run report using target privileges of the report owner** option under Privileges section in General tab.
- 4. Click the Access tab.
- 5. Select the Allow viewing without logging in to Enterprise Manager option.
- 6. Click OK.

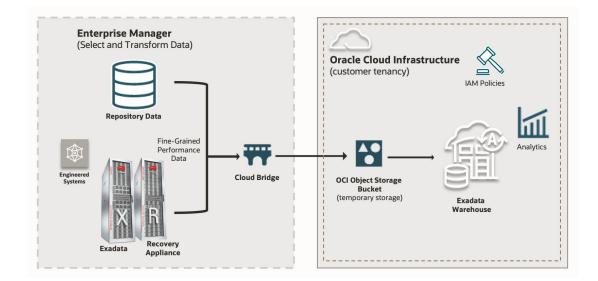


6 Exadata Warehouse

Set up Exadata Warehouse through Enterprise Manager Cloud Control such that it serves as a repository for fine-grained performance metric data collected from on-premises and cloudbased Oracle Engineered Systems like Exadata Database Machine and Zero Data Loss Recovery Appliance.

It provides a platform for long-term retention of historical and forecast data for performance and capacity analysis and planning.

The following image illustrates how data flows into the Exadata Warehouse after the configuration is complete:



The fine-grained data from Exadata components like storage servers and compute servers are uploaded to an Autonomous Database. The Exadata Warehouse generates periodic forecasts based on historical data, which are available for queries and export. Older forecast data points are retained for easy comparison.

Since the Exadata Warehouse resides in an Autonomous Database that you specify, the data uploaded to the Exadata Warehouse can be accessed even after data uploads for the Exadata systems have been paused or terminated.

Topics:

- Setting Up Exadata Warehouse and Analyzing Performance Data
- Simplifying Capacity Planning and Forecasting
- Configuring Purge Settings for Old Metric Data



Setting Up Exadata Warehouse and Analyzing Performance Data

For steps to set up Exadata Warehouse through Enterprise Manager Cloud Control, see *Exporting and Analyzing Oracle Enterprise Manager Engineered Systems Performance Data Using Exadata Warehouse* (Tutorial).

Simplifying Capacity Planning and Forecasting

Oracle Cloud Infrastructure (OCI) Operations Insights supports Exadata Warehouse for monitoring Oracle engineered systems like Exadata Database Machine and Zero Data Loss Recovery Appliance (ZDLRA).

Capabilities of Operations Insights' Exadata Warehouse:

- Analyze resource usage for databases running on on-premises Exadata platforms across the enterprise
- Forecast future demand for resources based on historical trends

With the introduction of Exadata Warehouse, resource utilization of the Exadata systems can be analyzed to identify spare capacity for new workloads. This feature is available for Exadata systems that are managed by Enterprise Manager Cloud Control (EM) 13c Release 5 Update 7 (13.5.0.7) and above. The use of Exadata Warehouse features requires OCI Operations Insights service license subscription.

For more information, see Operations Insights: Analyze Exadata Resources.

Key functionality of fine-grained metric ingestion and forecasting:

- Ingest metrics to customer-owned Autonomous Databases in customer's tenancy
- Store fine-grained metric data with per-minute granularity. Offers up to 1,440 data point per metric, if available.
- Back-fill metric data to accommodate periods where monitoring of Exadata through Enterprise Manager is interrupted
- · Automated forecasts and roll-ups, updated periodically
- Forecast data using machine learning with seasonality models
- Forecasts can be generated for up to the next 3 months by analyzing 9 months of historical data, subject to the availability of data

Capacity Planning:

Exadata Warehouse collects metrics from ASM Cluster, Exadata Storage Server and Exadata Compute Nodes and provides coverage for the areas below:

- CPU/vCPU and Memory consumption
- Storage Utilization
- IO Capacity, utilization and performance
- Network performance

Default metrics collected by Exadata warehouse:



ASM Cluster	Exadata Storage	Exadata Compute	Zero Data Loss
	Server	Nodes	Recovery Appliance
 Disk Group Physical Free (MB) Disk Group Free (MB) Disk Group Used % Used % of Safely Usable Physical Size (MB) Size (MB) Disk Group Usable Free (MB) Disk Group Usable (MB) 	 Large Read/Write Throughput Small Read/Write Throughput 	 Nodes CPU Utilization Memory Utilization Network Read Rate Network Write Rate 	Storage Locations Unused Space (GB)

Applications of Exadata Warehouse:

• Metric data from the Exadata Warehouse can be leveraged to build reports through Oracle Analytics Cloud to visualize historical and forecasted capacity utilization and resource usage.



Exadata Warehouse Sample Queries

Topics:

- Query 1: Top 10 Exadata Targets Based on Average CPU Usage Over a Chosen Time Period
- Query 2: Exadata Targets with Under-utilized IOPS

Query 1: Top 10 Exadata Targets Based on Average CPU Usage Over a Chosen Time Period

Use this query to get a list of the top 10 Oracle Exadata Database Machines, based on Average CPU Usage. The query takes the *EM_ID* and historic period in days as parameters and returns a list of up to 10 Oracle Exadata Database Machines sorted in descending order on the basis of CPU utilization over the selected historical period.

Input Parameters:

- EM_ID
- Historical time period in days, for example, 180 for 6 months

```
WITH cpu usage historical AS (
  SELECT
   em id,
   target name,
   target type,
   mean value v
  FROM
   XAWH DAILY METRIC DATA
  WHERE
     em id = :1
   AND target type = 'host'
   AND metric column = 'DS CPUT'
   AND metric name = 'xa analytics'
   AND metric time > SYSDATE - :2
   AND metric time < SYSDATE
), targets with exadata name AS (
  SELECT DISTINCT
   em id,
    target name,
    target type,
    CONNECT BY ROOT target name AS exadata name
  FROM
    XAWH TARGETS
  WHERE
    target type = 'host'
  CONNECT BY PRIOR target_guid = parent_guid
             AND em id = :1 START WITH ( parent guid IS NULL )
)
SELECT
  t.exadata name "Target",
  TRUNC(AVG(cpu usage historical.v),2) "Average CPU Usage"
```



```
FROM
    cpu_usage_historical,
    targets_with_exadata_name t
WHERE
        cpu_usage_historical.em_id = t.em_id
    AND cpu_usage_historical.target_name = t.target_name
    AND cpu_usage_historical.target_type = t.target_type
GROUP BY
    t.exadata_name
ORDER BY
    AVG(cpu_usage_historical.v) DESC
FETCH FIRST 10 ROWS ONLY;
```

Sample Output:

Input parameters provided:

- EM_ID: 19102682514EE3FAAE6DC8AFB460EAC8
- Historical period in days: 365

Output:

Target	Average CPU Usage
DB Machine sample1.example.com	29.08
DB Machine sample2.example.com	24.48
DB Machine sample3.example.com	14.52
DB Machine sample4.example.com	7.57
DB Machine sample5.example.com	3.68

Query 2: Exadata Targets with Under-utilized IOPS

Use this query to get a list of the top 10 under-utilized Oracle Exadata Database Machines, based on IOPS utilization computed for the following metrics:

```
    Number of requests to read small blocks per second from a cell disk
(CD_IO_RQ_R_SM_SEC)
    Number of requests to read large blocks per second from a cell disk
(CD_IO_RQ_R_LG_SEC)
    Number of requests to write small blocks per second to a cell disk
(CD_IO_RQ_W_SM_SEC)
    Number of requests to write large blocks per second to a cell disk
(CD_IO_RQ_W_LG_SEC)
```

The query takes the EM_ID and historic period in days as parameters and returns a list of up to 10 Oracle Exadata Database Machines sorted in ascending order on the basis of least IOPS usage over the selected historical period.

Input Parameters:

EM_ID



```
Historical time period in days, for example, 365 for 1 year
WITH iops usage historical AS (
  SELECT
    em id,
    target name,
    target type,
    mean value v,
    CASE
      WHEN KEY PART 1 LIKE 'CD%' THEN
        'CD'
      ELSE
        'FD'
    END
               disk_type
  FROM
    XAWH DAILY METRIC DATA
  WHERE
      em id = :1
    AND target type = 'oracle exadata'
    AND metric_column IN ( 'CD_IO_RQ_R_SM_SEC', 'CD_IO_RQ_R_LG_SEC',
'CD IO RQ W SM SEC', 'CD IO RQ W LG SEC' )
    AND metric name = 'xa analytics'
    AND metric time > SYSDATE - :2
    AND metric time < SYSDATE
), targets with exadata name AS (
  SELECT DISTINCT
    em id,
    target name,
    target type,
    CONNECT BY ROOT target_name AS exadata_name
  FROM
    XAWH TARGETS
  WHERE
    target type = 'oracle exadata'
  CONNECT BY PRIOR target guid = parent guid
             AND em id = :1 START WITH ( parent guid IS NULL )
)
SELECT
  t.exadata name "Target",
  t.target name "Oracle Storage Server",
  disk type "Disk Type",
  SUM(v) "Total IOPS"
FROM
  iops usage historical,
  targets with exadata name t
WHERE
    iops usage historical.em id = t.em id
  AND iops usage historical.target name = t.target name
  AND iops usage historical.target type = t.target type
GROUP BY
  t.exadata name,
  t.target name,
  disk type
ORDER BY
```



```
AVG(iops_usage_historical.v) ASC
FETCH FIRST 10 ROWS ONLY;
```

Sample Output:

Input parameters provided:

- EM_ID: 19102682514EE3FAAE6DC8AFB460EAC8
- Historical period in days: 365

Output:

Target	Oracle Storage Server	Disk Type	Total IOPS
DB Machine sample4.example.com	sample4adm09.example .com	FD	14368.85
DB Machine sample4.example.com	sample4adm11.example .com	FD	14605.37
DB Machine sample4.example.com	sample4adm10.example .com	FD	15722.89
DB Machine sample3.example.com	sample3adm02.example .com	CD	8364.61
DB Machine sample3.example.com	sample3adm01.example .com	CD	9614.26
DB Machine sample1.example.com	sample1adm03.example .com	CD	26910.9
DB Machine sample3.example.com	sample3adm02.example .com	FD	27305.82
DB Machine sample2.example.com	sample2adm06.example .com	FD	222255.41
DB Machine sample2.example.com	sample2adm04.example .com	FD	222294.83
DB Machine sample2.example.com	sample2adm05.example .com	FD	222339.38

Configuring Purge Settings for Old Metric Data

The volume of fine-grained data and rolled-up statistics stored in the Exadata Warehouse grows over time. You can configure settings to periodically delete old data from the Exadata Warehouse.

Data retention settings:

Data Type	Default Value (days)	Minimum Value (days)
Fine-grained metric data	395 (13 months)	30 (1 month)
Hourly roll-up metric data	1460 (4 years)	395 (13 months)
Daily roll-up metric data	2555 (7 years)	395 (13 months)
Diagnostic data	395 (13 months)	60 (2 months)



Customize Data Retention Settings for Exadata Warehouse

To override the default retention periods and to view the latest retention settings for the Exadata Warehouse tables, use the EM Job type **Exadata Warehouse Auto Purge Settings**. In the job, you can specify the value for the retention period for fine-grained data, hourly roll-up data, daily roll-up data, and diagnostic data. To create a new Job of the type:

- 1. In Enterprise Manager Cloud Control, click **Enterprise**, then **Job**, then click **Activity**.
- 2. On the Job Activity page, select the job type **Exadata Warehouse Auto Purge Settings** from the Create Job menu and click **Go**.
- 3. In the **General** tab, provide a name for the job and add the individual targets or one composite target such as a Group.
- 4. In the **Parameters** tab, provide value for the retention period for fine-grained data, hourly roll-up data, daily roll-up data, and diagnostic data, all specified in days.
- 5. In the Credentials tab, select an appropriate option for credentials.
- 6. In the Schedule tab, schedule the job.
- 7. In the **Access** tab, define or modify the access you want other users to have to this job.
- 8. Click Submit.

Auto-Purge Job Details

After the auto-purge job is created to override the default purge settings, you can view the job or modify the auto-purge settings:

Job Create 'Exadata Warehouse Auto Purge Settings' Job		
General Parameters Credentials Schedule Access		Cancel Submit
Retention period for fine-grained data (days) Default setting is 395 days (13 months) and minimum value supported is 30 days (11 months) Retention period for hourly rollup data (days) Default setting is 1460 days (4 years) and minimum value supported is 395 days (13 months) Retention period for daily rollup data (days) Default setting is 2555 days (7 years) and minimum value supported is 395 days (13 months) Retention period for diagnostic data (days) Default setting is 2555 days (7 years) and minimum value supported is 395 days (13 months) Retention period for diagnostic data (days) Default setting is 395 days (13 months) and minimum value supported is 60 days (2 months)	Name Description %end properties can be used in parameters Property names are case-ensitive. To escape %%, use %%%. Name Description %end_roc0% location of Agent %perblin% location of Part binary used by Agent %bTargetType% target type	
		Cancel Submit

If the job is run without any change to the parameters, the current retention settings are displayed in the job output.



7 Exadata Metrics

This chapter describes how to access the various metrics for the Oracle Exadata Database Machine and provides examples of key metrics including:

- Accessing Exadata Metrics
- Example Metrics
 - Aggregated Exadata FlashDisk and HardDisk Metric
 - Exadata Storage Server Metric
 - Exadata Key Performance Indicators Metrics

Accessing Exadata Metrics

For a complete list of metrics available for the Oracle Exadata Database Machine and related targets, see the following reference manuals for the plug-ins that together provide Exadata support:

- Oracle Exadata in Enterprise Manager Oracle Engineered Systems Metric Reference
 Manual
- Systems Infrastructure Plug-in Metric Reference Manual
- Virtual Infrastructure Plug-in Metric Reference Manual

Accessing Exadata Metrics

To access the available Exadata Metrics:

- 1. From the Targets menu, select Exadata.
- 2. On the Oracle Exadata Database Machines page, select an Exadata Database Machine from the list.
- 3. From the Target Navigation tree, select a target of interest.
- From the target's home page, select the target type name, then Monitoring, and then All Metrics.

Example Metrics

The following metric sections provide examples of the available metrics and how they are displayed.

Aggregated Exadata FlashDisk and HardDisk Metric

This metric category contains metrics that are aggregated over either the hard disks or flash disks in a Exadata Storage Server. Selecting this metric from the All Metrics page generates a high-level summary, as shown in the image:



Co	lle	ction Schedule Ev	very 15 Minutes Modify				
	ι	Jpload Interval Ev	ery Collection	_			
		Last Upload Ja	n 21, 2015 8:08:53 PM G	IMT			
		CellDisk Type	Average CellDisk IO Load	Average CellDisk Read IOPS	Average CellDisk Read Response Time	Average CellDisk Read Throughput	Average CellDisk Small Read Response Time
	>	FlashDisk	1	8.86	0.4	0.07	0.4
	>	HardDisk	4.33	216.55	59.73	215.64	59.73

Expand the **Aggregated Exadata FlashDisk and HardDisk Metric** in the All Metrics page to show a variety of metric details, such as **Average CellDisk Read Throughput**, which gives an indication of the average number of bytes read from the Exadata Storage Server disk, or **Total CellDisk I/O Load**, which gives an indication of the total input/output load to the celldisk.

Average CellDisk Read Throughput:

			View D	Data Last 24 Hours	▼ /	Auto Refresh Off 🔻			
Average CellDisk Read Throughput									
CellDisk Type	Average Value	Low Value	High Value	Last Known Value	Current Severity	Alert Triggered			
FlashDisk	0.09	0.02	0.36	0.06	Not Applicable	-			
HardDisk	190.36	92.54	368.79	130.37	Not Applicable	-			

Total CellDisk I/O Load:

			View D	Data Last 24 Hours	v /	Auto Refresh Off
otal CellDisk IO	Load					
CellDisk Type	Average Value	Low Value	High Value	Last Known Value	Current Severity	Alert Triggered
FlashDisk	16	16	16	16	Not Applicable	- 1
HardDisk	51.69	48	93	49	Not Applicable	-

Exadata Storage Server Metric

This metric category contains the performance metrics collected at the Exadata Storage Server level for each Exadata Storage Server, such as CPU utilization and memory utilization. Selecting this metric from the All Metrics page generates a highlevel summary, as shown in the image:



Collection Schedule Every 15 Minutes

Upload Interval Every Collection

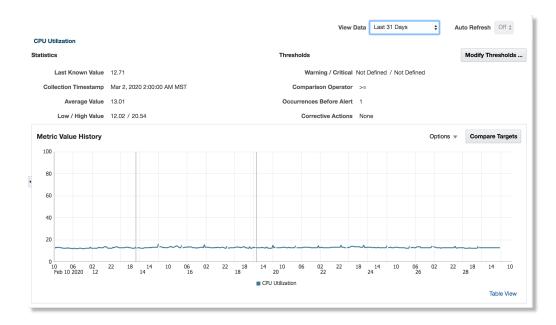
Last Upload Mar 2, 2020 2:00:00 AM MST

Metric	Thresholds	Real Time Value	
Cell Name	Not Applicable	slcc15cel01	
CPU Utilization	Not Set	12.7	
Disk I/O Objective	Not Applicable	2	
Exadata Run Queue Length	Not Set	3.37	
Exadata Temperature Lower Threshold	Not Set	21	
Exadata Temperature Reading	Not Applicable	21	
Exadata Temperature Upper Threshold	Not Set	21	
IORM Boost	Not Applicable	0	
LED Status	Not Applicable	off	
Memory Utilization	Not Set	96.07	
Network Received	Not Applicable	0.08	
Network Sent	Not Applicable	4.83	
Offload Efficiency	Not Set		

Expand the **Exadata Cell Metric** in the All Metrics page to show a variety of metric details, such as **CPU Utilization**, which provides information about the CPU utilization, or **Disk I/O Objective**, which provides the optimization objective which IORM is configured to achieve (for example, "Low Latency" or "Balanced" for OLTP-oriented databases, or "High Throughput" for data warehouses).

CPU Utilization:





Disk I/O Objective:



Exadata Key Performance Indicators Metrics

With Enterprise Manager *13c Release 4 Update 4 (13.4.0.4)* or higher version, you can access the Key Performance Indicators Metrics for Exadata Storage Servers and Exadata Storage Server Grid to view the metrics of the key parameters as listed in the image below for an Exadata Storage Server Grid:



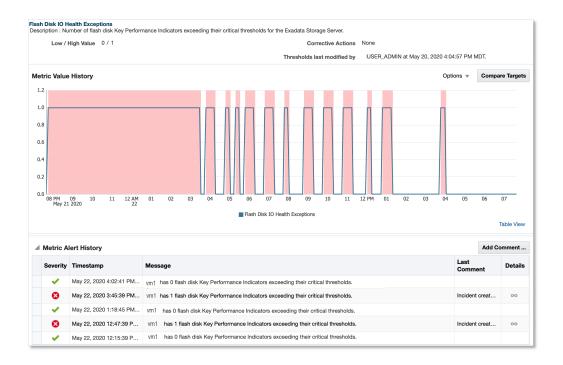
Exadata Storage Server Grid 🔻	Page Refreshed May 22, 2020 7:29:29 PM 1				
e Exadata Storage Server Grid: Exadata Grid > All M	etrics				
Metrics				4	
arch Q	Exadata Key Performance Indicato	rs tors for the Exadata Storage Server Grid.			
iew 🔻 🐺 🏦 🏗	tes 🖉				
Exadata Grid	Upload Interval Every Collect	P			
Exadata Key Performance Indicators	Last Upload May 22, 2020				
Average Flash Disk IO Load	Metric	Thresholds	Real Time Value		
Average Flash Disk Response Time	Average Flash Disk IO Load	Not Set	2.25		
Average Hard Disk IO Load	Average Flash Disk Response		0.25		
Average Hard Disk Response Time	Average Hard Disk IO Load	Not Set	2.21		
Flash Disk IO Health Exceptions	Average Hard Disk Response T		1.87		
Total Flash Disk IOPS	Flash Disk IO Health Exception		0		
Total Flash Disk Throughput	Hard Disk IO Health Exceptions	Set	1		
Total Hard Disk IOPS	Total Flash Disk IOPS	Not Set	19.49		
Total Hard Disk Throughput	Total Flash Disk Throughput	Not Set	45.7		
▶ Response	Total Hard Disk IOPS	Not Set	38.73		
	Total Hard Disk Throughput	Not Set	182.5		

The following is an example of the Average Hard Disk IO Load metric of an Exadata Storage Server:



The following is an example of the Flash Disk IO Health Exceptions metric of an Exadata Storage Server:







8 Troubleshooting

This chapter provides troubleshooting tips and techniques on installing, discovering, and configuring the Exadata plug-in. The following sections are provided:

- Discovery Troubleshooting
- EMCLI Discovery Issues
- Troubleshooting the Exadata Database Machine Schematic File
- Exadata Database Machine Management Troubleshooting
- Exadata Derived Association Rules
- Target Status Issues
- Metric Collection Issues
- Status: Pending Issues
- Monitoring Agent Not Deployed for IPv6 Environments
- Monitoring: Error Fetching Data for Grid and CellSys Targets IORM Page Charts
- Not able to receive SNMP traps on Exadata Storage Servers using IPv6

Discovery Troubleshooting

Very often, the error message itself will include the cause for the error. Look for error messages in the OMS and agent logs (case insensitive search for dbmdiscovery) or in the Discovery window itself.

It is recommended that you review the logs for troubleshooting issues. For the list of logs that you can review and their locations, see Review Logs.

The following sections are provided:

- Hardware Availability
- Discovery Failure Diagnosis
- Exadata Storage Server is not Discovered
- Compute Node or InfiniBand Switch is not Discovered
- Extra or Missing Components in the Newly Discovered Exadata Database Machine
- ILOM, PDU, or Cisco Switch is not Discovered
- Test Connection Fails in PDU
- Target Does not Appear in the Components Step of Guided Discovery
- Target Status is Down or Metric Collection Error After Discovery
- ILOM Credential Validation Fails During Discovery
- Discovery Process Hangs



- SNMP Configuration Missing
 - Set Up SNMP Subscription for Exadata Storage Servers
 - Set Up SNMP Subscription for Cisco Ethernet Switch Targets
 - Set Up SNMP for Power Distribution Unit (PDU) Targets
- Time Out Error During SNMP Subscription

Hardware Availability

All the hardware components must be "known" and reachable; otherwise, communication failures will occur. Use the ping command for each hardware component of the Exadata rack to make sure all names are resolved.

The MAP targets in Enterprise Manager Cloud Control 13c may fail while collecting the correlation identifier. This failure can happen if the credentials are incorrect OR if a target (for example, the ILOM) is too slow in responding.

ILOM can be slow when the number of open sessions on ILOM has exceeded the limit. You can resolve this issue by temporarily closing the sessions on the ILOM.

The rack placement of targets can fail:

- If examan did not return valid rack position for the target.
- If there is an existing target in the same location.

Discovery Failure Diagnosis

Should discovery of your Oracle Exadata Database Machine fail, collect the following information for diagnosis:

- Any examan-*.xml, examan-*.html, targets-*.xml, and examan*.log files from the AGENT ROOT/agent inst/sysman/emd/state/exadata directory.
- Agent logs: emagent_perl.trc and gcagent.log
- OMS logs: emoms.trc and emoms.log
- Any snapshot (screen capture) of errors shown on the target summary page.
- If the **Prerequisite Check** page shows critical errors, then discovery can be retried by clicking on the **Retry** menu and selecting the **Retry**, **Static Only** option.

Exadata Storage Server is not Discovered

If the Exadata Storage Server itself is not discovered, possible causes could be:

- The /etc/oracle/cell/network-config/cellip.ora file on the compute node is missing or unreadable by the agent user or Exadata Storage Server not listed in that file.
- The Exadata Storage Server is not listed in the /etc/oracle/cell/networkconfig/cellip.ora file.
- Management Server (MS) or cellsrv is down.
- Exadata Storage Server management IP is changed improperly. Bouncing both cellsrv and MS may help.



• To check that the Exadata Storage Server is discovered with a valid management IP, run the following command from the grid infrastructure or database home on the compute node used for discovery:

\$ORACLE_HOME/bin/kfod op=cellconfig

Compute Node or InfiniBand Switch is not Discovered

If there are problems with discovery of the compute node or the InfiniBand switch, possible causes could be:

- The InfiniBand switch host name or ilom-admin password is incorrect.
- The connection from the compute node to the InfiniBand switch through SSH is blocked by a firewall.
- The InfiniBand switch is down or takes too long to respond to SSH.

To resolve problems with the compute node or InfiniBand switch discovery, try:

• If the InfiniBand switch node is not discovered, the InfiniBand switch model or switch firmware may not be supported by EM Exadata. Run the ibnetdiscover command. Output should look like:

Switch 36 "S-002128469f47a0a0" # "Sun DCS 36 QDR switch switch1.example.com" enhanced port 0 lid 1 lmc 0

• If the compute node is not discovered, then run the *ibnetdiscover* command on the compute node. The output should look similar to that shown below. If the output shows missing or invalid values, refer the issue to your network administrator.

Ca 2 "H-00212800013e8f4a" # " xdb1db02 S 192.168.229.85 HCA-1"

Extra or Missing Components in the Newly Discovered Exadata Database Machine

If the list of components on the **Components** page of the discovery wizard contains extra components or missing components, then check the following troubleshooting steps:

- For extra components, examine them for Exadata Database Machine membership. Deselect any unnecessary pre-selected components on the components page.
- Verify which schematic file that was used for discovery. Ensure that Enterprise Manager can read the latest xml file (for example, databasemachine.xml) on the compute node.
- For missing components, check the schematic file content.
- To generate a new schematic file, see Oracle Support Doc ID 1684431.1.

ILOM, PDU, or Cisco Switch is not Discovered

If the ILOM, PDU, or Cisco switch is not discovered, the most likely cause is that the Exadata Database Machine Schematic file cannot be read or has incorrect data. See Troubleshooting the Exadata Database Machine Schematic File.



Test Connection Fails in PDU

If Test connection gives an error message Wrong credentials Please provide correct PDU user name and password..., ignore the message and proceed with the discovery. The PDU target will be in the down status initially. To correct the failure, you can try one of the following methods:

- Add the SNMP subscriptions to the PDU manually by following the steps in Enable SNMPv3 on PDUs. The target will be backup when SNMP starts collecting the availability metrics.
- Execute the below command from the agent that is monitoring the target:

```
emctl control agent runCollection <pdu-target-name>:oracle_si_pdu
oracle si pdu snmp config emctl upload agent
```

Target Does not Appear in the Components Step of Guided Discovery

Even though no error may appear on the **Prerequisite Check** page during the Exadata Database Machine guided discovery process, the target does not appear on the Components page. Possible causes and solutions include:

- Check the All Targets page to make sure that the target has not been added as an Enterprise Manager target already:
 - Log in to Enterprise Manager.
 - Select Targets, then All Targets.
 - On the All Targets page, check to see if the target that was not shown on Components selection page, appears in the list.
- A target that is added manually may not be connected to the Exadata Database Machine system target through association. To correct this problem:
 - Delete these targets before initiating the Exadata Database Machine guided discovery.
 - Alternatively, use the emcli command to add these targets to the appropriate system target as members.

Target Status is Down or Metric Collection Error After Discovery

After the Exadata Database Machine guided discovery, an error that the target is down or that there is a problem with the metric collection may display. Possible causes and recommended solutions include:

- For the Exadata Storage Server or InfiniBand switch, the setup of SSH may not be configured properly. To troubleshoot and resolve this problem:
 - The agent's SSH public key in the <AGENT_INST>/.ssh/id_dsa.pub file is not in the authorized_keys file of \$HOME/.ssh for ilom-admin.

For the Exadata Storage Server monitored using CellCLI: The agent's SSH public key in the<AGENT_INST>/.ssh/id_dsa.pub file is not in the \$HOME/.ssh.authorized_keys for the *cellmonitor* user on Exadata Storage Server.



For the Exadata Storage Server monitored using ExaCLI/RESTAPI: Exadata Storage Server credentials are not set as monitoring credentials for the Exadata Storage Server target.

For InfiniBand Switch: The agent's SSH public key in the <AGENT_INST>/.ssh/ id_dsa.pub file is not in the \$home/.ssh/authorized_keys file for *ilom-admin* user on Infiniband Switch.

 Verify permissions. The permission settings for .ssh and authorized_keys should be:

```
drwx----- 2 cellmonitor cellmonitor 4096 Oct 13 07:06 .ssh
-rw-r--r-- 1 cellmonitor cellmonitor 441842 Nov 10 20:03 authorized_keys
```

- Resolve a PerformOperationException error. See Troubleshooting the Exadata Database Machine Schematic File for more information.
- If the SSH setup is confirmed to be properly configured, but the target status is still down, then check to make sure there are valid monitoring and backup agents assigned to monitor the target. To confirm, click the **Database Machine** menu and select **Monitoring Agents**.
- For the ILOM, PDU, or Cisco switch, possible causes include:
 - The Exadata Database Machine Schematic Diagram file has the wrong IP address.
 - Monitoring Credentials is not set or incorrect.
- To verify or to set Monitoring Credentials:
 - Log in to Enterprise Manager.
 - Click Setup, then Security, and finally Monitoring Credentials.
 - On the Monitoring Credentials page, click the Exadata Database Machine target type. Verify that the monitoring credentials are set. If not, then set the monitoring credentials.

ILOM Credential Validation Fails During Discovery

ILOM Credential Validation Failure Errors

ILOM credential validation may fail while performing a 13*c* discovery. The following error may occur:

Authentication failed

The possible cause of the error is that the credentials provided are invalid.

To resolve the issue, use valid credentials.

Discovery Process Hangs

If the discovery process for the Exadata Database Machine hangs, then check the following troubleshooting steps:

- Examine your network to verify:
 - That the host name can be resolved.
 - That the Agent(s) can access the OMS.



- That a simple job can be executed from the console.
- If the OMS reported any errors, then check the following log file:
 \$MW_HOME/gc_inst/sysman/log/emoms.log
- For Repository issues, check the Repository database's alert.log file.
- For Agent issues, check the following log file on the monitoring agents: \$AGENT/agent_inst/sysman/log/gcagent.log

SNMP Configuration Missing

Set Up SNMP Subscription for Exadata Storage Servers

Exadata Storage Server supports SNMP v1/v2 and v3 version based alert notifications to the subscribers. To receive alerts in the SNMP V3 version, the monitoring agents must be added to the snmpsubscriber list using a snmpuser. To set the values of snmpSubscriber, notificationMethod and notificationPolicy:

- 1. Set the snmpSubscriber value:
 - SNMP V1

```
# cellcli -e "alter cell snmpSubscriber=((host='[host
name]',port=[port]),(host='[host name]',port=[port]))"
```

Where [host name] and [port] values are Agents monitoring your Exadata Storage Server targets.

SNMP V3

The process is same as above, but along with the host and port, an SNMP V3 user and type must be provided:

```
ALTER CELL snmpSubscriber=((host='host1.example.com',port=[port],
snmpUser='[v3user]', type=V3))
```

Before you run the command, make sure that a v3user is a valid SNMP user on the Exadata Storage Server. You can check by running following command:

cellcli -e "list cell attributes snmpUser"

If there is no valid SNMP user on the Exadata Storage Server, then add a SNMP V3 user. See Create SNMPv3 Users on Compute Nodes and Storage Servers.

Note:

Take special care not to overwrite existing settings for snmpSubsriber. If there are existing subscribers, then append the agent subscriptions. Get the list of existing SNMP subscribers using the command cellcli -e list cell attributes snmpSubscriber as below:

```
# cellcli -e list cell attributes snmpSubscriber
 ((host=ilm-asr.example.com,port=162,community=public,type=asr))
```

Then you must append the new agent subscriptions to the existing ones and run the command alter cell snmpsubscriber as shown below:

```
#cellcli -e "alter cell snmpSubscriber=((host='ilm-
asr.example.com',port=162,
community=public,type=asr),(host='[host name]',port=[port]),(host='[host
name]',port=[port]))"
```

- 2. For SNMP V3, update the following in Enterprise Manager:
 - Ensure that the SNMP V3 monitoring credentials set on the Exadata Storage Server target in Enterprise Manager match the SNMP V3 user on the Exadata Storage Server:
 - Log in to Enterprise Manager.
 - From the Setup menu, select Security, then select Monitoring Credentials.
 - Select the Exadata Storage Server type and click Manage Monitoring Credentials.
 - Select the Exadata Storage Server and set the SNMP V3 credentials.
 - Ensure that the Monitoring Configuration property SNMP Engine ID is set up for the Exadata Storage Server target in Enterprise Manager:
 - Log in to Enterprise Manager.
 - Go to the Exadata Storage Server home page.
 - From the Exadata Storage Server menu, select Monitoring Configuration.
 - If the Engine ID property is not set, then set it manually in Enterprise Manager.
 Obtain it from the Exadata Storage Server with the following command

CellCLI> list cell attributes snmpengineidhex ;

All of the above steps are automatically taken care of, if the SNMP V3 subscription is selected in the Exadata Storage Server Credentials region that appears as part of the Exadata Database Machine discovery wizard.

3. Set the notificationMethod value:

```
# cellcli -e "alter cell notificationMethod='snmp,mail'"
```

4. Set the notificationPolicy value:

```
# cellcli -e "alter cell notificationPolicy='Critical,Warning,Clear'"
```



Set Up SNMP Subscription for Cisco Ethernet Switch Targets

The Cisco Ethernet Switch must be configured to allow the Agents that monitor it to be able to both poll the switch and to receive SNMP alerts from the switch. To allow this, perform the following steps (swapping the example switch name dm01sw-ip with the name of the Cisco Ethernet Switch target being configured):

Note:

This procedure is valid for SI targets if the monitoring of the switch is performed with a non-administrator user. If Enterprise Manager monitors the switch with an administrator user, the following procedure is automatically performed as part of the discovery process.

1. Log in to the Cisco switch and enter Configure mode:

```
# ssh cisco-switch-host -l <admin user>
User Access Verification Password:
dm01sw-ip> enable
Password:
dm01sw-ip# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
dm01sw-ip(config)#
```

2. Enable access to allow the Agents monitoring Cisco Switch target to poll the switch.

In the command, [EMagentIPaddr] is the IP address of the server where the Enterprise Manager Agent is running. See Create SNMPv3 Users on Cisco Ethernet Switches and Create SNMP Community on Cisco Ethernet Switches.

3. Set the monitoring Agent as the location where SNMP alerts are delivered. The SNMP community specified for a monitoring agent on the Cisco Switch must match the value provided during Enterprise Manager Cisco Switch Management setup:

In the above command:

- EM_Agent_IP_Address: IP Address of the monitoring agent
- version { 1 | 2c | 3 { auth | noauth | priv }}: The SNMP version can be SNMPv1, SNMPv2c, or SNMPv3. The optional keywords {auth | noauth | priv}} are used to specify the authentication level.
- udp-port <EMagentRecvltListenPort>: [EMagentRecvltListenPort] is the EMD_URL port of the emagent or SnmpRecvletListenNIC property value if it is enabled. Specifying udp-port is optional.



 community-string: For SNMPv1 and SNMPv2c, enter the password-like community string. In case of SNMPv3, enter the SNMPv3 user name. For example, in case of SNMPv3, the above command is changed to:

```
snmp-server host <EM_Agent_IP_Address> version {3 { auth | noauth |
priv }} SNMPv3-user-name [ udp-port <EMagentRecvltListenPort> ]
```

4. Verify settings and save the configuration:

```
dm01sw-ip(config)# end
dm01sw-ip# show running-config
dm01sw-ip# copy running-config startup-config
```

Set Up SNMP for Power Distribution Unit (PDU) Targets

To enable Enterprise Manager to collect metric data and raise events for the PDU target, you must configure the PDU to accept SNMP queries from the Agents that monitor the PDU target. Also, appropriate threshold values for different phase values must be set on the PDU.

For steps to enable SNMPv3 on the PDU, see Enable SNMPv3 on PDUs.

Time Out Error During SNMP Subscription

During the discovery of Exadata Database Machine, when the Exadata Storage Servers have ILOM *5.0* or *later*, and the SNMP subscription step throws a *Time Out* error, the following two fixes are recommended:

- 1. Upgrade Enterprise Manager Exadata plugin to 13.4 RU12, 13.5 RU01, or later.
- 2. Upgrade Exadata Storage Server software to 21.2.0.0.0 or later version.

Review Logs

You can review the logs to verify the proper discovery, functioning, and troubleshooting. Following are some of the useful logs and their locations:

OMS logs

Location: \$INSTANCE_HOME/sysman/log

- emoms.log: The main log file for the OMS Console application
- *emoms.trc*: The main trace file for the OMS Console application
- *emoms_pbs.log*: The main log file for the OMS platform application

EM Managed Server logs

Location: Relative path from EM instance base user_projects/domains/GCDomain/ servers/EMGC_OMS1

- EMGC_OMS1.log: The EMGC_OMSn instance writes all messages from its subsystems and applications to this log file.
- EMGC_OMS1-diagnostic.log: This log file contains application-related security errors.
- Monitoring agent logs

Location: Relative path from AGENT INSTANCE HOME sysman/log



- gcagent.log: This log file contains trace, debug, information, error, or warning messages from the Agent. It can be used for debugging Agent framework issues.
- gcagent_errors.log: It is similar to gcagent.log, but it contains only the log messages of ERROR and FATAL levels. The log has no size limit.
- emagent_perl.trc: Trace file for the PERL scripts. EM uses Perl scripts to gather some metrics and target discovery. The log level can be changed by modifying EMAGENT_PERL_TRACE_LEVEL variable in sysman/config/ emd.properties file.

EMCLI Discovery Issues

The deployment procedure output displays the error messages for *targets not promoted*, *tasks not performed* (like *SNMP subscription*, *access point creation*, etc.) and information to resolve those errors. After you resolve the underlying cause for the error, submit the deployment procedure again.

To triage an issue, enable the debug mode on OMS and the agent and resubmit the discovery to get more information:

On OMS:

```
emctl set property -name log4j.rootCategory -value "DEBUG,
emlogAppender, emtrcAppender" -sysman pwd sysman
```

• On the agent:

```
emcli set_agent_property -agent_name="<agent_target_name>" -
value=DEBUG -name="Logger.sdklog.level"
```

The following are some of the errors that may be encountered and resolved:

- System Infrastructure Targets in Pending Status
- Discovery Status Summary States "Completed with errors"
- Target Discovered but Association Not Created
- Component not Available or Accessible Before Discovery
- Trouble Using ExaCLI during Discovery
- Input File Errors
- Unclear Message Shown on the Deployment Procedure Output

System Infrastructure Targets in Pending Status

System Infrastructure targets are in Pending status for a while until the first configuration metrics are collected.

If the status *Pending* is displayed for the discovered targets even after 15 minutes, then go to the target home page and investigate the cause and attempt to fix them manually. For example, metric collection errors, etc.

In most cases, the issue gets resolved without rediscovery if you wait long enough for the target metrics to be collected.



Discovery Status Summary States "Completed with errors"

If the EMCLI Deployment Procedure step **System Creation** completes with a status of *Completed with Errors*, then the summary information about the errors encountered will be displayed in the procedure output. For example:

Target Discovered but Association Not Created

If the discovery status reports that a target is created but its associations are not, then create associations manually by following these steps:

- 1. Add the target manually to the Exadata Database Machine Schematic from the database machine home page. This will associate the target with database machine rack.
- 2. Associate the target with Exadata Database Machine using the EMCLI command as in the following example:

```
emcli create_assoc -assoc_type='app_composite_contains' -
source='DB_Machine1.example.com:oracle_dbmachine'
    -dest='DB_Machine1.example.com:host'
```

Component not Available or Accessible Before Discovery

If the Exadata Database Machine member target is not available or accessible, then try resolving the issue through one of the following options:

- Make component available before performing Database Machine discovery.
- If the component's availability is unresolved for an indefinite time, then exclude it from the Exadata Database Machine discovery. Use the input file parameter *component.skipComponentList* and proceed with the discovery. After the component is available, remove it from the *component.skipComponentList* parameter and resubmit the discovery to add the target to the existing Exadata Database Machine.

Trouble Using ExaCLI during Discovery

If you selected ExaCLI as the monitoring mechanism for Exadata Storage Servers and if the monitoring agent is installed on the compute nodes, then ExaCLI should already be installed. If not, ensure that ExaCLI is installed on the agent that you have selected.



To verify if ExaCLI is installed properly on the agent, run the following command:

```
[oracle@myagent ~]$ which exacli
/usr/local/bin/exacli
[oracle@myagent ~]$ exacli -c mycell.example.com -l exacli_user --xml -
e 'list cell attributes name'
Password: ***********
<?xml version="1.0" encoding="utf-8" ?>
<cli-output>
<context cell="mycell"/>
<cell> <name>mycell</name>
</cell>
</cli-output>
```

Input File Errors

• Mandatory property name or value not specified in the input file

The error is displayed indicating the properties that are missing as part of the input file. For example, Property outputFileLoc is not defined.

The specified value is not applicable for a property

The error message lists out all allowed values for the property. For example, Check cell metric source input. It needs be CellCLI or ExaCLI.

The named credential specified in the input file does not exist

The error is displayed indicating the named credential which is not available in Enterprise Manager. For example, Credential not found owner SYSMAN name BLR BOX CREDS 1.

The specified named credential in not valid

The error is displayed indicating the credential failed during verification. For example, Credential test of cell target Exa Storage Server 1 failed..

Resolve the issue based on the additional information available with the error, and rediscover the targets.

Resolve the above errors by updating the information in the input file by using the resolution steps suggested in the Deployment Procedure output. Resubmit the Deployment Procedure to discover targets.

Unclear Message Shown on the Deployment Procedure Output

Typically, detailed information about the error and resolution is displayed for identified use cases. In case an unclear message is displayed, to learn the cause of the error:

- Check the Oracle Management Service logs (instance logs) in the
 location \$INSTANCE_HOME/sysman/log where the information would be logged.
- Check the Enterprise Manager server logs stored in the relative path from the Enterprise Manager instance base user_projects/domains/GCDomain/servers/ EMGC_OMS1, for more information.



Troubleshooting the Exadata Database Machine Schematic File

As part of any discovery troubleshooting, possible causes and recommended resolution with the schematic file can include:

• The schematic file on the compute node is missing or is not readable by the agent user.

For Exadata Release 11.2.3.2 and later, the schematic file is:

/opt/oracle.SupportTools/onecommand/databasemachine.xml

Ensure that the schematic file exists in the specified location and that the file and directory can be accessed by the agent installation user account.

- If a PerformOperationException error appears, the agent NMO is not configured for setuid-root:
 - From the OMS log:

```
2019-11-08 12:28:12,910 [[ACTIVE] ExecuteThread: '6' for queue:

'weblogic.kernel.Default (self-tuning)']

ERROR model.DiscoveredTarget logp.251 -

ERROR: NMO not setuid-root (Unix only)

oracle.sysman.emSDK.agent.client.exception.PerformOperationException:
```

As root, run:

<AGENT_INST>/root.sh

- In the /etc/pam.d file, pam ldap.so is used instead of pam unix.so on compute nodes.
 - Even though the agent user and password are correct, this errors appears in the agent log:

oracle.sysman.emSDK.agent.client.exception.PerformOperationException: ERROR: Invalid username and/or password

To resolve the issue, in /etc/pam.d file use pam unix.so on compute nodes.

- If the schematic file is blank, then:
 - Check your browser support and Enterprise Manager Cloud Control 13c.
 - Run through discovery again and watch for messages.
 - Check the emoms.log file for exceptions at the same time.
- If components are missing, then:
 - Add manually to the schematic page (click Edit).
 - Check for component presence in Enterprise Manager. Check to see if it is monitored.

Exadata Database Machine Management Troubleshooting

If data is missing in Resource Utilization graphs, then run a "view object" SQL query to find out what data is missing. Common problems include:

- Schematic file is not loaded correctly.
- Cluster, Database, and ASM are not added as Enterprise Manager targets.



- Database or Exadata Storage Server target is down or is returning metric collection errors.
- Metric is collected in the Enterprise Manager repository, but has an IS_CURRENT != Y setting.

Exadata Derived Association Rules

Exadata derived association rules depend on Exadata and DB/ASM ECM data. This data may take up to 30 minutes to appear depending on metric collection schedule. To check for data availability:

- From the Enterprise Manager Cloud Control console:
 - Click Targets, then All Targets.
 - On the All Targets page, click the **Oracle Exadata** target from the list.
 - Click Database System, then Configuration, and finally Last Collected.
 - On the Latest Configuration page, click Actions, then Refresh.
- From the command line:

```
# emctl control agent runCollection
```

target_name:target_type <collectionName>

Other troubleshooting tips include:

- Verify that ECM data are collected and present in Enterprise Manager repository.
- Verify that all data and conditions in query are met by running the query in SQL+.
- Verify triggers by enabling debug logging to check for timing issues.

Target Status Issues

If the Target status shows DOWN inaccurately, then:

If you are using cellCLI to monitor the Exadata Storage Server, you can check SSH equivalence (cellmonitor user) with the following command:

```
ssh -i /home/oracle/.ssh/id_dsa -l cellmonitor <cell name> -e cellcli list
cell
```

Output should be: <cell name>

 For the PDU: Check to make sure you can access the PDU through your browser to verify that it is connected to your LAN:

http://<pdu name>

 For the Cisco Switch: Check for proper SNMP subscriptions. See Set Up SNMP Subscription for Cisco Ethernet Switch Targets for details.

Metric Collection Issues

If the Target status shows a Metric Collection Error, then:

- Hover over the icon or navigate to Incident Manager.
- Read the full text of the error.



- Visit the Monitoring Configuration page and examine the settings. From the **Setup** menu, select **Monitoring Configuration**.
- Trigger a new collection: From the **Target** menu, select **Configuration**, then select **Last Collected**, then **Actions**, and finally select **Refresh**.
- Access the monitoring Agent Metric through your browser:

https://<Agent_Host_Name>/emd/browser/main

Click **Target >>** and then click **Response** to evaluate the results. You may need to log a service request (SR) with Oracle Support.

Status: Pending Issues

For those issues where components are in a Pending status, see the following troubleshooting steps:

- Cellsys Targets
- Database Machine Target or Any Associated Components

Cellsys Targets

If the Cellsys target seems to be in a Pending status for too long, then:

- Verify that there is an association for the Cluster ASM, Database, and Exadata Storage Servers.
- Check and fix the status of the associated target database.
- Check and fix the status of the associated target ASM cluster.
- Ensure an UP status for all Exadata Storage Server targets.
- Delete any unassociated cellsys targets.

Database Machine Target or Any Associated Components

If the Exadata Database Machine target or any associated components are in a Pending status for too long, then:

- Check for duplicate or pending delete targets. From the **Setup** menu, select **Manage Cloud Control**, then select **Health Overview**.
- Check the target configuration. From the target's home page menu, select **Target Setup**, then select **Monitoring Configurations**.
- Search for the target name in the agent or OMS logs:

\$ grep <target name> gcagent.log or emoms.log

Monitoring Agent Not Deployed for IPv6 Environments

Problem: For IPv6 environments, the monitoring agent is not deployed.

Cause: If the IPv6 address is not included in the /etc/hosts file, then the agent will not be deployed.



Resolution: Edit the /etc/hosts of the compute node (or the VM in case of virtual Exadata) to map the OMS host name to an IPv6 address.

Monitoring: Error Fetching Data for Grid and CellSys Targets IORM Page Charts

When you encounter Error Fetching Data in the IORM page *Workload distribution by Databases* of Grid and CellSys targets charts in the first 24 hours of Database Machine discovery, to resolve, you can wait 24 hours after the Database Machine is discovered or perform the following steps:

- **1.** Ensure that the Grid and CellSys member targets configuration collection is collected. If the configuration is not available, perform the below steps:
 - a. Go to Exadata Grid target menu, Configuration, Latest, click Refresh.
 - b. Select the member targets configuration collection and click **OK**.
 - c. Wait until the configuration collection is collected successfully.
- 2. Update the collection frequency of the **Exadata Storage Type** metric to 1 minute for every member of the Grid and CellSys target. Follow the below steps:
 - a. Go to Exadata Storage Server target menu, **Monitoring**, and **Metric and Collection Settings**.
 - **b.** Click the **Other Collected Items** tab. Update the **Exadata Storage Type** metric collection frequency to 1 minute and save it.
- 3. Wait for 10 minutes, launch the Grid and CellSys target home page, and ensure that the **Overview** section does not display the message *Configuration collection is not available*. If the message continues to appear, then repeat *Steps 1 and 2*.

After the issue is resolved for Grid and CellSys IORM page charts, set the **Exadata Storage Type** metric collection frequency to 1440 minutes.

Not able to receive SNMP traps on Exadata Storage Servers using IPv6

For IPv6 environments, the Enterprise Manager agent needs have SNMP v3 subscription to the Exadata Storage Servers, for complete monitoring.

Prerequisites:

- SNMP V3 user created on Exadata Storage Server. See **Step 1** for instructions.
- Exadata Storage Server version must be 12.1.2.2 or later to support SNMP V3 subscription.

If the SNMP subscription was missed during Exadata discovery, you can follow these steps:

To configure SNMP v3 subscription on an Exadata Storage Server:

1. Create an SNMP V3 user on Exadata Storage Server Target.



• Suppose you need a user called "v3user". You can check whether this user is already present on the Exadata Storage Server using this command:

cellcli -e "list cell attributes snmpUser"

• If this user is not present on the Exadata Storage Server, create a new user. See Create SNMPv3 Users on Compute Nodes and Storage Servers.

Note:

The Enterprise Manager Agent supports DES and AES privacy protocols in addition to SHA authentication protocol.

- 2. If you need to edit the SNMP V3 monitoring credentials of the Exadata Storage Server after discovery, you can log in to Enterprise Manager and:
 - Select Setup, then Security, then Monitoring Credentials.
 - Select Oracle Exadata Storage Server type, and click on Manage Monitoring Credentials button.
 - Select the corresponding row for the Exadata Storage Server target and SNMP V3 Monitoring Credentials credential set and click the Set Credentials button.
 - Populate the Enter Monitoring Credentials form with the appropriate information and click Save.

Note:

Ensure that the SNMP V3 monitoring credentials are setup on the Exadata Storage Server target in Enterprise Manager which match the SNMP V3 user on the Exadata Storage Server.



Index

A

alerts InfiniBand, 5-33 ALTER CELL command, 4-2

С

Cell management, 5-24 Cisco Ethernet Switch SNMP configuration, 8-8 creating roles user roles creating, 5-1

D

dashboard public report, 5-47 dashboard creation, 5-46 Database Machines alerts, 5-12 delete Exadata Database Machine component, 5-14deploy plug-in, 2-13 derived association rules, 8-14 discovery SPARC SuperCluster, 3-9 switch troubleshooting, 8-3 Disk I/O Objective, 5-28

Ε

Exadata Cell management, 5-24 Exadata component delete, 5-14 Exadata Database Machine configuration support, 1-4 dashboard, 5-46 remove target, 5-13 troubleshooting, 8-13 view topology, 5-2 Exadata Storage Server administration, 5-27 Exadata Storage Server SNMP configuration, 4-1

F

Fault Monitoring, 5-34 features, 1-1 hardware support, 1-2 monitoring and notification, 1-1 target discovery, 1-3 firewall configuration, 2-10

Η

hardware supported hardware, 1-4 view critical information, 5-5 hardware not supported, 1-7 hardware support features, 1-2

I

InfiniBand network management, 5-31 InfiniBand Switch configure for SNMP, 4-5

Μ

manually, 2-13 metrics and alert settings, 5-24 monitoring and notification features, 1-1 multi-rack support, 1-5

Ν

names resolution, 2-10

0

Oracle SuperCluster support, 1-6

Ρ

prerequisites Exadata Storage Server software, 2-8 firewall configuration, 2-10 InfiniBand Switch, 2-8



prerequisites (continued) PDU firmware, 2-9

R

remove Exadata Database Machine target, 5-13 remove SNMP subscription, 4-5

S

schematic file troubleshooting, 8-13 SNMP configure using cellcli, 8-6 configure using dcli, 4-4 SNMP configuration Cisco Ethernet Switch, 8-8 InfiniBand Switch, 4-5 SNMP subscription remove, 4-5 SPARC SuperCluster discovery, 3-9 SPARC SuperCluster (continued) SSH connectivity, 4-4 supported hardware, 1-4, 1-7 partitioned Exadata Database Machine, 1-5 supported operating systems, 1-7

Т

target discovery features, 1-3 troubleshooting discovery, 8-1 Exadata Database Machine, 8-13 schematic file, 8-13

U

user roles, 2-12

V

view topology, 5-2

