Oracle Management Cloud for Exadata


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**EXADATA OVERVIEW**

Exadata is a high-performance system for hosting the Oracle Database and delivers the highest levels of database performance available. The Exadata Database Machine consists of database servers, Oracle Exadata Storage Servers, an InfiniBand fabric for storage networking and all the other components required to host an Oracle Database. It delivers outstanding I/O and SQL processing performance for online transaction processing (OLTP), data warehousing (DW) and consolidation of mixed workloads. It delivers high performance due to many unique features such as ability to provides database aware storage with the ability to offload database processing from the database server to storage and accelerated Oracle Database processing by speeding I/O operations using Flash Cache.

There are 3 deployment options available for Exadata Database Machine:

- **Exadata on premise.** Customers choose to deploy and manage the Exadata systems.
- **Exadata Cloud Machine deployed on-premise as a service.** It allows companies to deploy the Exadata platform as a cloud service within their own data centers.
- **Exadata Cloud Service available in public cloud.** It allows companies to deploy their databases on Exadata while getting simplicity and cost effectiveness of cloud.

**INTRODUCTION TO ORACLE MANAGEMENT CLOUD**

Oracle Management Cloud (OMC) is a suite of next-generation integrated monitoring, management, and analytics cloud services. Data is automatically analyzed and correlated across all Oracle Management Cloud services, and the resulting insights are made instantly available via intuitive dashboards, Real time diagnostics, capacity planning, operational forecasting, and business analytics. OMC’s Unified Data Platform helps customers improve IT stability, prevent application outages, improve capacity planning, troubleshoot issues, increase DevOps agility and harden security across their entire application and infrastructure portfolio. Oracle Management Cloud enables Exadata customers to maximize their investments in Exadata by leveraging machine learning against the full breadth of the operational data set to maximize performance, optimize resources and troubleshoot operational issues rapidly.
Oracle Management Cloud Architecture
Exadata customers primarily use Oracle Enterprise to monitor their Exadata systems. Through its seamless integration with Oracle Enterprise Manager, Oracle Management Cloud (OMC) automatically discovers the key infrastructure components of Exadata, such as compute nodes, storage Servers, InfiniBand network, etc. OMC Data Collector collects configuration, associations, performance metrics, events and availability data about all Exadata hardware and software components from Oracle Enterprise Manager’s repository while OMC Cloud Agent collects database and SQL performance data from the Automatic Workload Repository (AWR) of the databases running on Exadata compute nodes.

Oracle Management Cloud Architecture

For customers who have deployed Oracle Enterprise Manager, OMC leverages offers these additional capabilities beyond the basic monitoring and management capabilities provided by Oracle Enterprise Manager (EM):

- OMC leverages the data over the long term (up to 13 months by default) collected from EM using machine learning based insights to forecast resource needs and enables administrators to do proactive management instead of being reactive. EM’s primary focus is on short term and it lacks the ability to provide any insights across business cycles (month to month or quarter to quarter).
- OMC enables management of fleet of hosts and databases and enables administrator to identify common problems that span across the IT estate. EM has its focus on managing one target at a time.
- OMC’s unified big data platform provides deep insights based on metric and log data across technical and business data for heterogeneous IT systems running on-premise or on cloud. EM primarily intended for monitoring and management of Oracle assets running in on-premise data centers.

MANAGING DATABASE WORKLOADS IN EXADATA ENVIRONMENT
Exadata is a high-performance system for hosting the oracle database, yet there are certain areas where administrators can benefit from additional information for managing the workloads running on Exadata.
Resource utilization: Administrators want to understand how they can optimize the capacity of existing Exadata systems when they have a large-scale IT environment. They need to be proactively alerted when certain Exadata systems are going to run out of capacity within a given time period.

Database consolidation: System administrators often get request to on-board new databases on existing Exadata systems. During new Database onboarding, it will help admins if they know which systems have spare capacity and can be used to place new databases.

Database and SQL Performance: Exadata Database Administrator needs better visibility to database performance across large number of enterprise wide databases. They want to quickly identify systemic database performance issues across the entire Exadata estate. The application can have thousands of SQLs which makes it challenging to rapidly identify application SQLs having performance issues across the enterprise wide databases. They want to troubleshoot performance issues faster. It will benefit them if such issues can be identified out of the box and they can focus more on the solution.

Troubleshooting and root-cause analysis: The database is a critical component of most applications as the repository of application data. It is very important for system administrators to get a complete picture of how the database is performing. Oracle Management Cloud (OMC) can help DBAs to both monitor their Exadata environment by integrating Infrastructure monitoring (with diagnostic troubleshooting & root-cause analysis using Log Analytics. When the database is experiencing performance or operational issues, the application may be impacted with longer response time than unusual or page errors. DBAs can get access to all the relevant database alert and storage logs, apply different machine learning capabilities to their data to find potential issues, outliers or any possible anomalies. They can also use the query language to search through their data (current and historical data) to gain useful insight into the root cause and resolve the issue quickly before it impacts the application users.

**OPTIMIZING RESOURCE UTILIZATION IN EXADATA**

OMC provides comprehensive capacity analysis to give administrators the ability to view, analyze, proactively forecast and detect potential constraints in Exadata resources. As a system administrator they want to be able to make critical decisions to optimize their Exadata IT estate; plan for growth, compare resource usage and perform what-if analysis for various scenarios.

**Visibility into resource utilization for fleet of Exadata**

IT administrators or capacity planners can use OMC to get complete visibility into the entire fleet of their Exadata systems. The Exadata app in OMC enables complete visibility into current and future resource utilization of all Exadata resources. By using intelligent machine learning based forecasts, capacity problems can be prevented or identified faster instead of taking days or weeks of manual analysis.

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Figure 2: Inventory and Capacity
IT administrators can view the inventory and capacity of all Exadata systems including databases by versions.

IT administrators can explore the overall system resource usage. They can explore the aggregate of CPU and memory utilization of their Exadata compute nodes for a specific time period as well as IOPS and storage capacity utilization of their storage servers. IT administrators can analyze the current as well as projected resource utilization of Exadata systems that can help ensure that databases have sufficient compute or storage resources to meet future business needs.

Administrators can explore a single Exadata system.

Figure 3: Single Exadata Machine Software and Hardware Inventory
IT administrators can analyze the current resource utilization of the Exadata systems and thereby identify critical Exadata systems with capacity constraints. The Exadata systems are categorized under 0–25%, 25–50%, 50–75%, and 75–100% utilization of resources. IT administrators can also view the Exadata systems running with current high resource utilization and explore utilization of critical resources, including CPU, memory, storage and IOPS of Exadata systems in a single view.

OMC automatically analyzes the trend in resource usage of Exadata systems and identifies systems projected to reach high utilization so that administrators can take actions early and intelligently plan for future growth. Exadata systems projecting to reaching capacity headroom section shows the Exadata systems that are forecasted to reach the high threshold in terms of capacity in the next 30, 90, 180, and 180+ days (30 days highlighted with red arrow in figure). Administrators can use this to not only preemptively resolve issues when they occur but prevent them from occurring altogether so that maximum value can be derived from their Exadata investment.

OMC uses machine learning techniques for forecasting and trend analysis to find Exadata systems with projected high utilization. Users can:

- Explore trend of their current and historic resource utilization
- Predict seasonality aware forecasted utilization and take action to prevent problems before they occur

To get details on single Exadata which is forecasted to run out of capacity in future, administrators can further explore that Exadata system.

**Insights**

<table>
<thead>
<tr>
<th>Resources</th>
<th>Current Utilization</th>
<th>Reaching High Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host CPU</td>
<td>58 of 72 cores</td>
<td>81%</td>
</tr>
<tr>
<td>Host Memory</td>
<td>363 of 512 GB</td>
<td>71%</td>
</tr>
<tr>
<td>IOPS</td>
<td>73.2K of 896K IOPS</td>
<td>8%</td>
</tr>
<tr>
<td>Storage</td>
<td>57.55 of 136.06 TB</td>
<td>42%</td>
</tr>
</tbody>
</table>

Figure 5: Single Exadata system’s resource insights
Administrators can find the current usage and understand in how many days a given Exadata system will reach high utilization threshold with respect to CPU, memory, I/O, and Exadata storage under the Resource Insights section. They can also find databases with performance degradation, databases with highly variant performance, and the inefficient databases, using performance insights section.

**Identifying compute nodes with resource constraint**

Capacity planners can find IT resource usage across Exadata hosts over time. They can identify compute nodes that are resource constrained and which resource are under constraint e.g. CPU or memory and how many days of capacity are remaining.

Figure 6: Exadata host resource trend and forecast

Capacity planners can find how many total host CPU cores are available, how many cores are used and days of capacity remaining. Similarly, for memory they can find how many days of host CPU or memory capacity they have before capacity utilization will reach capacity utilization threshold. The default is 75% out of the box but it is configurable by the end user in the IT Analytics administration section.

Administrators can also find the CPU utilization on the Exadata host in the Host CPU Utilization chart and can explore if it shows increasing resource utilization. To find top resource consuming databases, DBAs can view the hosted entity utilization and identify the database which is using most resources.
DBAs can get visibility into which databases are top resource consumers on this host e.g. by CPU or memory so they can look into consolidation or placement of those DBs. They can also find databases that have the highest resource growth.
IT administrator and capacity planner, can explore how critical DB resources, including CPU, memory, interconnect activity, and storage, are used and their future forecasted usage.

**Optimizing Exadata storage usage**

IT administrator can get visibility into IOPS usage and storage space consumption per ASM disk group. They can see total disk space capacity; how much total disk space is available and how much is used.

Storage administrators, they can find storage cell’s current IOPS, throughput and how many days of storage capacity is remaining before utilization will reach capacity utilization threshold. To analyze storage resource growth, database administrators can drill down into tablespace storage usage and growth and identify the top tablespaces for that database.
Database administrator can drill down into tablespace usage for a given database and view which are the top tablespaces for that DB.

**Analyzing IOPS, Throughput and IORM usage**

Exadata Storage is often shared by multiple types of workloads and databases. Running multiple types of workloads and databases on shared storage may lead to performance problems if proper resource control is not in place. I/O Resource Management allows workloads and databases to share Oracle Exadata Storage Servers according to user-defined policies. Oracle Management Cloud’s out of the box Exadata Dashboard provides details of IO Utilization of Oracle Exadata Storage Server by each Database machine. Exadata administrators can see the details of IO Utilization by FlashDisk and HardDisk. The Dashboard also provides insights by showing what and when was the highest IO Utilization. This can help the Exadata Database Administrator to set the I/O Resource Management policies in place and manage it over a longer period of time.
Exadata Database Administrator can also get insights to the Oracle Exadata Storage Server Read and Write Response Times. This read and write Response Times is also available by FlashDisk and HardDisk. This can help to manage the performance of database workloads running on Exadata Machine. An Exadata Database Administrator can find any anomaly, increasing or decreasing trends of this key Exadata storage performance metrics and correlate it with database performance at the given time period.

![Oracle Exadata Storage Server Read/Write Response Times](image)

Identifying Exadata systems for placing new databases

DBAs want to find Exadata Systems and hosts where they can place new Databases.

**Exadata Systems with Low Utilization**

- Exadata Systems with current and projected low utilization for the next 6 months.

![Exadata systems for placing new Databases](image)

By analyzing the resource utilization, OMC identifies the Exadata systems with current and projected low utilization for the next 6 months, so that they can accommodate new workloads. This helps onboarding new workloads or consolidating existing workloads.
MAXIMIZING DATABASE PERFORMANCE

Oracle Management Cloud’s IT Analytics Database Performance Analytics and SQL Analytics application allows customers to maximize database performance by identifying databases and SQLs which are performing poorly by various measures, perform historical, comparative analysis to reveal major performance bottlenecks affecting enterprise-wide databases and SQLs. It enables an Exadata Administrator to examine the aggregate performance by various dimensions to determine recurring systemic database and SQL performance problems. It helps to identify common performance findings across databases and SQLs using machine learning. Database Performance Analytics and SQL Analytics automatically analyzes and provides the results as to which databases and SQLs needs Exadata Database Administrator’s attention. Exadata Administrators can rapidly identify database and SQL performance problems and provides more time to focus on the solution rather than finding the problem and its root cause.

Database Performance Analytics

For maximizing database performance on Exadata, Database Performance Analytics automatically provides insights into the database performance by analyzing database performance degradation, databases with varying workload performance, database inefficiency and top SQL statements.

![Database Performance Analytics Summary](image)

Problems in the performance of your Exadata databases can affect your application performance. As an Exadata Administrator, you can use Database Performance Analytics to analyze database performance issues across your enterprise-wide Exadata and identify the underlying systemic causes of the performance issues. Exadata Database Administrator can find database that is in most need of his attention and degrading in performance, databases on Exadata that are most likely to have varying end-user experience and databases that represent the best tuning opportunity, so that the application can perform even better.

Using ITA Analytics Database Performance Analytics application, you can find:

**Databases degrading in performance**

Databases are normally expected to perform well with increase in demand. However, there are several anomalous behaviors that may be exhibited with decrease in demand or no change in demand. OMC analyzes this data to classify databases based on

**Decrease in Demand:** These are the databases on Exadata with performance degradation correlated with decrease in demand indicating highly anomalous behavior. It is quite possible that the demand decreased because the database performance was not as expected. These are the databases in which Database Response Time has increased by more than 20% and demand has decreased by more than 10% at the same time.
Figure 15: Database Performance Degradation

No Change in Demand: These are the databases on Exadata with performance degradation but the demand has remained in the same range. These are the databases in which Database Response Time has increased by more than 20% and demand stays between -10% and +10% at the same time.

Change in Response Time > +20% and Change in Demand > -10%

Increasing in Activity of more than 20%
Decreasing demand Trend by more than 10%

Figure 16: Database Performance Trend
Databases with Variant Workload Performance and SQL queries that are highly varied in performance

Normally Exadata Database Administrators expect a very stable response times from application SQLs. Variant SQLs are the ones whose performance is not stable and relative variability is high. Variant SQLs are the ones that need attention. Database performance Analytics identifies databases that are running workload with high variance in performance. OMC first identifies SQLs with high relative variability of a SQL, which is standard deviation of SQL Response Time divided by average of SQL Response Time. To calculate a variant database caused by variant SQL, OMC identifies databases with variant workload performance by calculating for each database the SQLs that are variant over the time, the elapsed time for each variant SQL. Thus, OMC computes the variant workload performance using the variant time for each SQL and the total elapsed time of the database focusing on databases where variant workload performance is more than 50%. A Relative Variability of a SQL close to zero indicates stable Response Times, while greater than 1.66 indicates higher variability in Response Times. A Relative Variability greater than three indicates a very high degree of variability in Response Times.

Exadata Database Administrators can look into further cause of the variance like change in execution plan and take appropriate action to make the performance of the SQL and database stable in future.

Databases which are increasingly inefficient

Databases which are increasingly inefficient provide workload tuning opportunity. Typically, inefficient waits are a result of application behavior and concurrency. Inefficient wait time is in Active Sessions, which are not part of CPU Time, IO wait Time and idle wait events. Inefficent percentage is calculated by sum of Inefficient Wait Time divided by sum of IO Time, CPU Time and inefficient waits Time.

Most databases are likely to have some inefficiency. However, over time, if the database is getting increasingly inefficient, and the Inefficient percentage is greater than 50%, then, as an Exadata Database Administrator, you must pay attention to this database workload to maximize its performance. Exadata Database Administrator along with application development must proactively tune this application and workload to maximize database performance and reduce inefficiency.
### Top SQL

Exadata administrator can identify the top SQL statements across entire Exadata database environment. Top SQL statements may consume an uneven amount of system resources. These SQL statements often cause a large effect on database performance and resource consumption. Identifying top SQL statements is an important SQL tuning activity that Exadata Database Administrator must perform regularly. Database Performance Analytics provides this out of the box and makes it easy for Exadata Database Administrator to maximize database performance.

The value that OMC brings to an Exadata environment and database administrator managing them is that OMC analyzes top SQL by various characteristics, e.g. response time, CPU or I/O time across all databases running on an Exadata for longer time periods (month or quarter) to find these top SQLs.

![Figure 18: Increasingly inefficient databases](image)

![Figure 19: Top SQL across databases](image)

Top SQL by Active Sessions and with the most change in Response Time %

This database represents workload tuning opportunity
SQL Analytics

SQL Analytics application analyzes SQL performance problems for enterprise-wide applications across a fleet of databases, provides trends and key insights to SQL performance issues thereby helping you to be proactive in avoiding future database performance problems.

Exadata Database Administrator can find SQLs resulting in poor end-user experience because they are degrading in response time, SQLs that are resulting in varying end user performance because their response times are varying, SQLs that are inefficient and that represent the best tuning opportunity, so that the application can perform even better and SQLs that have multiple execution plans. Exadata Database Administrator can also find CPU and IO Intensive SQLs as well. SQL Analytics categorizes SQLs across databases and applications, which need attention. The categories are:

- Degrading SQLs: SQLs with more than 20% increase in SQL response time, based on linear regression. The value of the SQL response time is derived from the total elapsed time divided by the total number of executions for the SQL.
- Variant SQLs: SQLs with a relative variability of more than 1.66. Relative variability of an SQL is measured by the standard deviation of the SQL response time divided by the average of the SQL response time. Those SQLs that have a relative variability of more than 3 are identified as SQLs with highly variant performance. A Relative Variability of a SQL close to 0 indicates stable Response Times, while greater than 1.66 indicates higher variability in Response Times. A Relative Variability greater than 3 indicates a very high degree of variability in Response Times.
- Inefficient SQLs: SQLs with inefficiency of more than 20%. Inefficiency percentage of an SQL is derived from the inefficient wait time (wait time other than I/O, CPU, or idle wait time events) divided by the total database time.
- SQLs with Plan Changes: These are SQLs that use multiple execution plans. Typically, SQL with multiple execution plans may be a source of SQL performance issues leading to varying, unexpected or poor application performance.

All the above category of SQLs need an Exadata Database Administrator's attention. SQL Analytics provides this analysis out of the box and helps them quickly narrow down the problem to specific database and SQL. Tuning these SQLs proactively will result in better application performance.

![Figure 20: SQL Analytics Performance Summary](image)

Out of the box, SQL Analytics provides answer to the question which SQLs are consuming most CPU or IO across the entire Exadata estate. This helps the Exadata Database Administrator to quickly narrow down where is the most CPU or IO resources consumed and if needed proactively tune those SQLs or control the resource consumption by using Oracle Database Resource Manager or I/O Resource Management (IORM).
Exadata Database Administrator looking to identify pattern of SQL performance problems across entire application workload can also use SQL Analytics. Using machine learning, SQL Analytics provides trends on key SQL performance metrics so that Exadata Database Administrator can identify pattern of SQL performance problems across entire application workload.

Example Trends are “31 of the 33 degrading SQLs have increasing I/O Time of more than 50%”, “14 of the 32 variant SQLs have plan changes”, “26 of the 33 degrading SQLs are variant”, “4 of the 4 inefficient SQLs have plan changes”.

Because of these trends on key SQL Performance metrics Exadata Database Administrator can uncover systemic SQL performance problems across all the databases on Exadata. SQL Analytics uses least squares regression line model to identify SQLs, which are degrading by more than 20% based on SQL Response Time. SQL Analytics uses Pareto analysis to find SQL issues with more impact, for example, “N SQLs that contribute to 80% of database time”, finally SQL Analytics uses clustering to see commonality across workload, and for example, “90% of degrading SQLs have plan changes”.

Figure 21: Top SQLs by CPU

Figure 22: Top SQLs by I/O
Out of the box, SQL Analytics provides fine-grained performance information and insights about an individual SQL. It provides SQL Text, the database name and host the SQL is being executed. Further, it provides Performance Summary, which includes Average Response Time, % change in Average Response Time, Executions Per Hour, Variability and Inefficiency. The Execution Plan Insights shows number of execution plans the SQL has used, the best and worst performing plan, the execution plan which has consumed the most CPU and IO. The Performance Trend by various measure section includes Average Response Time, Executions Per Hour, Active Sessions, I/O Time, CPU Time and Another Wait Time. SQL Analytics provides Activity breakdown of Active Sessions by I/O Wait, CPU Time, and Another Wait. It provides by Response Time Distribution and Response Time Breakdown of the SQL. By getting access to find grained SQL Performance statistics of an individual SQL, Exadata Database Administrator can find out where the SQL went bad, if there was a plan change, which plan is good, which plan is bad.

SQL Analytics also provides ability to compare SQL performance over last 13 months so Exadata Database Administrator can compare historical performance for the same SQL within the same database, Compare SQL performance across different databases and Compare SQL performance between production, test or dev.
This fine-grained performance information and insights about an individual SQL can help Exadata Administrators to quickly get to the root of an SQL Performance issue.

RAPID TROUBLESHOOTING OF PROBLEMS

One of the most common issues in IT operation is related to application performance, so when apps are slow, fingers often point at the database and DBAs. DBAs should be able to answer if the problem is somewhere else or the problem is in the database. The reality is databases are complex and full of critical information, so database monitoring and troubleshooting needs to become a priority.

DBAs should work with the rest of the IT department to provide complete visibility over DB related entities to not get blamed and help the team to faster troubleshoot issues. When it comes to troubleshooting, logs are one of the most important assets but unfortunately, logs spread across a variety of sources. When an issue happens, DBAs need to access different logs across many sources which is hard and sometimes not even possible because of privileges issues.

To answer the question mentioned above, DBAs can use Oracle Log Analytics (LA) as part of OMC to collect, aggregate and store logs from across all databases (single instance, RAC, ASM, Exadata). Log Analytics can monitor each separate entity to automatically collect all DB related logs through out-of-the-box log sources. There are different capabilities to collect/access logs in LA such as monitoring log files through Cloud Agent or extract data from Oracle Database through the same agent. Also, users can send data through syslog or API to OMC. In addition, L can automatically parse all those events through rich parsers built in. So, collecting and parsing data require almost zero effort. To mention some of the out-of-the-box Exadata related log sources, Database Alert logs, Database Trace logs, Database Incident, Listener log file, Database Audit logs, Database Audit XML logs, ASM alert log, ASM Trace log, OS message log file, OS Secure log file & etc.

Once all the necessary data is in LA, system administrators can use the different search capabilities (query language or visual builder) to easily search and slice & dice through their data to troubleshoot, get insight, find unknowns and eventually find root-cause of issues. DBs can easily get answers to questions like “how many times a DB has restarted?”, “who and how many login failures happened with last 24 hours?”, “How many instance shutdowns and crashes happened within last 7 days?” or monitor the hourly trend of logs to identify the change over the past 24 hours. The example below shows how easily users can search for a specific “OS Process ID” from all their “Oracle Database Instance” & “Oracle Database Listener” logs within the last 24 hours.
Create Dashboards to show overall health of systems

Exadata Database Administrators can easily build different custom dashboards to monitor their Exadata health overview. They can edit the content of the dashboards at any time. They can create dashboards which contain both log related data and metric related data from the monitoring of the system in one place. They can have all the necessary information in one place to correlate events together to get the context around the issue in troubleshooting scenarios. As an example, the user is monitoring “ORA-600” and “ORA-7445” errors at the dashboard level to get visibility of number of occurrences. The dashboard is also visualizing the error distribution over time to be able to easily drill-down into any specific one while troubleshooting.
Dashboards and alerts are typically the first two things that administrators and product owners check to make sure the system is healthy and there is no issue or outages. One of the advantages of dashboards in OMC is it can visualize data from multiple resources either coming as a metric from monitoring services or raw events from logs. These dashboards typically get used as a single pane of glass and single source of truth.

Figure 27: Overall Database Health Overview Dashboard

Exadata Database Administrators can also take advantage of smart alerts in Log Analytics. They can create complex saved search queries and create alert to get notified about issues in real-time. They can even create anomaly alerts based on their data and use cases to eliminate noises based on calculated baseline for each search. In the example below, users can easily create an alert for authentication failures based on “Linux Secure Logs” since “Authentication Failure” is a known error category in OMC LA.

Figure 28: Create Alerts in Log Analytics
Topology-aware Log Exploration

Log Analytics Service is not only able to collect logs from any source/entity; but also, it is aware of associations between those entities; for example, databases, servers, middleware servers etc. In addition, further associations can be defined to customize the topology view of an environment or application. Database Administrators can easily see all the components made their applications and use the topology flow to filter and drill-down into specific entities and its associations for troubleshooting and root-cause analysis. For instance, users can use LA to quickly find if there are any errors in their database instances as shown in the diagram below. As shown in the entity flow diagram below, there is a DB instance which is not normal (colored red), users can select the entity or combination of entities to drill-down into relevant logs and search for any specific error like “ORA*” (example below) from the events.

Figure 29: Topology Aware Log Exploration

Out of Box Deep Oracle Knowledge

One of the unique capabilities of Log Analytics is all logs automatically get classified into commonly known/used error categories when it comes to Oracle products like Oracle Database, Exadata, WLS. All the relevant logs get associated with labels based on out-of-the-box defined conditions. There are many labels built in the product like “Data Corruption” instead of “ORA-0227”, “Connection Error” instead of “ORA-03106” or “Deadlock” instead of “ORA-00060”.

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As mentioned, for Oracle products like databases, Exadata, Web Logic Servers & etc. all error categorizes and their trends will be shown automatically if there is any in data coming to OMC. As shown in the screenshot below, the system automatically finds all the error category, priority, count and trend of each errors. Users not only get visibility over these out-of-the-box, but also can use them to drill-down into relevant data for troubleshooting and root-cause analysis use cases. Users can create their own labels based on simple/complex conditions to enrich their dataset and expand the error category labels for different data types.

Figure 30: Out-of-the-box Error Categories

These error categories (labels) help system Administrators to be able to search faster and easier in troubleshooting and root-cause analysis use cases. For instance, users can search for all “Memory Error” events across log sources in their environment by just searching for label = “memory error” as shown in the first screenshot below or search for label = deadlock in the second screenshot below.
Log Analytics Machine Learning “Cluster”

Using Oracle Log Analytics Machine Learning “Cluster” capability, users can:
• Reduce millions of log events into a smaller set of patterns based on common signatures
• Rapidly troubleshoot problems by quickly identifying outliers and potential issues
• Show trend of each clustered group; correlate clustered events that show similar trends

Sometimes, issues are not common (unknown) and DBAs have a hard time to find out where is the best place to start the investigation and how to narrow down the scope of the search to only relevant data. Using Machine Learning Clustering empowers users to automatically find potential issues and outliers (events that have only happened once). These are all out-of-the-box insight provided to users automatically specially when there is not much clear sign or useful information around the issue/problem for faster troubleshooting and get to the root-cause.

Figure 33: Logs Clustering

ORACLE MANAGEMENT CLOUD FOR EXADATA

While most enterprise IT systems provide a reactive approach to system monitoring, capacity utilization, workload performance and issue resolution, Oracle Management cloud delivers an automated, proactive and end to end integrated management solution to customers.

Oracle Management Cloud for Exadata provides complete management solution for Exadata deployments—Oracle Exadata, Exadata Cloud Machine and Oracle Exadata Cloud Service. OMC for Exadata enables customers to get complete Exadata visibility, streamline the capacity planning process, automate DB performance issue identification while helping to proactively troubleshoot issues. It comes with low management effort, costs than comparable solutions and administrators get best prebuilt functionality for Oracle Exadata, Oracle Database and applications.
CONCLUSION

Oracle Management Cloud provides comprehensive solutions for Exadata to enable Exadata administrators and DBAs to maximize performance, optimize capacity and rapidly troubleshoot problems in Exadata.