

Oracle自动化运维实践

公益讲座11:00准时开始，请大家先浏览云技术微信公众号技术文章。资料会在各群同步发布，已入群客户请勿重复入群！



20-22

数据库和云讲座群



甲骨文云技术公众号



B站专家系列课程





基于 Oracle 数据库 免费企业数据健康检查

- 及时了解数据库健康状况，发现并解决潜在问题
- 维护数据库系统良好状态，保护数据资产的安全
- 提升数据库性能、稳定性和安全性，降低业务风险

免费咨询热线：

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释放您繁重的运维工作 — Oracle 自动化运维实践

甲骨文技术公益课 - 数据库专场

2023年11月17日 11:00

线上直播

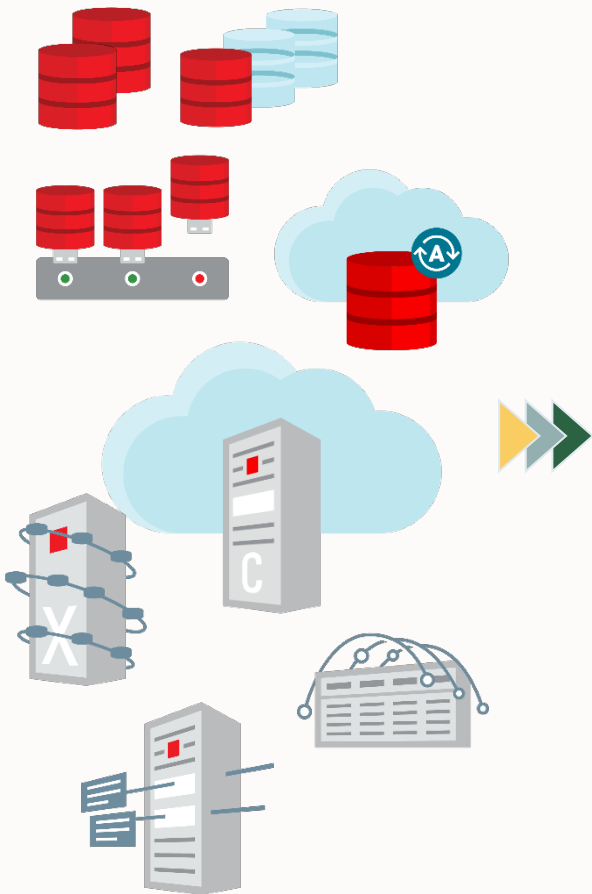
Jasper Zhu

议程

- 1 使用OEM实现全面监控，降低运维复杂度
- 2 OEM 快速定位故障和解决性能瓶颈



OEM企业管理器： Oracle 数据库和工程化系统的监控、管理和控制



针对 **Oracle** 数据库和 **Oracle** 工程化系统的全面管理

跨 **Oracle** 云和本地部署系统的整体监控和管理

把诊断、调优和生命周期统一集中管理



监控的最佳实践

入门级（基本监控）

需求

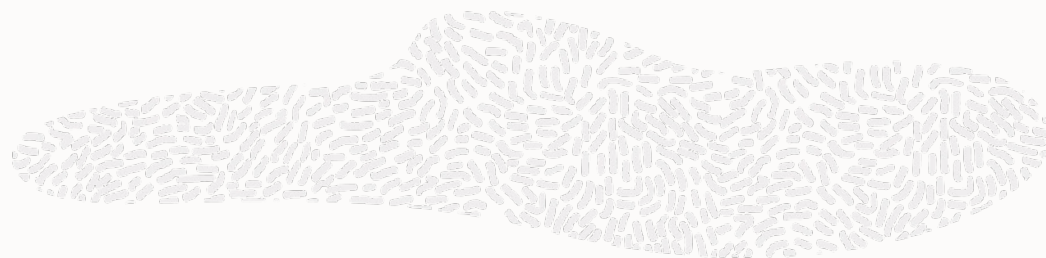
- 部门级别/团队级别使用情况
- 监控目标数量少
- 基本监控（状态、资源使用情况、性能警报）
- 电子邮件通知

企业级监控

需求

- 覆盖所有 Oracle 技术堆栈
- 每个 LOB/部门都有自己的监控目标和自己的监控要求
- 要管理的目标数量较多（生产/非生产）
- 要管理大量Event事件/Incident 意外事件
- 告警事件与企业级 ticketing 系统集成
- 24 x 7 全天候监控生产目标
- Oracle E-Business Suite
- Oracle Exadata
- MYSQL/MS SQL / PostgreSQL

基本监控最佳实践



1. 利用内置功能：自动发现、开箱即用监控
2. 调整监控设置
3. 使用监控模板标准化监控设置
4. 配置电子邮件设置
5. 复制现成（开箱即用）的事件规则集,并启用

使用自动发现添加目标



Go to Setup > Add Target > Auto Discovery Results and Promote targets to monitor

Auto Discovery Results

► Overview

Servers, Storage and Network (0) **Targets on Hosts (165)** Ignored Targets (0)

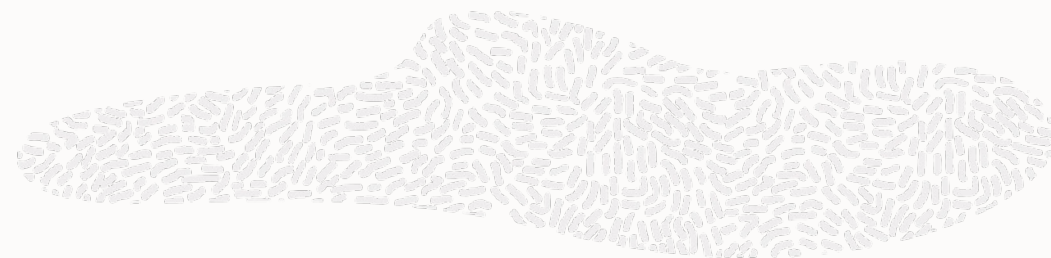
► Search

View ▾ **Promote** Rename Delete Ignore Detach

| Target Name | Target Type | Discovered On |
|--|------------------------------|------------------------------|
| +ASM1_...us.oracle.com_1 | Automatic Storage Management | Apr 3, 2020 7:51:14 PM PDT |
| +ASM2_...us.oracle.com_1 | Automatic Storage Management | Sep 12, 2019 5:04:03 AM PDT |
| /Farm_GCDomain/GCDomain_...oracle.com_7102 | Oracle WebLogic Domain | May 12, 2020 9:41:35 AM PDT |
| /Farm_GCDomain/GCDomain_...oracle.com_7102 | Oracle WebLogic Domain | May 3, 2019 9:39:23 AM PDT |
| /Farm_GCDomain/GCDomain_...oracle.com_7102 | Oracle WebLogic Domain | Jan 14, 2020 2:12:40 PM PST |
| ...us.oracle.com | Database Instance | May 3, 2019 9:39:23 AM PDT |
| ...us.oracle.com_CDBROOT | Pluggable Database | Jun 18, 2019 11:14:16 AM PDT |
| ...us.oracle.com_SALES | Pluggable Database | Jun 18, 2019 11:14:16 AM PDT |
| ...us.oracle.com | Database Instance | Jul 4, 2019 9:31:48 AM PDT |



开箱即用的度量设置



转到“所有度量”页面以查看指标值和集合设置

All Metrics View Data Last 31 Days Off

Search

View

- Streams Capture Queue Statistics
- Tablespace Allocation
- Tablespaces Full
 - Tablespace Free Space (MB)
 - Tablespace Space Used (%)**
- Tablespaces Full (Temp)
- Tablespaces Full (Undo)
- Tablespaces Full (dictionary manag
- Tablespaces With Problem Segmen
- Temporary File Status
- Total Objects by Pluggable Databas
- Total Objects by Schema

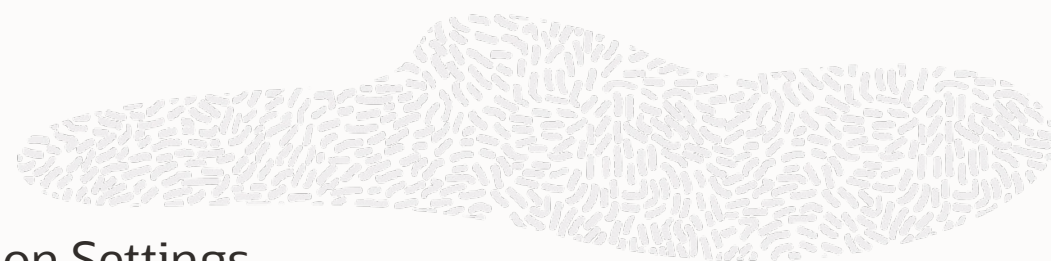
| Tablespace Name | Average Value | Low Value | High Value | Last Known Value | Current Severity | Alert Triggered | Last Collection Timestamp |
|-----------------|---------------|-----------|------------|------------------|------------------|-----------------|---------------------------|
| AQ_TBS_Q_1 | 62.9 | 62.9 | 62.9 | 62.9 | ✓ | - | Oct 15, 2019 11:03:29 P. |
| AQ_TBS_Q_2 | 62.81 | 62.81 | 62.81 | 62.81 | ✓ | - | Oct 15, 2019 11:03:29 P. |
| SYSAUX | 1.19 | 1.19 | 1.19 | 1.19 | ✓ | - | Oct 15, 2019 11:03:29 P. |
| SYSTEM | 0.85 | 0.85 | 0.85 | 0.85 | ✓ | - | Oct 15, 2019 11:03:29 P. |

Tablespace Name : SYSTEM

| Statistics | Thresholds |
|---|----------------------------|
| Last Known Value 0.85 % | Warning / Critical 85 / 97 |
| Collection Timestamp Oct 15, 2019 11:03:29 PM PDT | Comparison Operator >= |
| Average Value 0.85 % | Occurrences Before Alert 1 |
| Low / High Value 0.85 / 0.85 % | Corrective Actions None |



调整监控设置 (如果需要)



[Target-Specific Menu] > Monitoring > Metric and Collection Settings
Enable/disable metrics, 调整 warning/critical thresholds 及修改收集频度

Metric and Collection Settings

Oracle Database ▾ Performance ▾ Availability ▾ Security ▾ Schema ▾ Administration ▾

Pluggable Database: orcl_PDB1 > Metric and Collection Settings > Edit Advanced Settings: Failed Login Count

Edit Advanced Settings: Failed Login Count

Corrective Actions

Warning <none> [Add](#)

Critical <none> [Add](#)

Allow only one corrective action for this metric to run at any given time

Advanced Threshold Settings

Comparison Operator

Warning Threshold

Critical Threshold

Number of Occurrences

Collection Schedule

Edit Alert Message Reset Alert Message

Alert Message

TIP The length of the alert message cannot be more than 4000 characters.

Metrics | Other Collected Items

TIP Consider using Adaptive Thresholds for performance metrics or Time-based Static Thresholds for availability metrics. Configure these thresholds in the "Advanced Threshold Management" page.

View

[Expand All](#) | [Collapse All](#)

| Metric | Comparison Operator | Warning Threshold |
|------------------------------|---------------------|---------------------------------------|
| eva4.us.oracle.com_PDB1 | | |
| Database Job Status | | |
| Broken Job Count | > | <input type="text" value="0"/> |
| Failed Job Count | > | <input type="text" value="0"/> |
| Failed Logins | | |
| Failed Login Count | >= | <input type="text" value="150"/> |
| Replication Processes Status | | |
| Replication Process Errors | > | <input type="text" value="0"/> |
| Replication Process Status | = | <input type="text" value="DISABLED"/> |
| Response | | |
| State | Matches | <input type="text"/> |



将自定义监控模板应用于其他目标

从目标设置创建监控模板

使用 UI 或 emcli 将模板应用于其它目标

oracle.com / ↑ SALES19

Oracle Database Performance Availability Security

| | | |
|--|---------|---------|
| Segments Approaching Maximum Extents Count | > | 0 |
| Segments Not Able to Extend Count | > | 0 |
| Temporary File Status | | |
| Status | Matches | OFFLINE |

TIP Empty Thresholds will disable alerts for that metric.

Related Links

- Advanced Threshold Management
- Pending Apply Operations
- Create Monitoring Template**

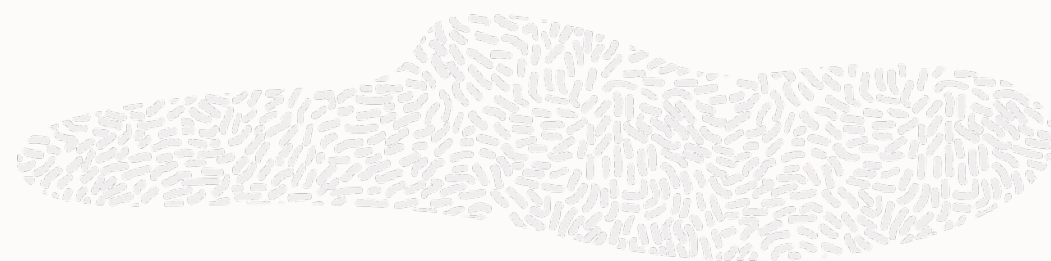
Enterprise Targets

- Summary
- Dashboards
- Monitoring
- Job
- Reports
- Configuration
- Compliance
- Provisioning and Patching
- Quality Management
- My Oracle Support
- Cloud
- Migration and Consolidation

- Incident Manager
- Runbook Sessions
- Logs
- Blackouts
- Runbooks
- Corrective Actions
- Metric Extensions
- Monitoring Templates**
- Template Collections



将监控模板设置为“默认”



模板设置将自动应用于新发现的目标

Monitoring Templates
Monitoring Templates > Create Monitoring Template
Create Monitoring Template

Cancel OK

General Metric Thresholds Other Collected Items


* Name Production PDB Monitoring Template

Target Type **Pluggable Database**

Owner **SYSMAN**

Description Monitoring template for Production PDB

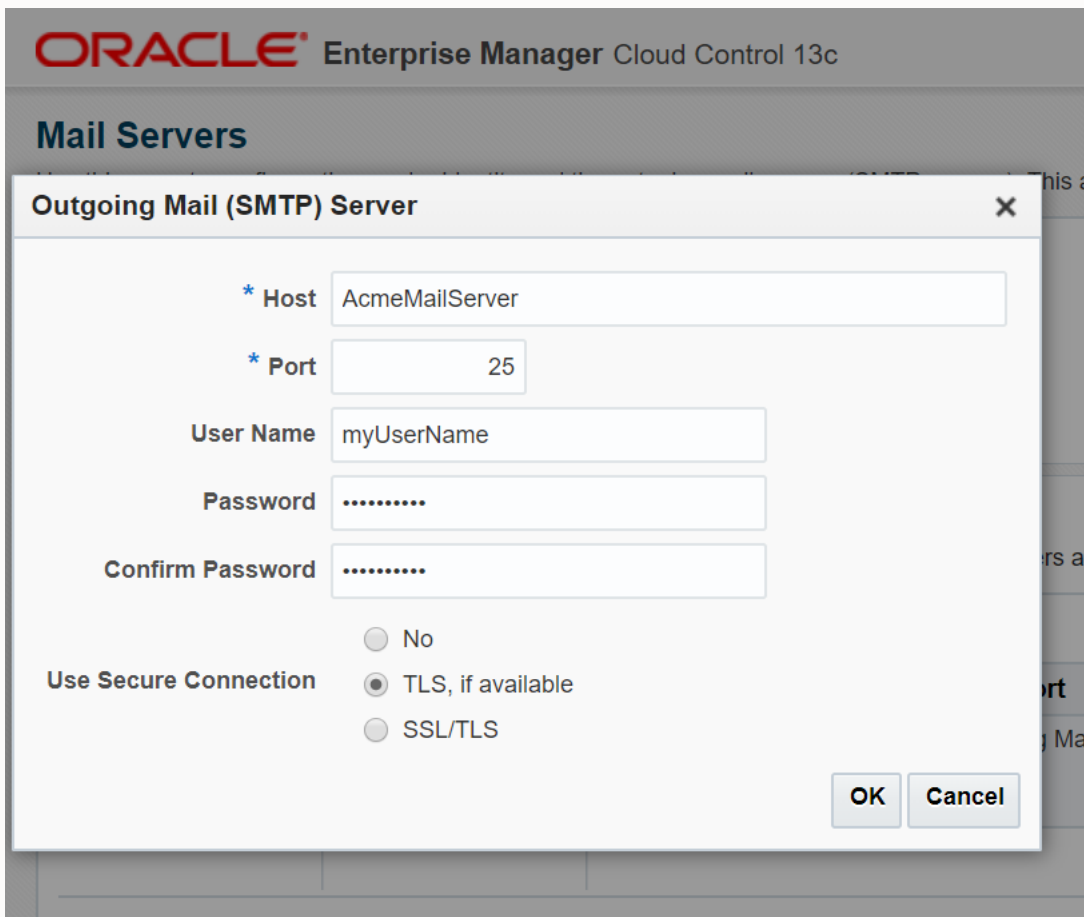
Default Template Make this the default template for this target type

 **TIP** If checked, this template will be applied automatically to newly discovered Pluggable Database targets, completely replacing Oracle provided out-of-box settings.



配置电子邮件设置

1 设置邮件服务器



ORACLE Enterprise Manager Cloud Control 13c

Mail Servers

Outgoing Mail (SMTP) Server

* Host: AcmeMailServer

* Port: 25

User Name: myUserName

Password:

Confirm Password:

Use Secure Connection:

- No
- TLS, if available
- SSL/TLS

OK Cancel

2 指定您的电子邮件地址

Enterprise Manager Password & Email

Password

Changing the SYSMAN user password requires a special operation which is described in the Oracle Enterprise Manager documentation.

E-mail Addresses

These addresses are used to send notifications to you. You can specify multiple addresses if you want to for each address. Later on, you will need to define a Notification Schedule before any e-mail notifications

Remove Test

Select All | Select None

| Select | E-mail Address | Email Type (Message Format) |
|-------------------------------------|------------------|-----------------------------|
| <input checked="" type="checkbox"/> | email@oracle.com | Email (Long) ▾ |

Add Another Row

复制现有意外事件规则（Incident Rule）并邮件订阅

1 在事件管理规则集执行“Create Like”

Incident Rules - All Enterprise Rules
A rule set is a collection of rules that applies to a common set of objects, for example, targets, individual rules can respond to incoming or updated events, incidents, or problems, and then and applied in the order specified. You can change the order using the Reorder Rule Sets action.

Actions View Create Rule Set... View Edit... Delete

- Create Rule Set...
- Reorder Rule Sets...
- Assign Methods to Multiple Rules
- Enable
- Disable
- Create Like Rule Set...

| Name | Description |
|------------------------|--|
| Targets | Rule set to create and manage incidents for all targets |
| Incidents after 7 d... | Rule to clear up ADP events than 7 days |
| al business app... | Rule used to create incidents critical or fatal business application alerts from RUEI. |
| ld violation ev... | Rule to create incidents for J |

2 指定名称并保存规则集

Incident Rules - All Enterprise Rules
Create Like Rule Set Save Cancel

A rule set is a collection of rules that applies to a common set of objects, for example, targets, jobs, and templates. A rule contains a set of automated actions to be taken on specific events, incidents or problems. For example, individual rules can respond to incoming or updated events, incidents, or problems, and then take actions such as sending e-mails, creating incidents, updating incidents, and creating tickets.

Name: My_Incident_RuleSet

Description: Rule set to create and manage incidents for all targets

Applies To: Targets

Targets

Rules

3 为规则设置接收电子邮件：
目标的可用性状态的事件创建规则

- 为关键指标警报创建事件

Incident Rules - All Enterprise Rules Page Refreshed Oct 21, 2019 12:19:36 AM PDT

A rule set is a collection of rules that applies to a common set of objects, for example, targets, jobs, and templates. A rule contains a set of automated actions to be taken on specific events, incidents or problems. For example, individual rules can respond to incoming or updated events, incidents, or problems, and then take actions such as sending e-mails, creating incidents, updating incidents, and creating tickets. Rule sets and rules are evaluated and applied in the order specified. You can change the order using the Reorder Rule Sets action.

Actions View Create Rule Set... View Edit... Delete... E-mail >>

| Name | Description | Priority | Enterprise |
|---|---|----------|------------|
| Create incidents for CRAC/EXAC/availability | | | Enterp... |
| Compress configuration standard violation events | | | |
| Compress metric collection error events for a target | Rule to compress metric evaluation error events for a target in one incident. | 3.01 | |
| Create incident for critical metric alerts | Rule to create incidents for critical metric alert events. | 3.011 | |
| Clear metric alert events older than 7 days | Rule to clear metric alert events older than 7 days. | 3.012 | |
| Clear blackout infrastructure alerts older than 1 day | Rule to clear blackout infrastructure alerts which are older than 1 day | 3.013 | |

E-mail Me
Do not E-mail Me
E-mail another administrator ...
Do not E-mail administrator ... into an incident.



监控的最佳实践

入门级（基本监控）

需求

- 部门级别/团队级别使用情况
- 监控目标数量少
- 基本监控（状态、资源使用情况、性能警报）
- 电子邮件通知

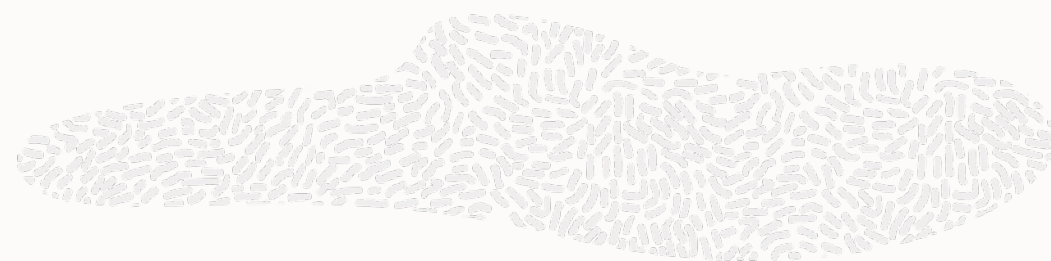


企业级监控

需求

- 覆盖所有 Oracle 技术堆栈
- 每个 LOB/部门都有自己的监控目标和自己的监控要求
- 要管理的目标数量较多（生产/非生产）
- 要管理大量Event事件/Incident 事故
- 告警事件与企业级 ticketing 系统集成
- 24 x 7 全天候监控生产目标
- Oracle E-Business Suite
- Oracle Exadata
- MYSQL/MS SQL / PostgreSQL

企业级监控最佳实践



设置监控

- 对目标进行分组
- 使用监控模板
- 使用纠正措施自动解决警报
- 使用度量扩展满足自定义要求



管理警报

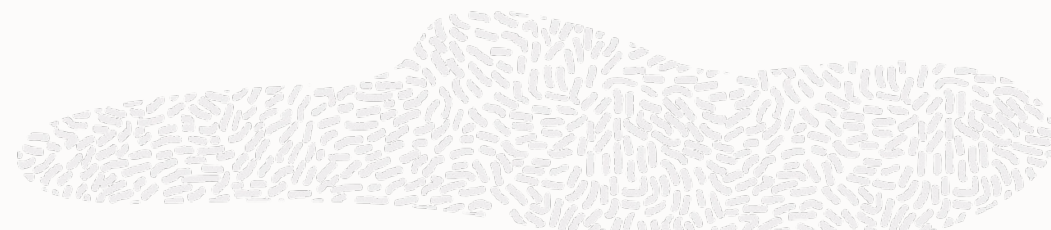
- 使用意外事件
- 压缩 Event 事件以减少 incidents 意外事件的操作
- 与您的 ticketing 系统集成
- 使用动态运行手册 Runbooks 管理意外事件
- 使用封锁 blackouts 来防止计划内维护期间出现虚假警报
- 通过始终在线监控设置 24 x 7 警报



为监控目标定义组

为监控的每类目标定义（动态）组

- 举例: 生产环境组 vs 开发环境组
- 动态组定义成员资格标准可自动加入新的目标
 - 举例:生产环境组定义为具有属性*Lifecycle Status = Production*的目标
- 选择使组“权限传播”的选项“privilege-propagating”
 - 您授予用户的组权限将自动应用于所有成员
 - 管理目标权限的扩展方式



Add Target

Create Dynamic Group

General | Charts | Columns | Dashboard | Access

* Name

Privilege Propagation Enabled
If privilege propagation is enabled for a group, privileges granted on the group will be propagated to the group's member targets. Therefore only those targets on which you have Full Target privileges can be members of a privilege propagation-enabled group.

Parent Groups
[Add](#)

Define Membership Criteria

Specify the target properties that determine the group membership. All targets that match all criteria (logical AND) will automatically be added to the group

[Define Membership Criteria](#)

| Target Property | Property Value(s) |
|------------------|-------------------|
| Lifecycle Status | Production |



生命周期状态

生命周期状态目标属性具有特殊语义

在OEM中用于处理数据时的优先级

生命周期状态值：（按优先级降序排列）

- 关键任务（最高优先级）
- 生产
- 临时
- 测试
- 开发（最低优先级）

适当设置值，以确保以最高优先级管理最重要的目标

ORACLE Enterprise Manager Cloud Control 13c

创建 权限传播组 > 定义成员资格标准和选择 > 添加/删除

添加/删除

选择将用作组成员资格标准的生命周期状态值。

| 可用生命周期状态值 | 所选生命周期状态值 |
|--------------------------------|-----------|
| 临时 关键任务 开发版 正式版 测试 | |
| | |

移动

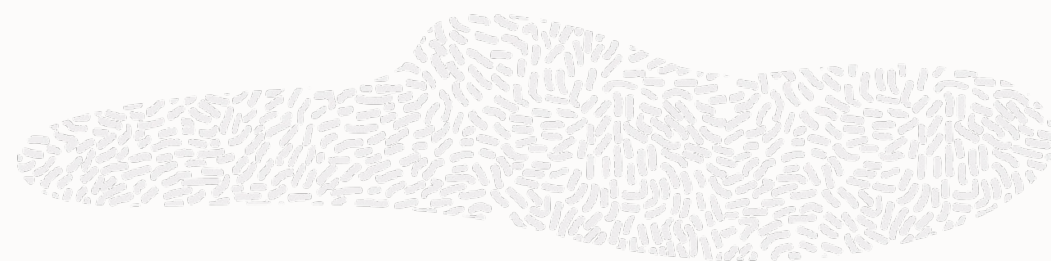
全部移动

移去

全部移去

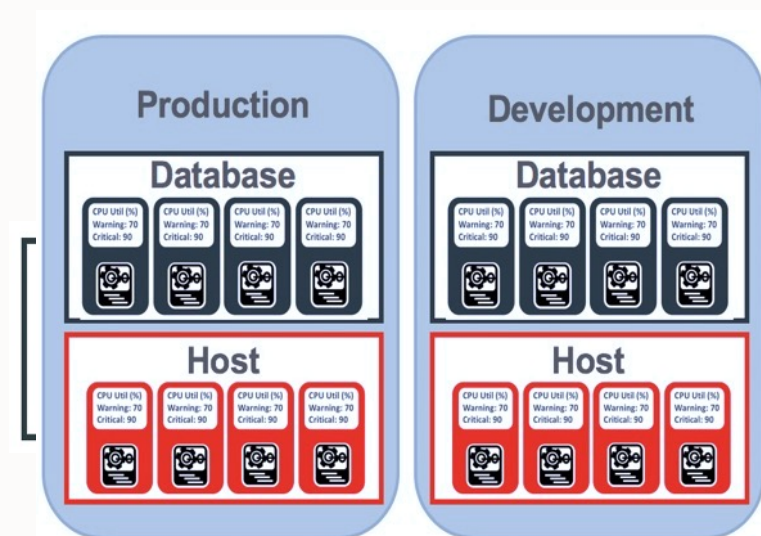


对每个组使用监控模板



创建包含每个组的监控设置的监控模板

- 度量、收集频率、阈值、纠正措施等.
- 创建模板的提示:
 - ✓ 创建特定于目标类型的监控模板
 - 数据库目标类型的模板仅适用于数据库目标
 - 主机目标类型的模板仅适用于主机目标
 - ✓ 为类似条件下的目标创建一个模板
 - “生产”和“开发”数据库的监控标准将它们放在各自单独的模板中
 - “生产”和“开发”主机的监控标准将它们放在各自单独的模板中



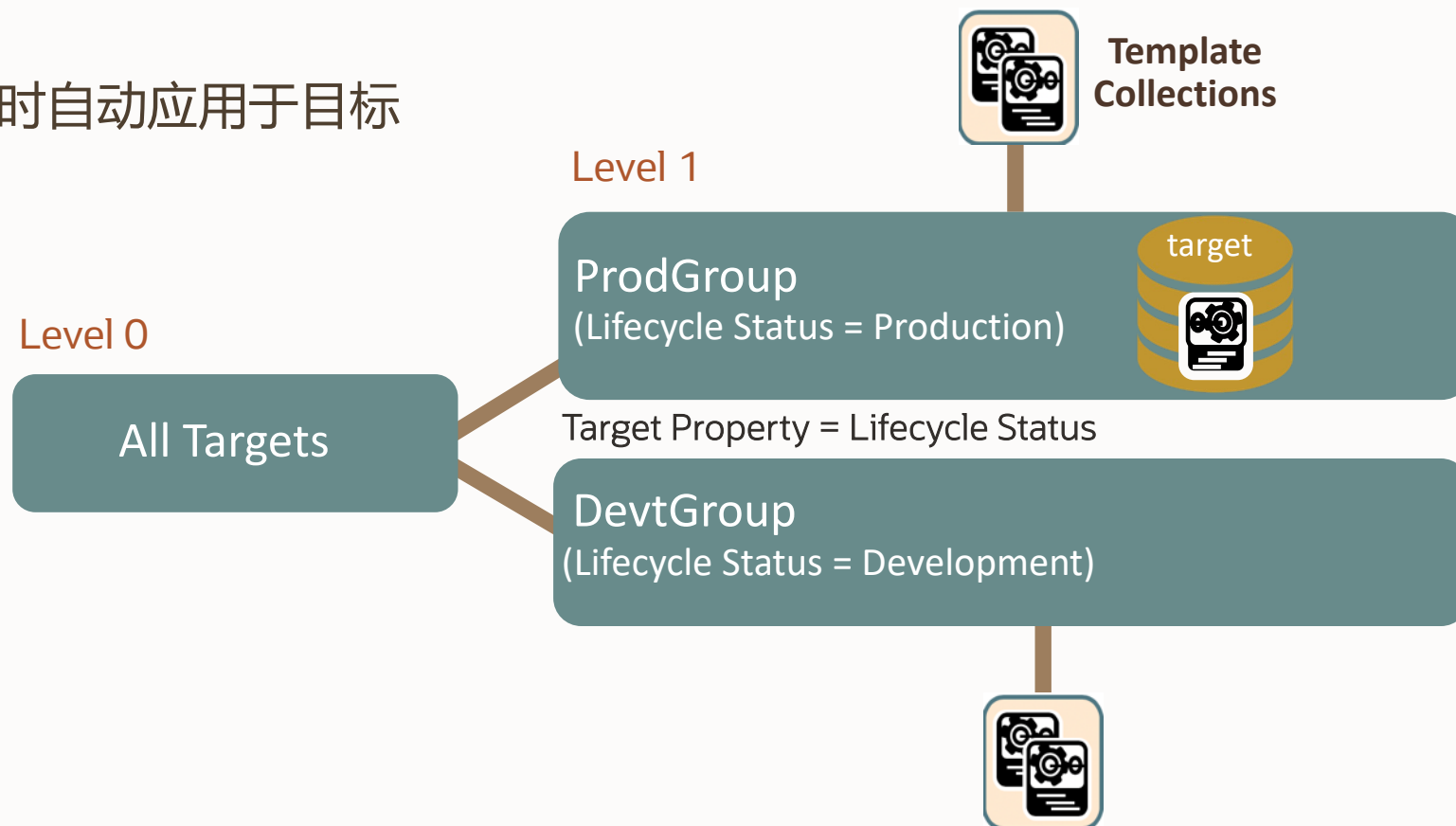
在 EM 控制台或 EMCLI 中手动将模板应用于组，或使用管理组和模板集合自动应用模板



设置管理组和模板集合自动执行模板应用操作

- 步骤 1 根据目标的属性条件定义为管理组的层次结构
- 步骤 2 将模板集合（即为多个监控模板的集合）与管理组关联
- 步骤 3 将目标添加到 EM 时，设置目标属性后即会加入正确的组

监控模板在目标加入管理组时自动应用于目标



监控数据库的主库和备库

- 根据数据库角色，监控一组不同的指标
 - **主库:** Redo 产生量
 - **备库:** Apply Lag, Transport Lag, Redo Applied, Redo Apply Rate, Apply Lag Data Refresh Time, Transport Lag Data Refresh Time, Estimated Failover Time
- 自动监控 switchover 和 failover 的相应指标和阈值
 - 使用管理组和模板集合管理警报阈值
 - 数据库模板应包括主库和备库数据库的所有指标和阈值
 - 举例: ProdGroup-DB Template has:
 - Redo Generation Rate (kb/sec): Warning = 25, Critical = 150 (Primary)
 - Apply Lag (sec): Warning = 7, Critical = 17 (Standby)
 - 将 Prod-DB 模板添加到模板集合，与管理组关联
 - 将目标属性值设置为主数据库和备库数据库以加入此管理组



监控数据库的主库和备库

ORACLE Enterprise Manager Cloud Control 13c

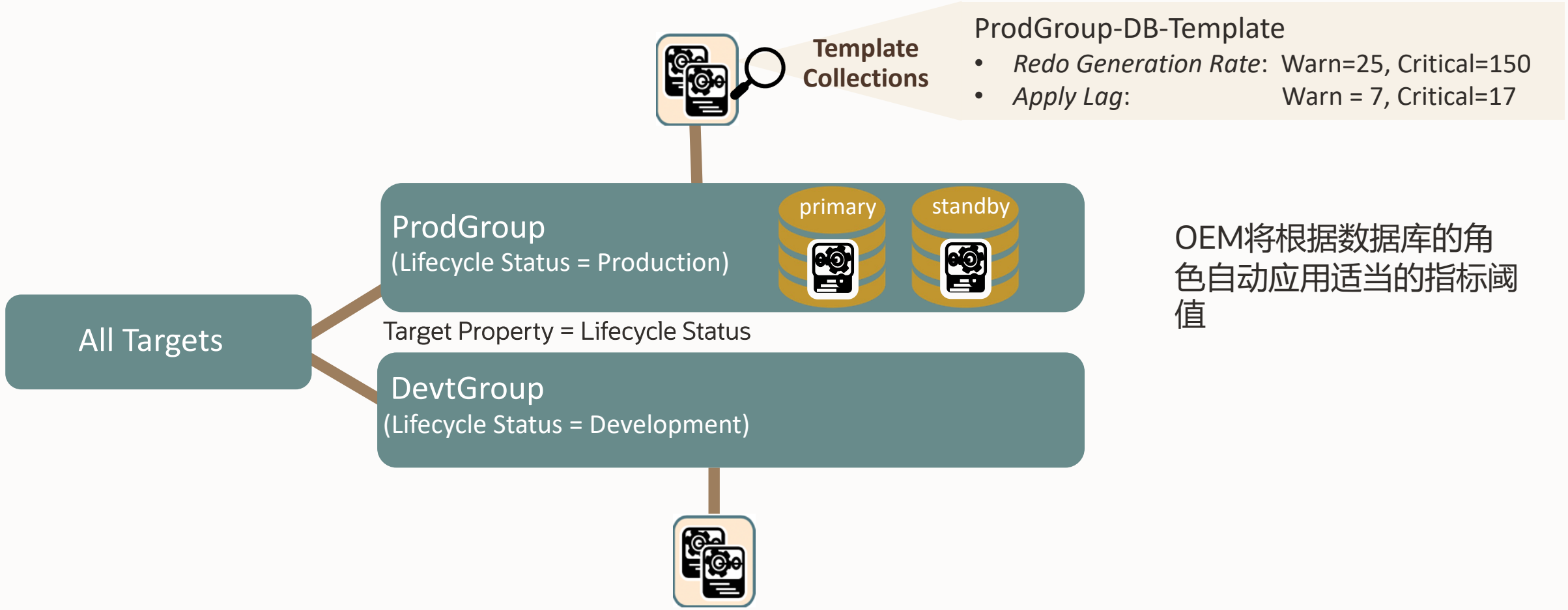
Enterprise Targets Favorites History Setup

Monitoring Templates

| | | | | | | | |
|--|-----------------------------------|---|---------------------------------|----------------------------------|------|------------------|--|
| Database Job Status | | | | | | Every 30 Minutes | |
| Database Limits | | | | | | Every 15 Minutes | |
| Database Monitoring User Privileges Check | | | | | | Disabled | |
| Database Replay | | | | | | | |
| Database Services | | | | | | Disabled | |
| Database Vault Attempted Violations - Command Rules | | | | | | Disabled | |
| Database Vault Attempted Violations - Realms | | | | | | Disabled | |
| Database Vault Configuration Issues - Command Rules | | | | | | Disabled | |
| Database Vault Configuration Issues - Realms | | | | | | Disabled | |
| Database Vault Policy Changes | | | | | | Disabled | |
| Data Failure | | | | | | Every 5 Minutes | |
| Data Guard - 10.1 Database | | | | | | Every 5 Minutes | |
| Data Guard - 9.2 Database | | | | | | Every 5 Minutes | |
| Data Guard Failover | | | | | | | |
| Data Guard Fast-Start Failover | | | | | | Every 5 Minutes | |
| Data Guard Fast-Start Failover Observer | | | | | | Every 1 Minute | |
| Data Guard Fast-Start Failover Observer - 10.2 Database | | | | | | Every 5 Minutes | |
| Data Guard Performance | | | | | | Every 5 Minutes | |
| Metric Thresholds applicable for Primary Database | | | | | | | |
| <input type="checkbox"/> | Redo Generation Rate (KB/second) | > | <input type="text" value="25"/> | <input type="text" value="150"/> | None | | |
| <input type="checkbox"/> | Apply Lag (seconds) | > | <input type="text" value="7"/> | <input type="text" value="17"/> | None | | |
| Metric Thresholds applicable for Standby Database | | | | | | | |
| <input type="checkbox"/> | Apply Lag Data Refresh Time | | | | | | |
| <input type="checkbox"/> | Estimated Failover Time (seconds) | > | <input type="text"/> | <input type="text"/> | None | | |
| <input type="checkbox"/> | Redo Apply Rate (KB/second) | < | <input type="text"/> | <input type="text"/> | None | | |
| <input type="checkbox"/> | Transport Lag (seconds) | > | <input type="text"/> | <input type="text"/> | None | | |
| <input type="checkbox"/> | Transport Lag Data Refresh Time | | | | | | |



监控主数据库和备库数据库(续)



请参考 MOS note: **Managing Alert Thresholds with Database Role Changes in Enterprise Manager (2700743.1)**



自动解决问题：更正操作

更正操作 Corrective Actions

- 报警的解决方法，无需手动干预
- 自动收集诊断信息

执行方式：

- 自动：使用度量设置或事件规则指定
- 手动：从意外事件管理器手动调用

EMCC 针对数据库开箱即用的更正操作有：

- 当数据库停时启动
- 当Listener停时启动
- 当表空间满时添加更多空间
- 运行 SQL 脚本以收集诊断信息
- ...等

The screenshot displays the Oracle Enterprise Manager Cloud Control 13c interface for configuring a corrective action for the metric 'Tablespace Space Used (%)' on database instance 'db19c'. The page is titled 'Edit Advanced Settings: Tablespace Space Used (%)'. It includes sections for 'Corrective Actions' (Warning and Critical thresholds), 'Advanced Threshold Settings' (Comparison Operator, Warning Threshold, Critical Threshold, Number of Occurrences, Collection Schedule), 'Template Override', and 'Threshold Suggestion'. The 'Submit Corrective Action' section is highlighted, showing a 'Select corrective action' button and a checkbox for using preferred credentials of SYSMAN. Below this, there are sections for 'Clear events' and 'Forward to Event Connectors'.

Event raised

Corrective
Action
executes

Issue resolved



更正操作Corrective Action：“增加表空间”（开箱即用）

通过扩展现有数据文件或创建新数据文件自动添加表空间。

可通过参数定制：

- 可限制磁盘空间消耗
- 按 % 或 MB 添加空间
- 可限制最大数据文件大小

可以与所有表空间指标相关联

- Space Used %, Free Space (MB) for Locally Managed, Dictionary, Temp, Undo
- 表空间名称支持的通配符

Blog: [How to Automatically Fix Tablespace Full Alerts Using Corrective Actions](#)

ORACLE Enterprise Manager Cloud Control 13c

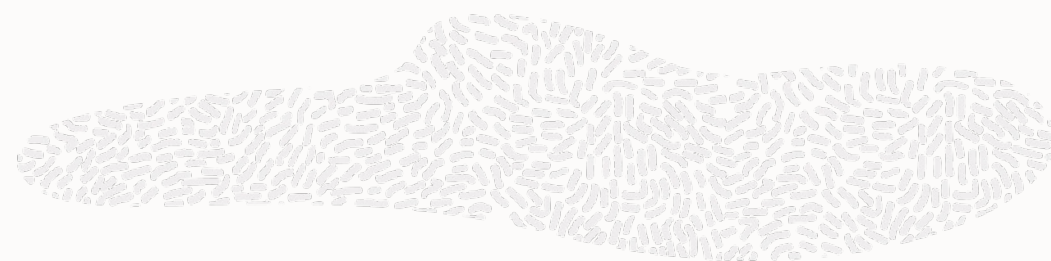
Job

Create 'Add Space to Tablespace' Library Job

General Parameters Credentials Schedule Access

| | | |
|-------------------------------|--|---|
| How to Measure Free Space | <input type="text" value="% Full"/> | <small>For % Full, the Maximum Disk Usage (%) parameter is required. For MB Free, the Minimum Free Space (MB) parameter is required.</small> |
| Maximum Disk Usage (%) | <input type="text" value="90"/> | <small>Enter the maximum percentage of disk or disk group (ASM) space that can be consumed. If current or projected disk usage exceeds this maximum, the tablespace size will not be increased.</small> |
| Minimum Free Space (MB) | <input type="text" value="100"/> | <small>Enter the minimum amount of free disk or disk group (ASM) space that must be preserved. If current or projected free space is below this amount, the tablespace size will not be increased.</small> |
| How to Increase Space | <input type="text" value="Increase By %"/> | <small>For Increase By %, the Increase Tablespace Size (%) and Increase Bigfile Size (%) parameters are required. For Add MB, the Increase Tablespace Size (MB) and Increase Bigfile Size (GB) parameters are required.</small> |
| Increase Tablespace Size (%) | <input type="text" value="10"/> | <small>Enter the percentage of current tablespace size to add to an existing datafile in a smallfile tablespace. Enter 0 to create a new datafile instead.</small> |
| Increase Tablespace Size (MB) | <input type="text" value="100"/> | <small>Enter the number of megabytes to add to an existing datafile in a smallfile tablespace. Enter 0 to create a new datafile instead.</small> |
| Maximum Datafile Size (GB) | <input type="text"/> | <small>Enter the maximum size in gigabytes that a single datafile in a smallfile tablespace can grow to. If not specified, the Oracle maximum will be used.</small> |
| Maximum Tablespace Size (GB) | <input type="text"/> | <small>Enter the maximum size in gigabytes that a smallfile tablespace can grow to. If not specified, the Oracle maximum will be used.</small> |
| Initial Datafile Size (MB) | <input type="text" value="100"/> | <small>Enter the initial size in megabytes for datafiles created in smallfile tablespaces.</small> |
| Autoextend | <input type="text" value="Yes"/> | <small>Enables autoextend when creating datafiles in smallfile tablespaces.</small> |
| Autoextend Next Size (MB) | <input type="text" value="20"/> | <small>If using autoextend, enter the size in megabytes for datafiles to be automatically extended when they next require space.</small> |
| Datafile Name Template | <input type="text"/> | <small>Enter a naming convention for creating new datafiles. Use %key_value_name% to substitute the actual tablespace name. May include directory or disk group, name and/or suffix. If not specified, a name will be generated based on the last created datafile.</small> |
| Maximum Bigfile Size (GB) | <input type="text"/> | <small>Enter the maximum size in gigabytes that a bigfile tablespace can grow to. If not specified, the Oracle maximum will be used.</small> |
| Increase Bigfile Size (%) | <input type="text" value="5"/> | <small>Enter the percentage to increase a bigfile tablespace.</small> |
| Increase Bigfile Size (GB) | <input type="text" value="10"/> | <small>Enter the number of gigabytes to add to a bigfile tablespace.</small> |

通过度量扩展满足自定义要求



- 允许用户创建自己的度量（监控指标）
- 支持任何目标类型，并用于使用度量的任何功能
- 利用Agent的收集机制（SQL 脚本、操作系统脚本、SNMP、JMX）
- 生命周期支持：开发、测试、部署
- Tutorial: <https://www.youtube.com/watch?v=6m8rSa9PEVE>



度量扩展的计算表达式

根据对先前度量列的数学值运算

示例：空间使用情况的自定义指标

- *UsedDiskSpace* (from script)
- *TotalDiskSpace* (from script)
- *FreeDiskSpace* = *TotalDiskSpace* – *UsedDiskSpace*
- *PctFreeSpace* = $(TotalDiskSpace == 0) ? 0 : ((FreeDiskSpace / TotalDiskSpace) * 100)$

更灵活地计算指标列的值

基本语法检查

ORACLE Enterprise Manager Cloud Control

Metric Extensions

常规属性 适配器 列

新建: 列

在此处指定度量列。
度量列具有一定的顺序, 应与适配器返回的顺序相符。

| 名称 | 显示名称 |
|----------------|----------------|
| UsedDiskSpace | UsedDiskSpace |
| TotalDiskSpace | TotalDiskSpace |
| FreeDiskSpace | FreeDiskSpace |

编辑列

* 名称: FreeDiskSpace * 显示名称: FreeDiskSpace

* 类型: Data Column Key Column

关键字列是一组列中用于唯一标识表中每一行的一列。关键字列中的值应该具有代表性, 例如方案名、磁盘驱动器名称。其性质上不应唯一, 例如会话 ID、时间戳等。

* 值类型: Number

单位: []

其他单位: []

临时: True False

选择度量的类别, 以便以后可以按类别搜索度量或其预警。

预警阈值

比较运算符: [] 警告: [] 严重: []

可手动清除的预警: True False

预警前的发生次数: 1

预警消息: %columnName% 的值为 %value%

清除消息: %columnName% 的预警已清除

计算表达式

使用计算表达式可以基于其他度量列上的数学或逻辑运算来计算此度量列的值。

计算表达式: TotalDiskSpace-UsedDiskSpace

计算表达式需要至少先定义另外一个度量列, 并且只能按顺序包含在此度量列之前列出的那些度量列。

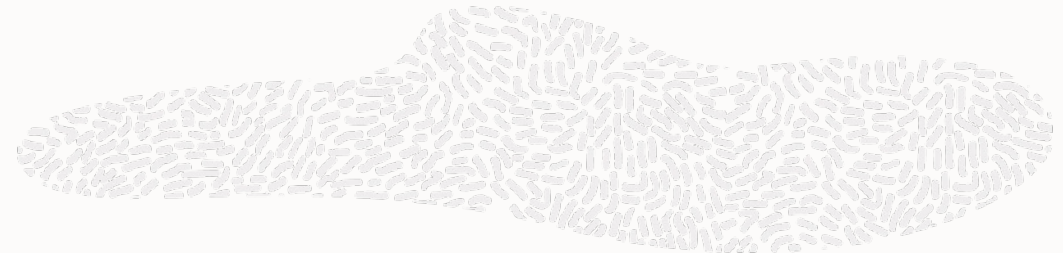
信息
计算表达式有效。

验证

确定 取消



EM 13c: 计算表达式指标扩展



计算表达式运算符可用于计算列值

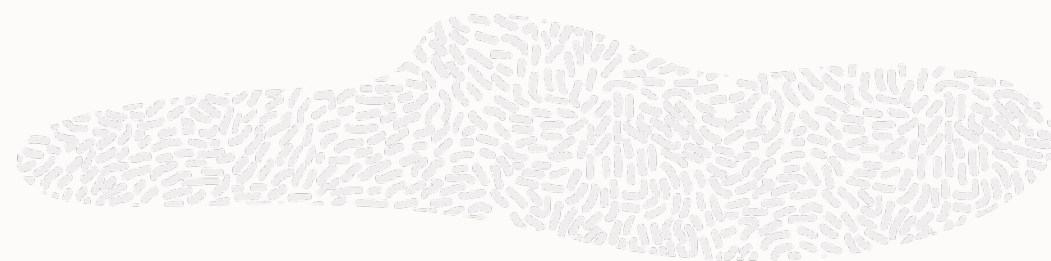
| Operator | Example | Explanation |
|-----------|-------------------------------|---|
| | Column1 + Column2 | Returns the sum of the values of Column1 and Column2. |
| - | (Column1 + Column2) - Column3 | First add Column1 and Column2 values, then subtract Column3 value and return the result. |
| * | (Column1*Column2) + Column3 | First multiply Column1 and Column2 values, then add Column3 value and return the result. |
| / | (Column1 + Column2) / 2 | Returns the average of Column1 and Column2 values. |
| __ceil | __ceil Column1 | Returns the value of Column1 rounded off to the largest integer. |
| __floor | __floor Column1 | Returns the value of Column1 rounded off to the lowest integer. |
| __round | __round Column1 | This expression will round the value of Column1 to the nearest integer, away from zero. |
| == | Column1 == 1 | Returns true if the value of Column1 is 1, else returns false. |
| != | Column1 != 1 | Returns false if the value of Column1 is 1, else returns true. |
| () ? ; | (Status == 1) ? "UP": "DOWN" | This operator is equivalent to if then else statement. This expression will return "UP" if Status value is 1 otherwise it will return "DOWN". |
| __is_null | __is_null Column1 | Returns true if the value of Column1 is NULL, else returns false. |
| __delta | __delta Column1 | Returns the difference between the current value and the previous value of Column1. |
| contains | Column1 contains "ORA-" | Returns true if the value of Column1 contains "ORA-" |

空间使用情况的度量扩展

| Name | Display Name | Type | Value Type | Compute Expression | Alert Threshold | | |
|-------------------|-------------------------|-------------|------------|---|---------------------|---------|----------|
| | | | | | Comparison Operator | Warning | Critical |
| UsedDiskSpace | Used Disk Space | Data Column | Number | | | | |
| TotalDiskSpace | Total Disk Space | Data Column | Number | | | | |
| FreeDiskSpace | Free Disk Space | Data Column | Number | TotalDiskSpace - UsedDiskSpace | > | | |
| GrowthOfDiskUsage | Growth Of Disk Usage... | Data Column | Number | 100*((UsedDiskSpace - _UsedDiskSpace)/__interval) | > | | |
| pctFreeSpace | % free Space | Data Column | Number | (TotalDiskSpace == 0) ? 0: ((FreeDiskSpace/TotalDiskSpace)*100) | | | |



数据库度量扩展的高级属性



适用于数据库实例和集群数据库目标类型

控制度量扩展应用的范围

示例：指标适用于 RAC 实例数据库

Advanced Properties

Please select categories of databases this metric will be applicable to. Metric will be applicable to all database categories if none is specified.

Instance Scope RAC Instance Only ▼

Container Database Scope CDB Only ▼

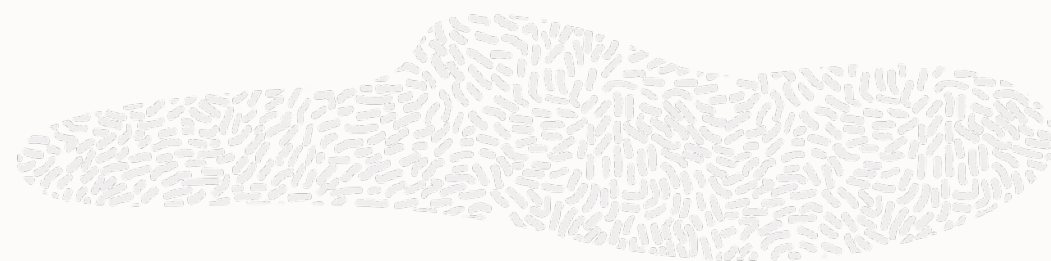
Data Guard Status

- Primary
- Physical Standby
- Logical Standby
- Snapshot Standby

- 实例范围（适用于数据库实例）：仅数据库实例、仅限 RAC 实例
- 容器数据库范围：排除 CDB、仅限 CDB
- 数据卫士状态：主、物理备库、逻辑备库、快照备库



企业级监控最佳实践



设置监控

- 对目标进行分组
- 使用监控模板
- 使用纠正措施自动解决警报
- 使用度量扩展满足自定义要求



管理警报

- 使用意外事件
- 压缩 Event 事件以减少 incidents 意外事件的操作
- 与您的 ticketing 系统集成
- 使用动态运行手册 Runbooks 管理意外事件
- 使用封锁 blackouts 来防止计划内维护期间出现虚假警报
- 通过始终在线监控设置 24 x 7 警报

解决意外事件（Incidents）的问题

Incidents事件: EM Incident Ticket

- 包含一个或多个可操作 events (alerts)

Incidents 意外事件的作用

- 支持管理意外事件的生命周期（分配所有者、跟踪解决状态、添加注释等）
- 将Event事件量减少到较小的可操作问题集
 - 将属于同一问题症状的event事件合并到一个incident事件中
 - 将同一个人管理的event事件合并到一个incident事件中

Incident 1

Owner: John Status: New

Events:

Agent Unreachable –agent 1

Agent Unreachable –agent 2

Agent Unreachable –agent 3

Agent Unreachable –agent 4

意外事件规则集：自动执行event事件和incidents意外事件

Incident 规则集包含:

- Targets (可使用 Groups)
- 一个或多个 Event 规则
 - 发送有关events的电子邮件通知
 - 创建 Incident,使用 Event 压缩策略
 - 将 SNMP traps发送到外部系统
- 一个或多个Incident规则
 - 分配 owner
 - 设置优先级
 - 发送有关 incidents 的电子邮件通知
 - 基于incidents 创建 tickets (用 Ticketing 连接器)

当基于组创建事件规则集时，请 disable 适用于所有目标的原始事件规则集。

Select Type of Rule to Create ✕

A rule applies to incoming events, incidents or problems. Accordingly, the selection mechanism and available set of actions varies in rule definition. Choose the type which best matches your requirement.

What will the rule apply to?

Incoming events and updates to events

Applies to incoming events and updates to events (for example, corrective action failed for a metric alert). The rule can be used to create incidents, send e-mails or pages, or clear the event if possible.

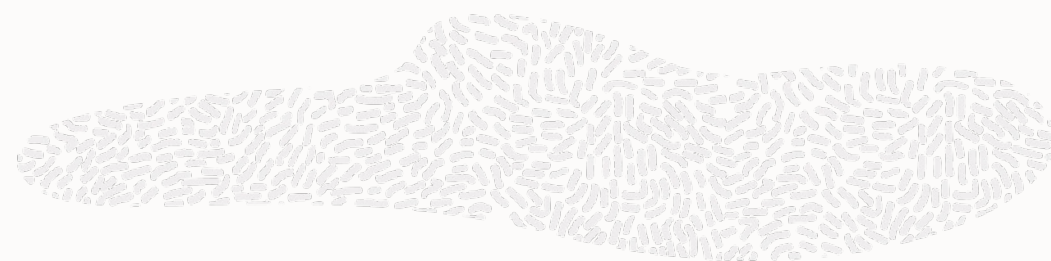
Newly created incidents or updates to incidents

Applies to new incidents or updates to incidents (for example, an incident is escalated to level 2). The rule can take actions like send e-mails, assign an owner, and set a priority.

Newly created problems or updates to problems

Applies to new problems or updates to problems (for example, a problem is escalated to level 2). The rule can take actions like send e-mails, assign an owner, and set a priority.

压缩events事件以减少incident意外事件



Event 压缩策略

- 将多个相关事件 event 基于条件分到 1 个incident事件中

例:

压缩 WebLogic 群集及其成员上的“目标可用性”（例如，关闭）事件，如果这些事件发生在 5 分钟内

- 与事件规则集结合使用

为常见场景提供了开箱即用的事件压缩策略

| Policy Name | Description | Enabled | Ord... ▲ | Created By | Status | Actions |
|---|---|-------------------------------------|----------|------------|-----------|---------|
| Target down events for a cluster database and its members | Compress target-down events for a cluster database and its member instances occurring within the 60-minute time window. | <input checked="" type="checkbox"/> | 1 | Oracle | Published | ⋮ ▼ |
| Target down events for a DB High Availability Cluster and its members | Compress target-down events for a DB High Availability Cluster and its member instances occurring within the 60-minute time window. | <input checked="" type="checkbox"/> | 2 | Oracle | Published | ⋮ ▼ |
| Availability events from all components of Exadata Database Machine | Availability events for Exadata Database Machine and its member instances occurring within 30 minute time window | <input checked="" type="checkbox"/> | 3 | Oracle | Published | ⋮ ▼ |
| Availability events for System Infrastructure Targets | Availability events for Access Points of System Infrastructure targets | <input checked="" type="checkbox"/> | 4 | Oracle | Published | ⋮ ▼ |
| Target availability (i.e. down and error) events for the Weblogic cluster and its members | Compress target availability (i.e. down and error) events for the Weblogic cluster and its members occurring within 5-minute time window. | <input checked="" type="checkbox"/> | 5 | Oracle | Published | ⋮ ▼ |
| Metric evaluation error events for a target | Compress Metric collection error events for a target occurring within a 1-hour time window | <input checked="" type="checkbox"/> | 6 | Oracle | Published | ⋮ ▼ |
| Agent unreachable events for targets monitored by the same agent | Compress agent unreachable events for targets monitored by the same agent occurring within 1-hour time window. | <input checked="" type="checkbox"/> | 7 | Oracle | Published | ⋮ ▼ |





Event 事件压缩策略如何与事件规则集配合使用

在创建事件的事件规则中，选择使用事件压缩策略




Incident Rule Set

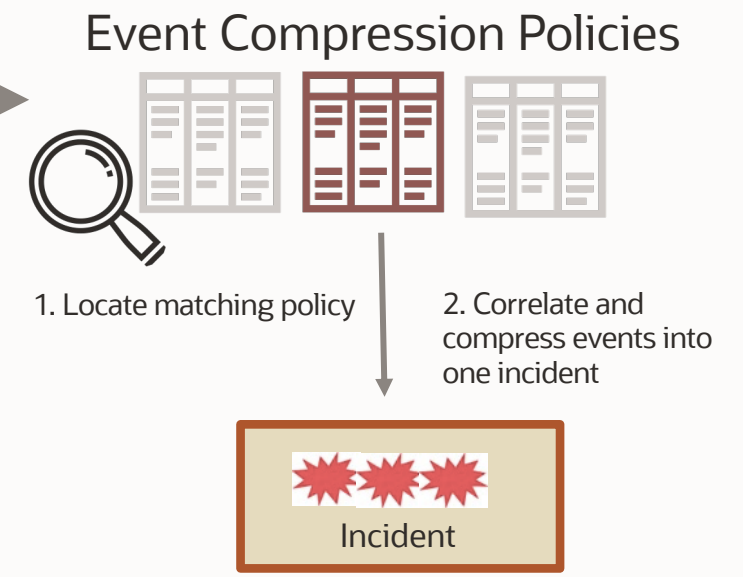
Targets ProdGroup

Event Rules

Rule1: All 'Target Down' Availability Events 
Action: Create Incident
→  Use Event Compression Policies

Scenario:

-  (event1) WLS Managed Server1 Down
-  (event2) WLS Managed Server2 Down
-  (event3) WLS Cluster Down



在为目标Down event 事件创建incident事件之前，将找到适用的事件压缩策略，并将其用于将event 事件压缩为一个incident 意外事件。



与外部管理系统集成

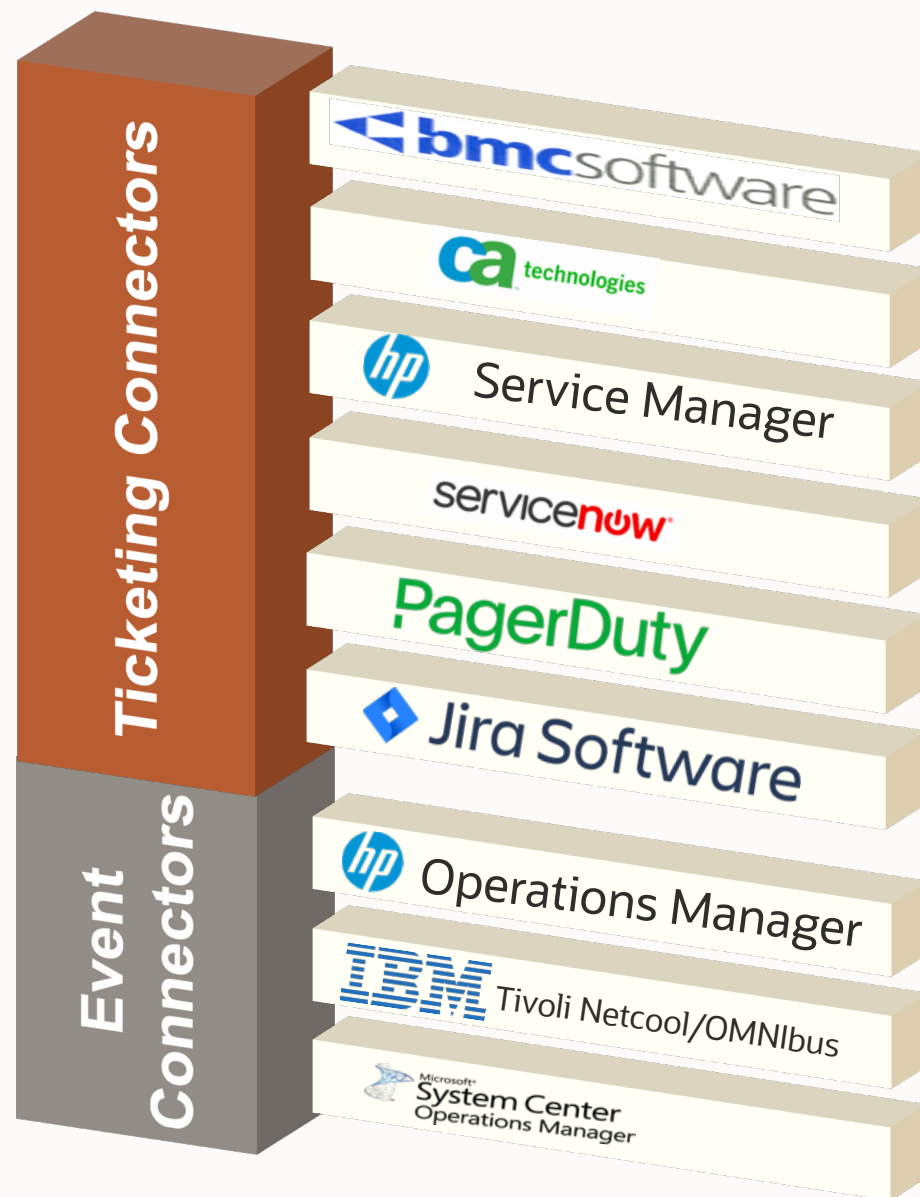
管理连接器

Ticketing Connectors

- 支持将 incidents 意外事件转发到外部票证 ticketing 系统

Event Connectors

- 支持将 events 事件转发到外部事件管理连接器的优势：
 - 快速解决跨多个管理系统的事件
 - 整合关键监控信息
 - 简化关键支持流程并提高运营效率
 - 执行跨平台根本原因分析和诊断



Ticketing/Event 连接器

● 自行更新

[自行更新](#) > [管理连接器](#)

管理连接器 更新

操作 ▾ [下载](#) [应用](#) [管理连接器](#) [搜索说明](#)

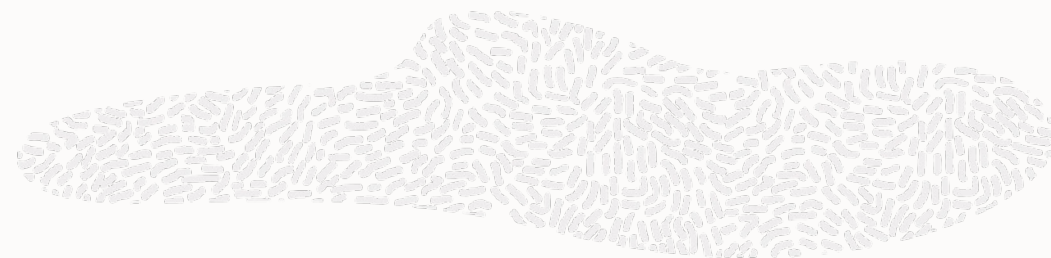
| 状态 | 类型 | 类别 | 版本 | 供应商 | 大小 (MB) | 说明 |
|----|-----------------------------|-----------------|------------|--------|---------|--|
| 可用 | SCOM Connector | Event Connector | 13.2.2.0.0 | Oracle | 24.279 | Microsoft SCOM 2012, 2016 Connector - 13.2.2.0.0 |
| 可用 | SCOM 2007 R2 Connector | Event Connector | 13.2.1.0.0 | Oracle | 22.165 | Microsoft SCOM 2007 R2 Connector - 13.2.1.0.0 |
| 可用 | HP OMU Connector | Event Connector | 13.2.1.0.0 | Oracle | 31.438 | HP Operations Manager UNIX 9 Connector - 13.2.1.0.0 |
| 可用 | HP OMU Connector | Event Connector | 13.2.2.0.0 | Oracle | 32.484 | HP Operations Manager UNIX 9 Connector - 13.2.2.0.0 |
| 可用 | IBM Tivoli Netcool/Omnib... | Event Connector | 13.5.1.0.0 | Oracle | 0.005 | IBM Tivoli Netcool/Omnibus REST Event Connector - 13.5.1.0.0 |
| 可用 | IBM Tivoli Netcool/OMNI... | Event Connector | 13.2.1.0.0 | Oracle | 21.610 | IBM Tivoli Netcool/OMNibus 7.2, 7.3, 7.4, 8.1 Connector - 13.2.1.0.0 |
| 可用 | IBM Tivoli Netcool/OMNI... | Event Connector | 13.2.2.0.0 | Oracle | 20.905 | IBM Tivoli Netcool/OMNibus 7.2, 7.3, 7.4, 8.1 Connector - 13.2.2.0.0 |
| 可用 | IBM Tivoli Netcool/OMNI... | Event Connector | 13.2.3.0.0 | Oracle | 22.656 | IBM Tivoli Netcool/OMNibus 7.2, 7.3, 7.4, 8.1 Connector - 13.2.3.0.0 |
| 可用 | SCOM Connector | Event Connector | 13.2.1.0.0 | Oracle | 23.233 | Microsoft SCOM 2012, 2016 Connector - 13.2.1.0.0 |
| 可用 | SCOM 2007 R2 Connector | Event Connector | 13.2.2.0.0 | Oracle | 23.212 | Microsoft SCOM 2007 R2 Connector - 13.2.2.0.0 |

过去的活动

| 操作 | 状态 | 类型 | 类别 | 版本 | 管理员 |
|----|----|----------------|-----------------|------------|--------|
| 可用 | 成功 | SCOM Connector | Event Connector | 13.2.2.0.0 | SYSMAN |



Oracle Enterprise Manager 连接器



Ticketing连接器

- 支持使用外部 Ticketing 系统打开意外事件incident工单，例如：
 - BMC Remedy Service Desk
 - CA Service Desk
 - HP Service Manager
 - ServiceNow
 - PagerDuty
 - JIRA Service Management

Event连接器

- 支持与外部系统共享事件events，例如：
 - HP Operations Manager
 - IBM Tivoli Netcool/OMNibus
 - Microsoft SCOM

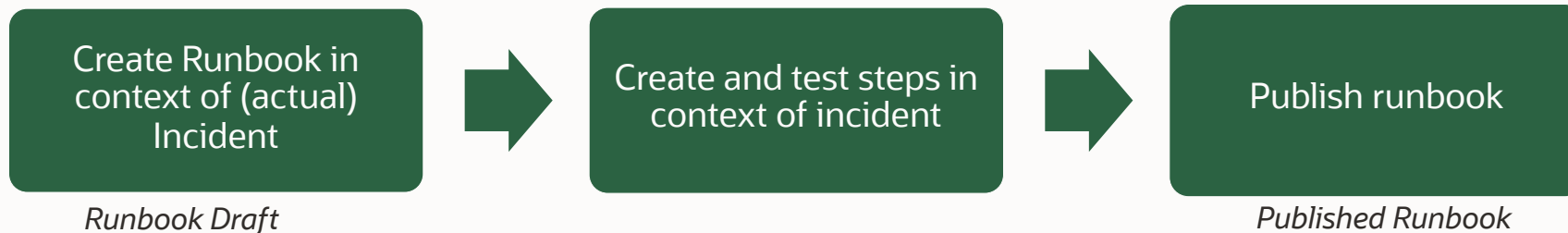
查看所支持的版本, 请参考 My Oracle Support: <https://support.oracle.com/>, OEM 的认证页面



动态运行手册Runbooks

动态Runbooks允许您从专家那里获取诊断和解决事件的过程知识和专业知识，并将它们存储在Enterprise Manager中，以便其他Enterprise Manager用户随时访问和执行。

创建 Runbooks



使用 Runbooks



在意外事件管理器中使用动态运行手册

The image shows a multi-step process in Oracle Enterprise Manager Cloud Control 13c. It starts with an incident list, moves to incident details, then to a 'Start a Runbook Session' dialog, and finally to a detailed runbook page for 'Fast Recovery Area Runbook: Incident 440'. The runbook page lists six steps for resolving the incident.

Start a Runbook Session

| Start Session | Name | Owner | Description |
|-----------------------|----------------------------|--------|-------------|
| <input type="radio"/> | Fast Recovery Area Runbook | SYSMAN | |

Runbook Sessions > Fast Recovery Area Runbook: In...

Fast Recovery Area Runbook: Incident 440

Description Runbook for orcl.us.oracle.com (Database Instance)

Incident Details

| Display ID | Message | Target Name | Target Type Display Name |
|------------|--|--------------------|--------------------------|
| 440 | The value of Fast Recovery Area % Used is 85.149 | orcl.us.oracle.com | Database Instance |

1 Overview & Prerequisites

This runbook can be used to triage and resolve FRA incidents.

Prior to beginning:

1. Set up a named credential for the target database on which the FRA incident has occurred
2. Set up a privileged named credential for the target database in case you need to reconfigure the FRA

2 Review the metric that triggered the incident

Run this step to review the latest metric value for FRAPercentUsed in MESFRA_CHECK

3 Find out why FRA usage is high

Run this step to identify the file types using the most FRA space in orcl.us.oracle.com.

4 Check the FRA size for the database

Run this step to check the database FRA parameters for orcl.us.oracle.com. Verify the FRA size is set to at least 1 Terabyte.

5 Reset the size of the FRA, if necessary

If the db_recovery_file_dest_size is less than 1 Terabyte, run this step to set that value to 1 Terabyte

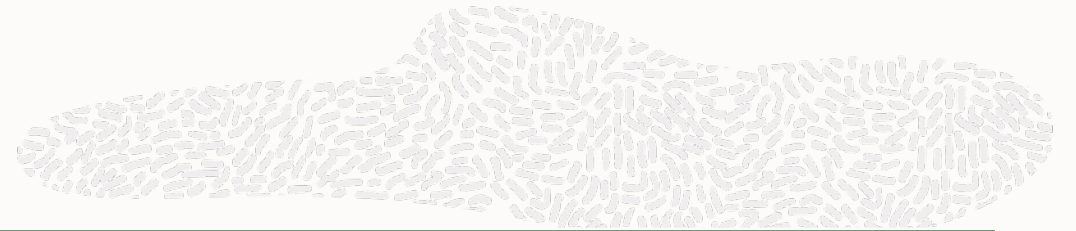
6 Confirm the updated value of the FRA size

在意外事件管理器中，您可以：

- 启动事件的运行手册会话
- 选择适当的运行手册
- 执行 Runbook 步骤以调试和解决事件



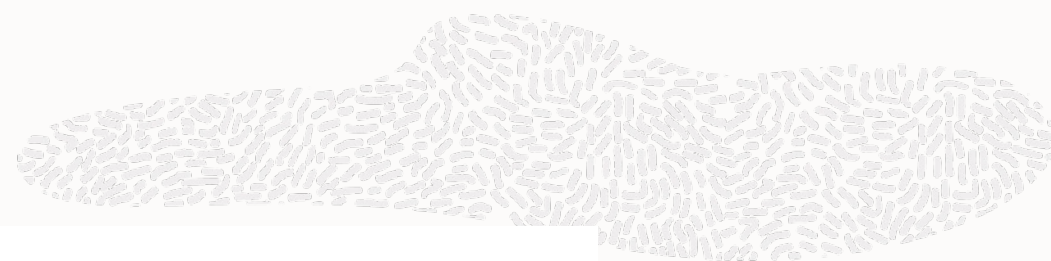
Runbook Steps



| Runbook Step Type | Used for... |
|-------------------|---|
| Note | 提供说明，可以使用 markdown 语法 添加指向 MOS 注释的链接 [MOS 链接文本] (MOS: MOS ID) 将链接添加到任何地方 [链接文本] (http://www.somesite.com) |
| Target SQL | 对目标数据库运行查询、DML、DDL 使用命名凭据 |
| Repository SQL | 对存储库视图运行查询 |
| Metric Data | 在图表中显示指标数据 |
| OS Command | 针对以下对象运行同步操作系统命令或脚本： 主机目标 Target 的主机 使用命名凭据 |



动态运行手册Runbooks

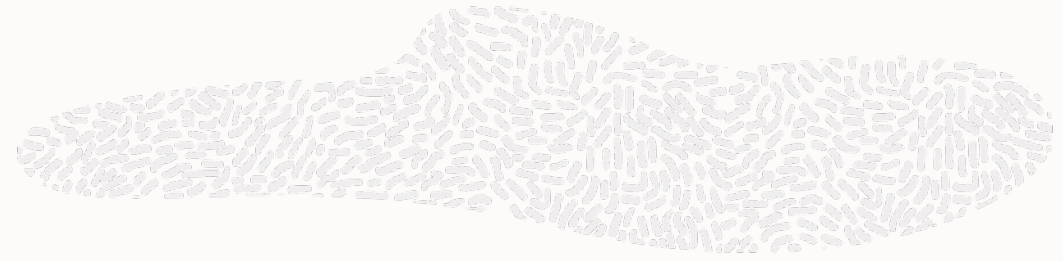


Feature Updates

| Feature/Update | Release |
|--|--|
| Oracle Provided Runbooks and OS Command Step | Enterprise Manager 13c Release 5 Update 15 (13.5.0.15) |
| Import/Export and Note Step External Links | Enterprise Manager 13c Release 5 Update 11 (13.5.0.11) |
| Relevant Runbooks | Enterprise Manager 13c Release 5 Update 10 (13.5.0.10) |
| Create Like | Enterprise Manager 13c Release 5 Update 8 (13.5.0.8) |
| Dynamic Runbooks Initial Release | Enterprise Manager 13c Release 5 Update 7 (13.5.0.7) |



意外事件管理器



集中管理、诊断和解决意外事件

Incident Manager: All open incidents Dashboard Page Refreshed Oct 15, 2019 11:40:46 AM PDT

Views Actions >> Acknowledge

| Severit | Summary | Target | Priority | Status | Age | Time Since Last Update | Owner | Ackn | Escal | Type | Category |
|---------|--|-----------|----------|--------|-------------|------------------------|-------|------|-------|----------|--------------|
| ⊖ | The current status of the target is Down | exadb2... | None | New | 22 days ... | 3 days 2 hours | - | No | No | Incident | Availability |
| ⊖ | The current status of the target is Down | exadb1... | None | New | 22 days ... | 3 days 2 hours | - | No | No | Incident | Availability |
| ⊖ | The current status of the target is Down | dbm01_... | None | New | 22 days ... | 3 days 2 hours | - | No | No | Incident | Availability |

Rows Selected 1 Columns Hidden 24 Row count

⊖ The current status of the target is Down Open in ne
Symptom, Unassigned, Not acknowledged

General Events Notifications My Oracle Support Knowledge All Updates Related Events

Incident Details

ID 1483

Target [exadb2_exadb21 \(Database Instance\)](#)

Incident Created Sep 23, 2019 12:26:19 AM MDT

Last Updated Oct 12, 2019 10:01:07 AM MDT

Summary The current status of the target is Down

Internal Event Name Status

Internal Reported State DOWN

Event Type Target Availability

Category Availability

Causal Analysis Update Symptom

[Show internal values for attributes ...](#)

Tracking Acknowledge **More** ▾

Escalated No Owner -

Priority None Acknowledged No

Status New

Last Incident created by rule (Name = Incident management rule set for all targets, Incident creation rule Comment for a Target Down availability status [System generated rule]): on Sep 23, 2019 12:26:19 AM MDT

This incident will be automatically cleared when the underlying issue is resolved.

Guided Resolution

Recommendations

If the target was brought down as part of a planned maintenance, consider creating a blackout on the target. If the target was brought down in error, start it by going to the target homepage, target menu -> Control -> Start up, or start the target manually. If the target status is not correct, refer to My Oracle Support article Enterprise Manager 12c: How to run the "Targets Status Diagnostics Report" to Troubleshoot Target Status Availability issues (up, down, metric collection error, pending, unreachable) for all Targets (Doc ID 1546575.1).

Diagnostics **Actions** **Corrective Actions** ⓘ

[View topology](#) [Blackout Target](#) [Submit from library](#)

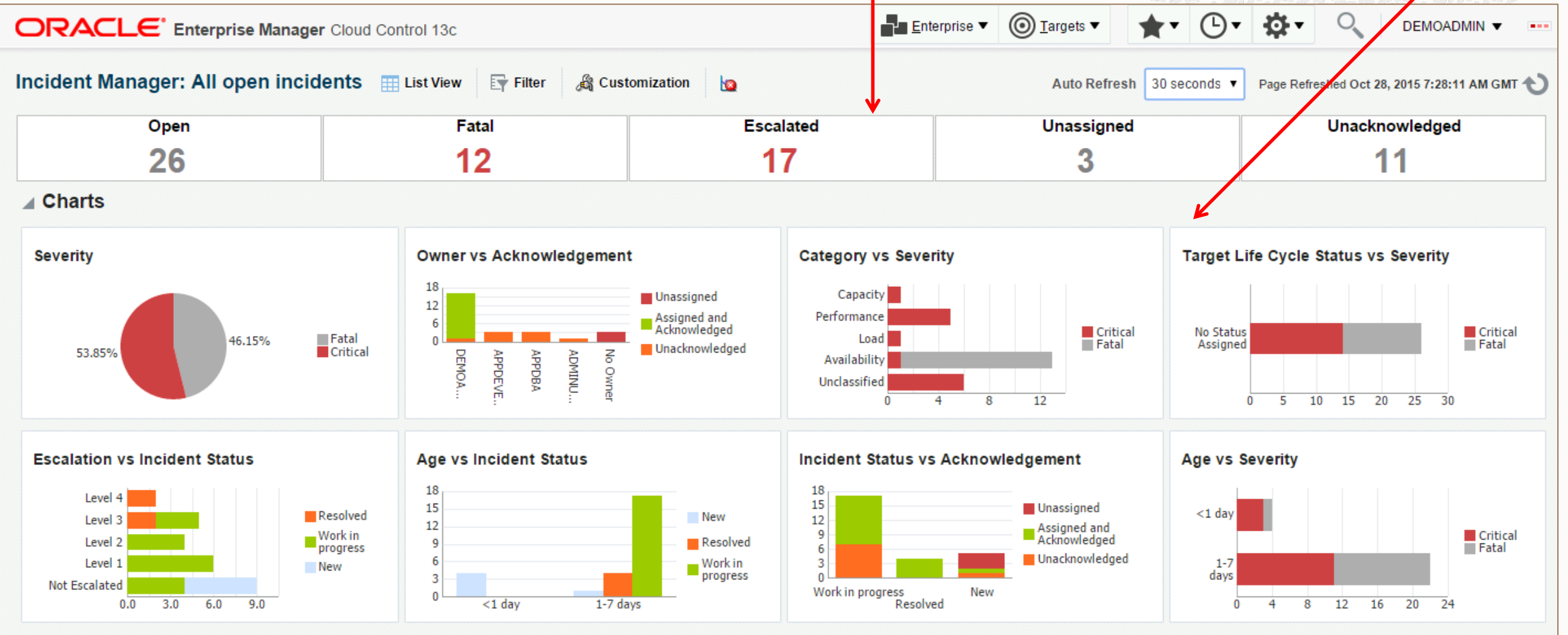
[View recent configuration changes](#) [Add corrective action](#)



意外事件仪表板

Summary

Charts



仪表盘

Overview

Targets with Status



Incidents (Last 7 Days)



Jobs



Patch Recommendations



Infrastructure

Hosts

1

Host Status



Databases

3

Database Status



WebLogic Servers

2

WebLogic Server Status



Host Incidents



Database Incidents



WebLogic Server Incidents



OS Versions



Database Versions



WebLogic Server Versions



Compliance

Compliance (Violations)



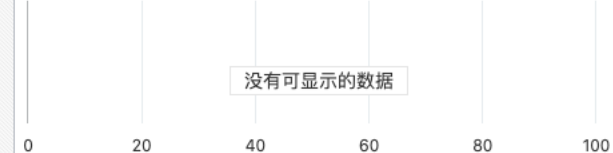
Lowest Compliance Scores (Host)



Lowest Compliance Scores (Database)



Lowest Compliance Scores (WebLogic Server)

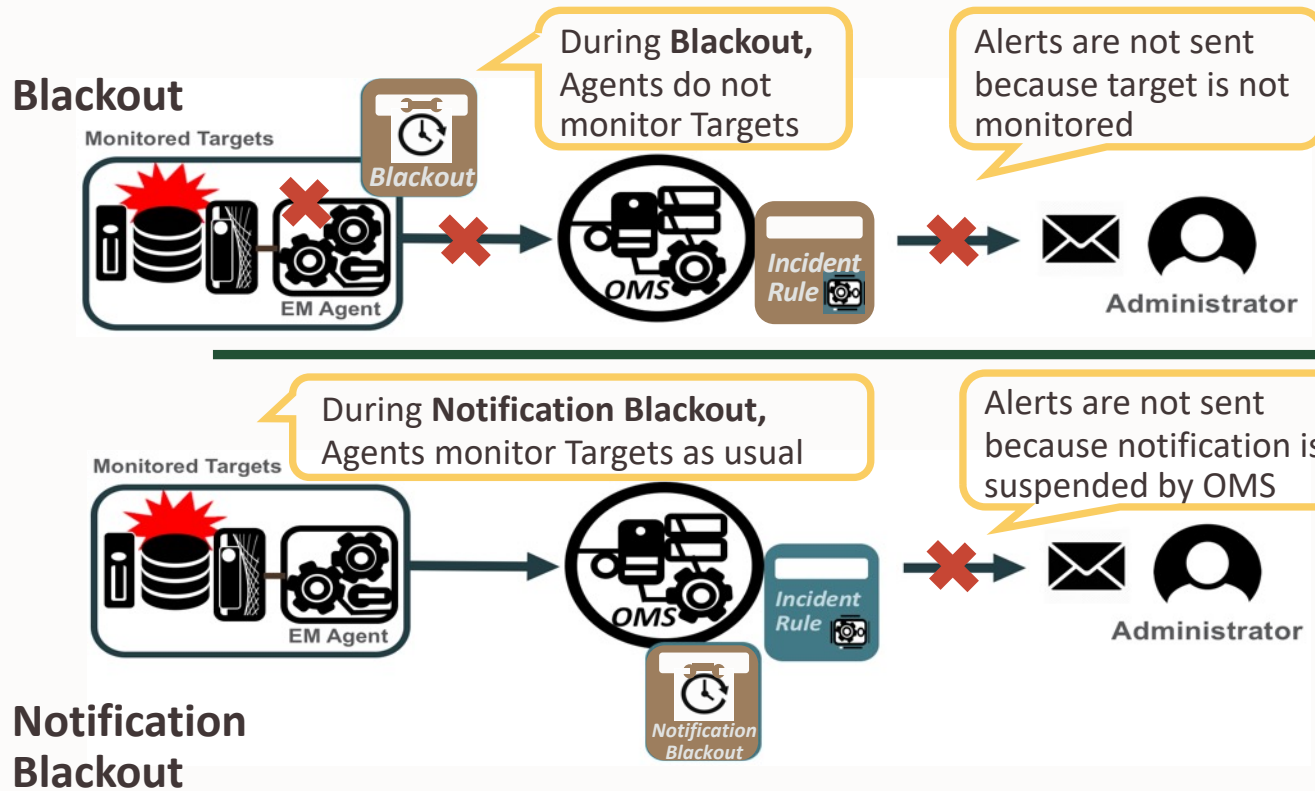


使用封锁Blackouts来防止计划内维护期间出现虚假警报

在组上创建封锁 blackouts

当给目标打补丁且 Agent 无法与目标交互时使用 *Blackout*

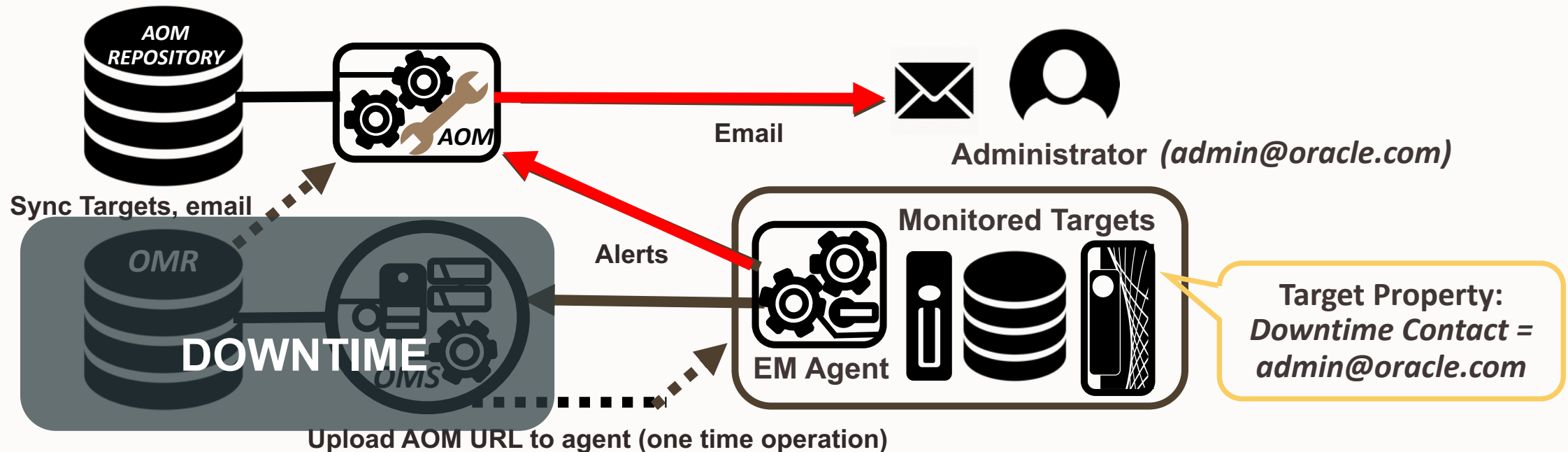
使用通知封锁*Blackout* 你可监控目标但是不想收到告警通知时



7 x 24 警报, 始终在线监控 (Always-On Monitoring AOM)

独立的 Java (J2SE) 应用程序, 可在 EM 停机期间为目标提供电子邮件警报
独立运行, 无需 EM 中间层

从代理接收目标 availability alerts, Metric alerts, and Metric evaluation error 事件
将电子邮件发送到指定为“停机时间联系人”目标属性的地址“



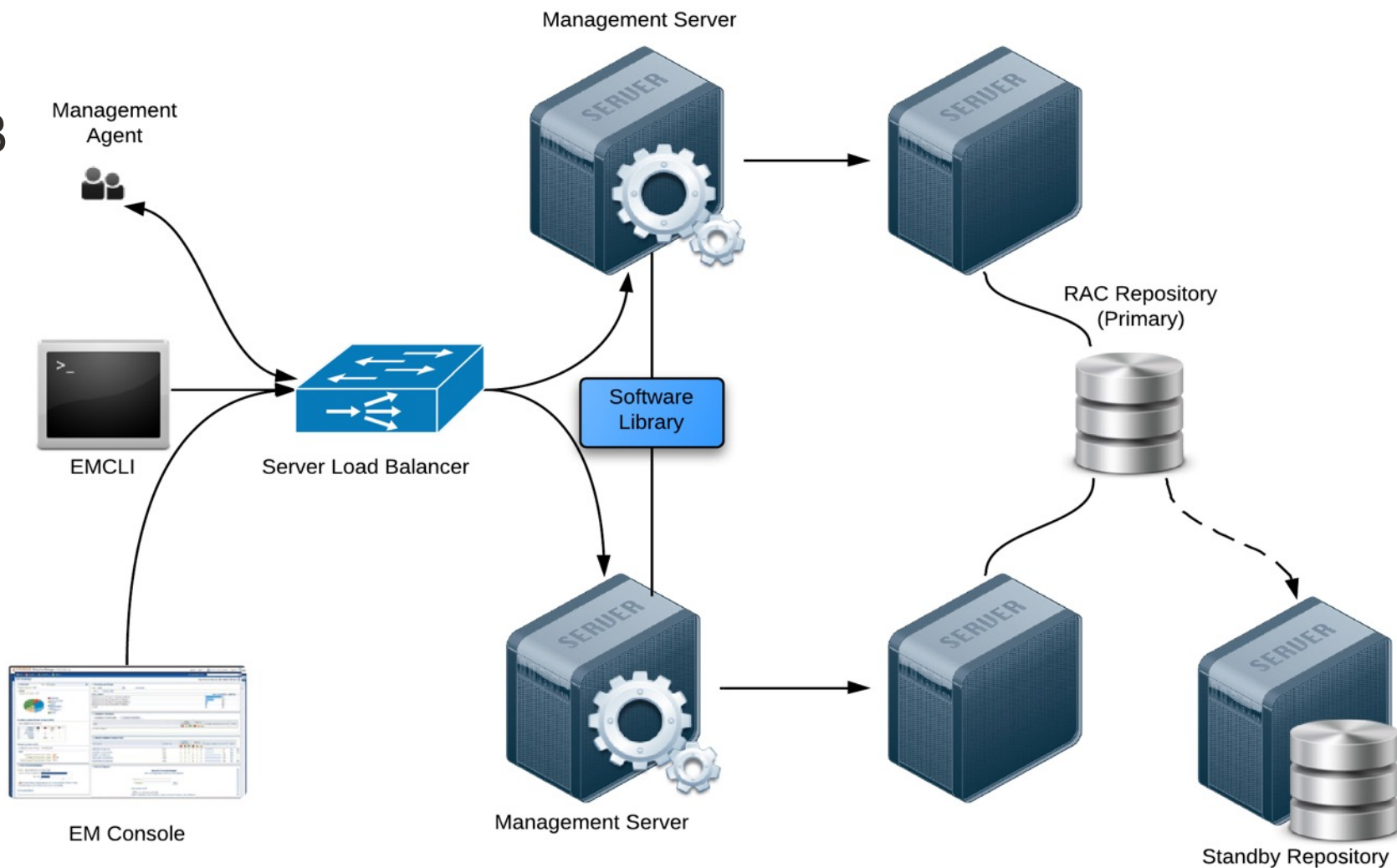
EM13c MAA 部署--- 7 x 24 警报, 始终在线监控

- 四个级别的EM HA 部署

| | Description | Load Balancer Requirements | Cost |
|----------------|--|--|----------|
| Level 1 | OMS and repository on their own hosts. No failover. Repository backup and OMS export config | None | \$ |
| Level 2 | OMS installed on shared storage with a VIP based failover. Database protected with Local Data Guard. | None | \$\$ |
| Level 3 | OMS in Active/Active configuration. RAC repository with Local Data Guard | SLB at primary | \$\$\$ |
| Level 4 | Primary OMS in Active/Active configuration RAC Repository on primary site. Standby OMSs at DR site Standby RAC database at DR Site. | SLB at primary and standby sites Optional GLB | \$\$\$\$ |

Level 3 级别的HA部署--- 7 x 24 警报, 始终在线监控

- 外部访问通过SLB接入
- 多个OMS之间使用SLB
- OMS共享软件库
- 资料库使用RAC
- 资料库增加本地主备

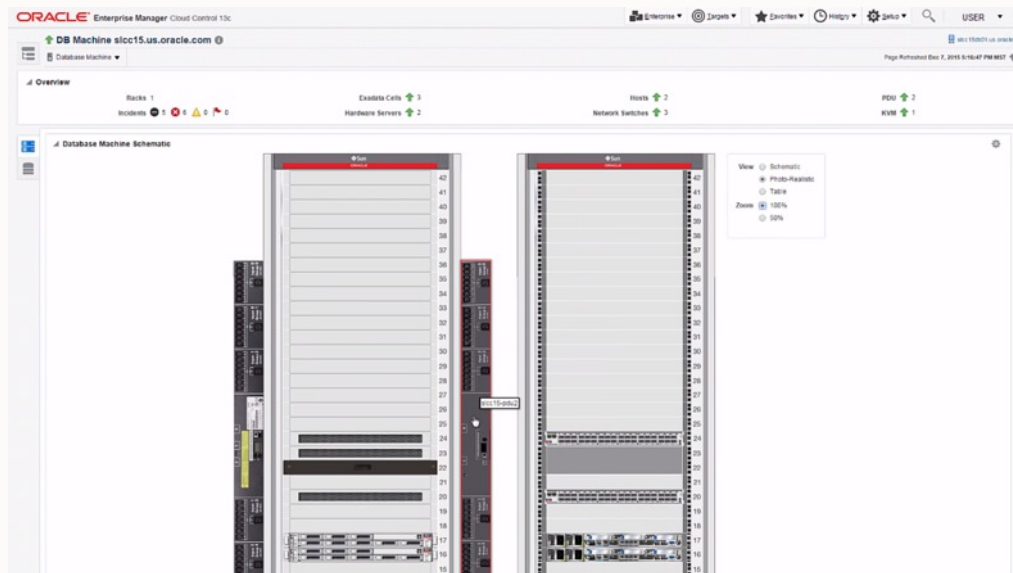




Oracle Exadata管理

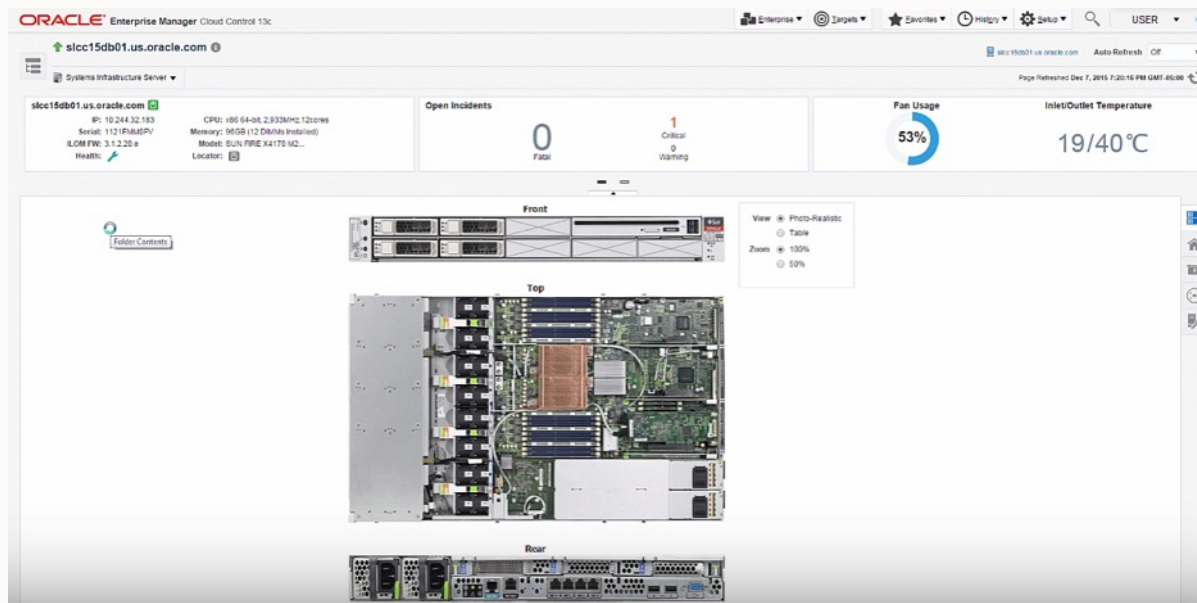
集成 软硬件集中管理

- 硬件图表及报警
- 集成 及深度软件管理
- 软硬件拓扑图, 配置管理



主动式支持

- “Phone home”
- 健康检查
- 补丁及最佳实践的建议



Exadata管理 软硬件统一视图

硬件视图

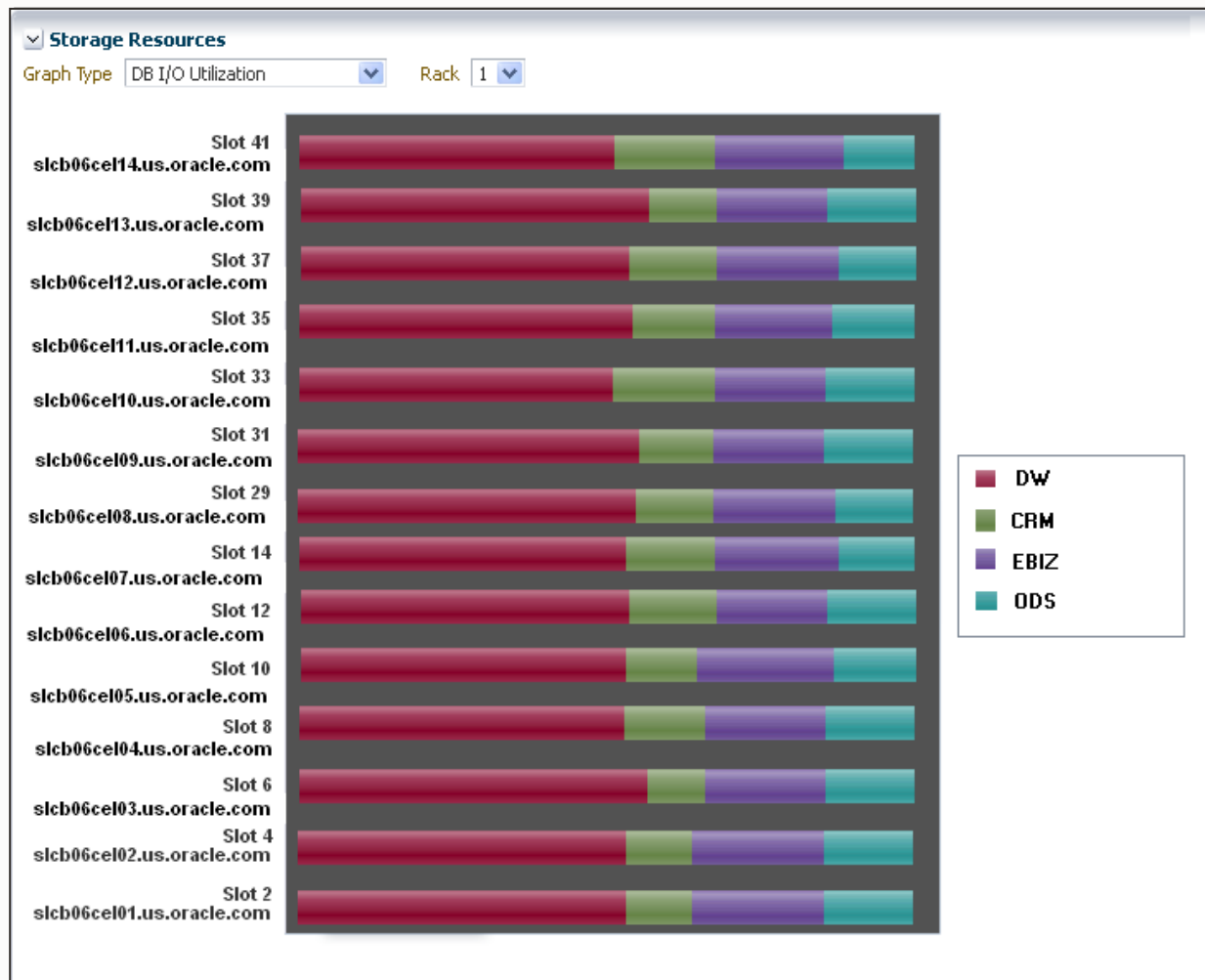
- cells, compute nodes and switches的各种图例
- 硬件组件告警

软件/系统视图

- 数据库、服务、Cluster等的性能、可用性、使用情况
- 数据库、Cluster、ASM等的告警
- 数据库系统/Cluster拓扑图

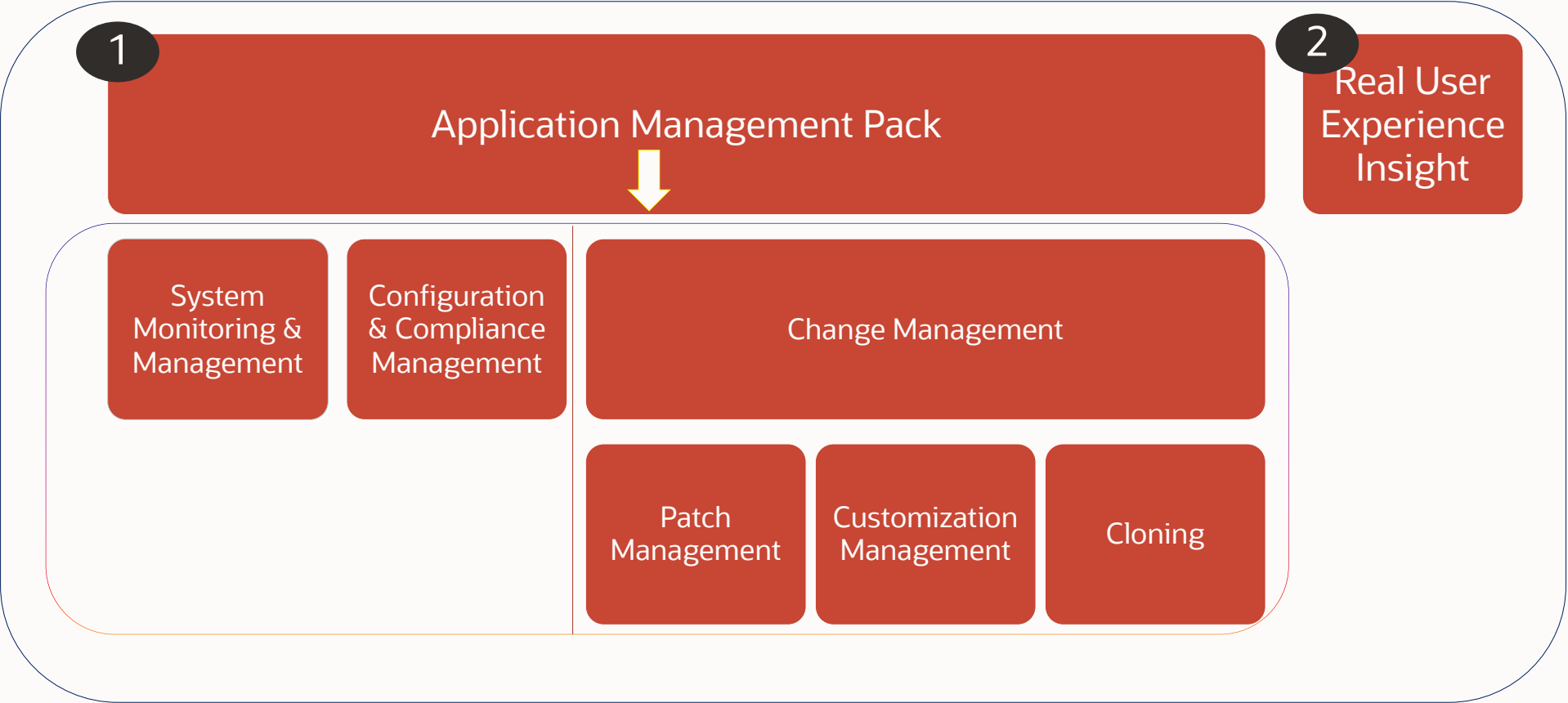
配置视图

- 所有组件的版本汇总，包括补丁建议



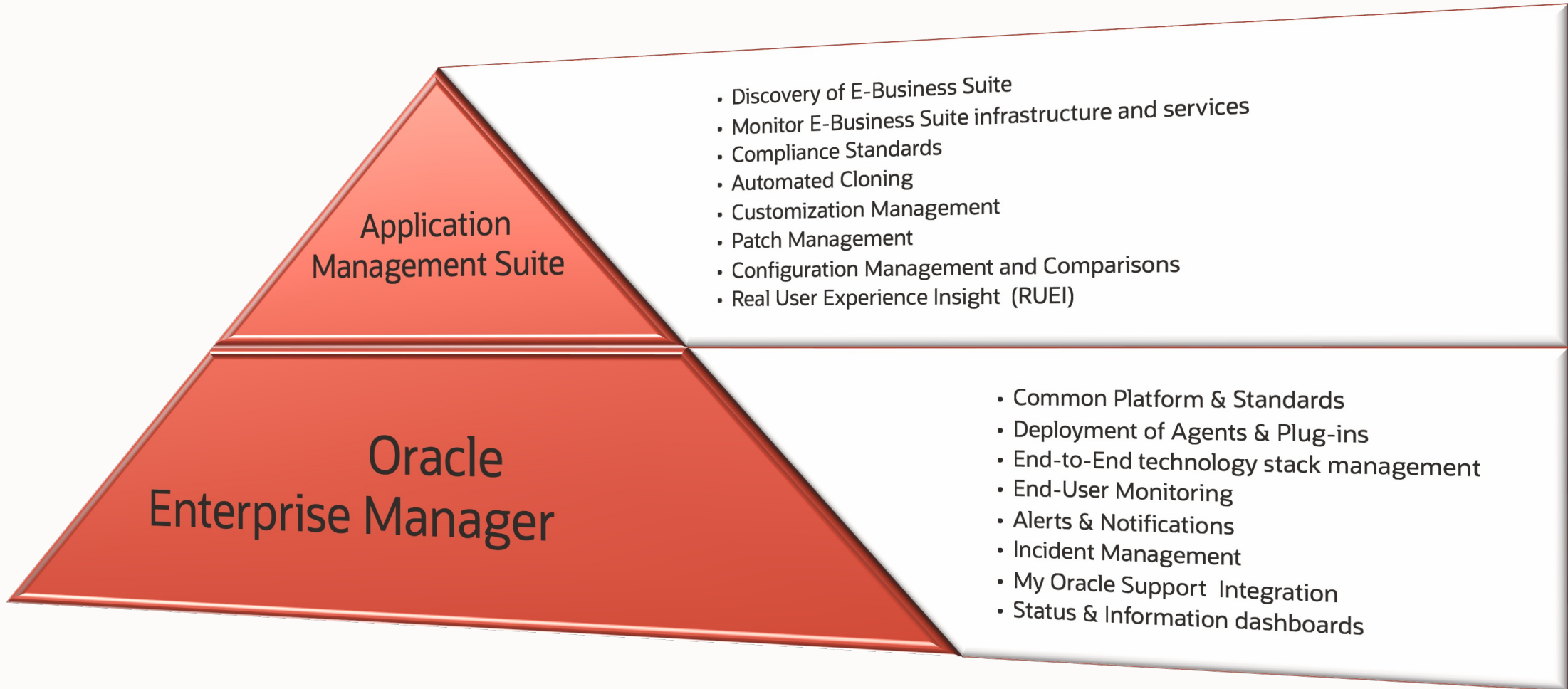
Oracle E-Business Suite 的监控

EBS Plug-in



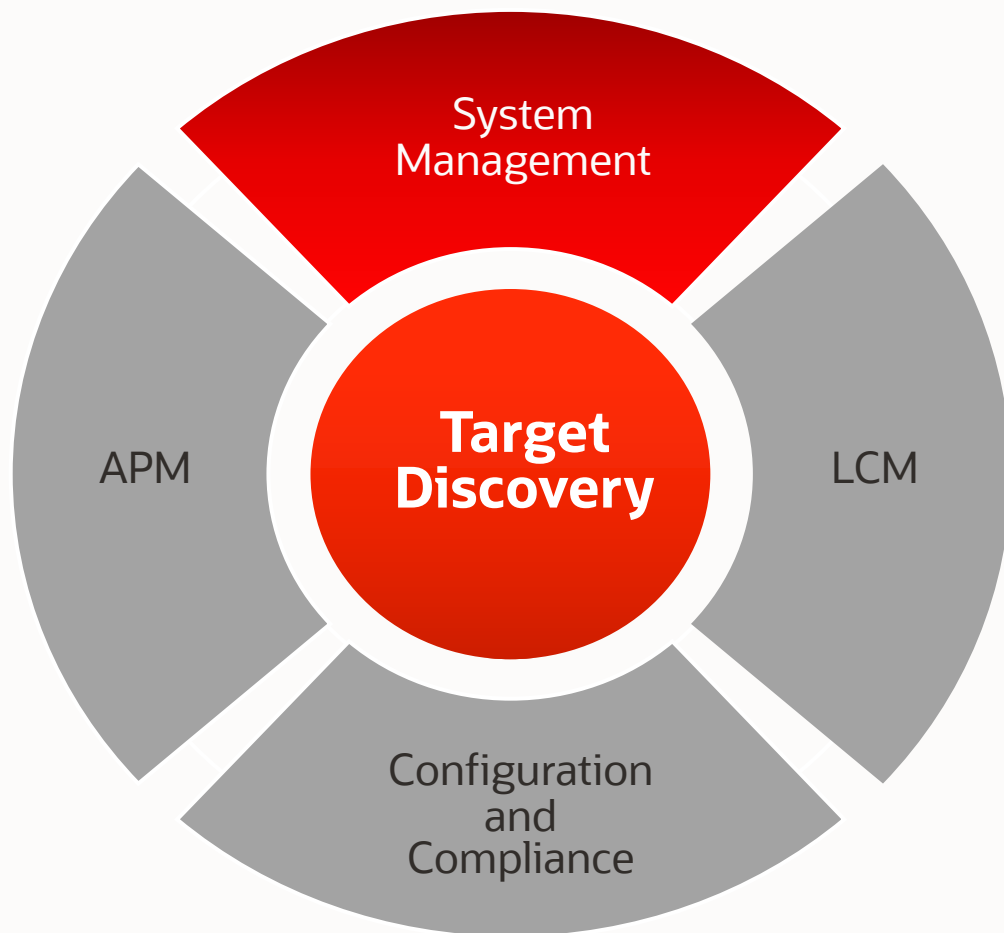
Oracle E-Business Suite 的监控

Enterprise Manager Framework and AMS Capabilities



Oracle E-Business Suite 的监控

系统监控与管理



- EBS 目标的发现
- 集中监控
- 并发请求监控
- 用户监控
- 性能监控
- 服务级别监控
- 意外事件和通知
- 配置与合规性



Microsoft SQL Server 监控主页

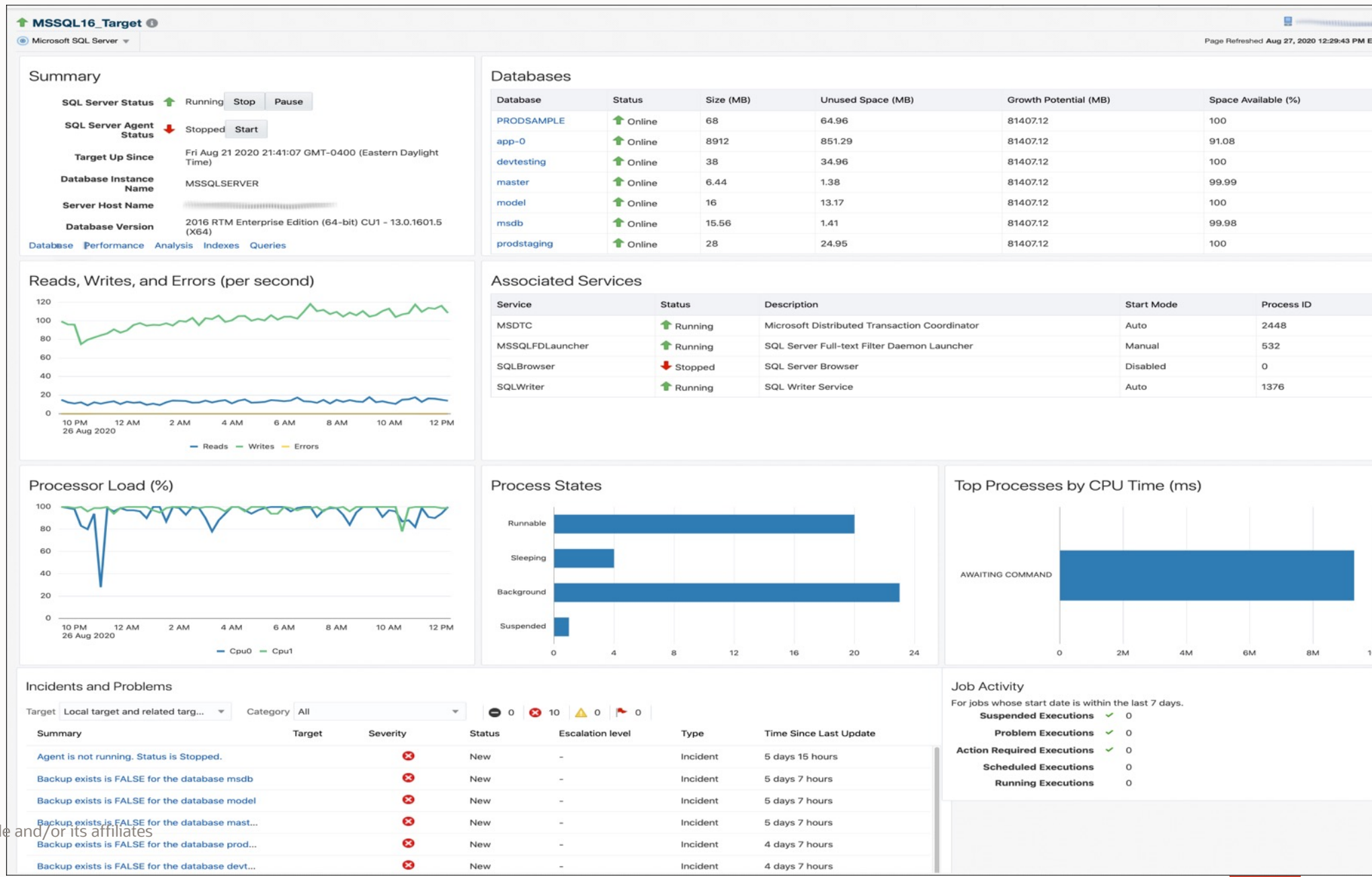
整体汇总信息

数据库状态

读写及相关进程
负载信息

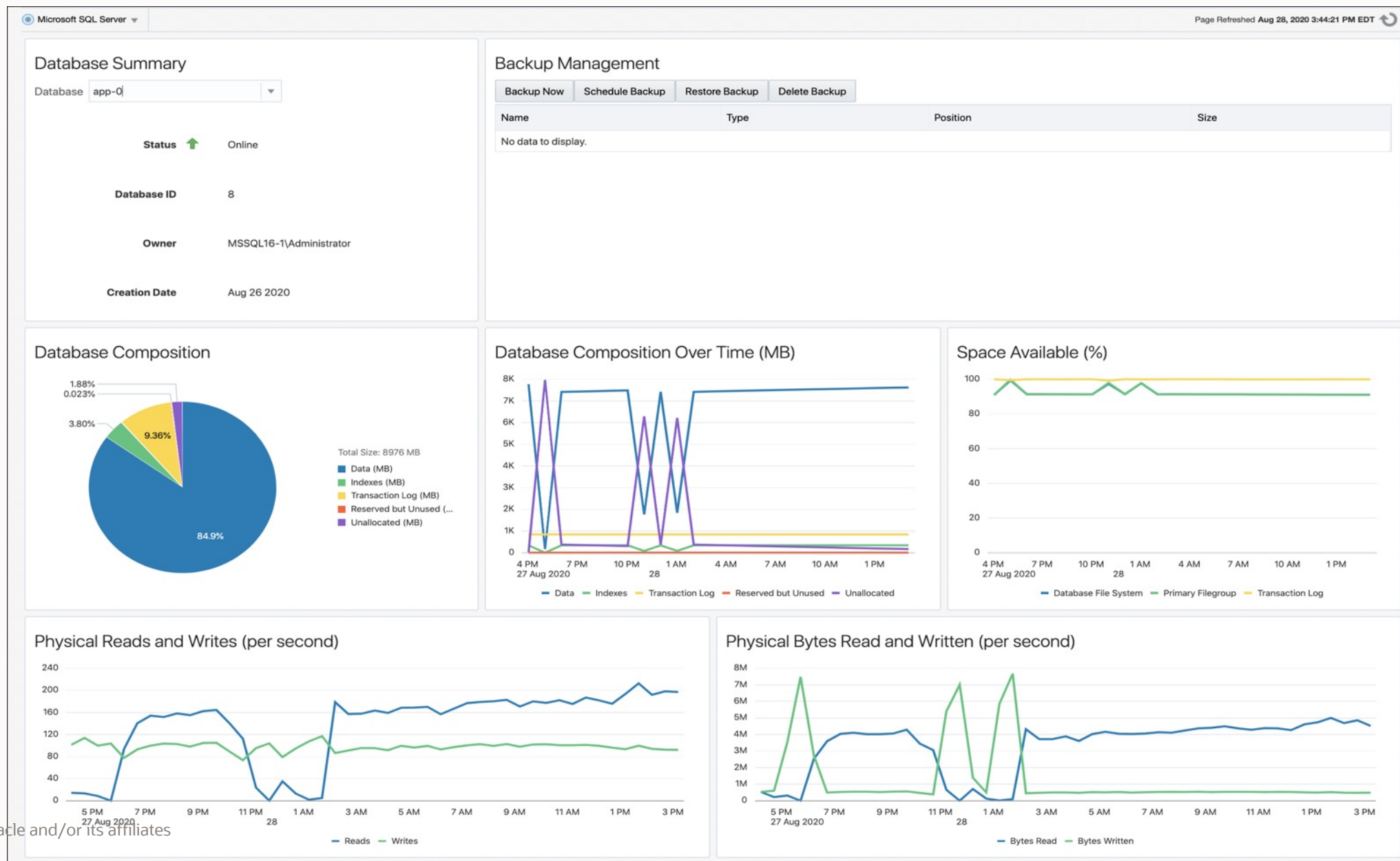
任务调度信息

故障及报错信息



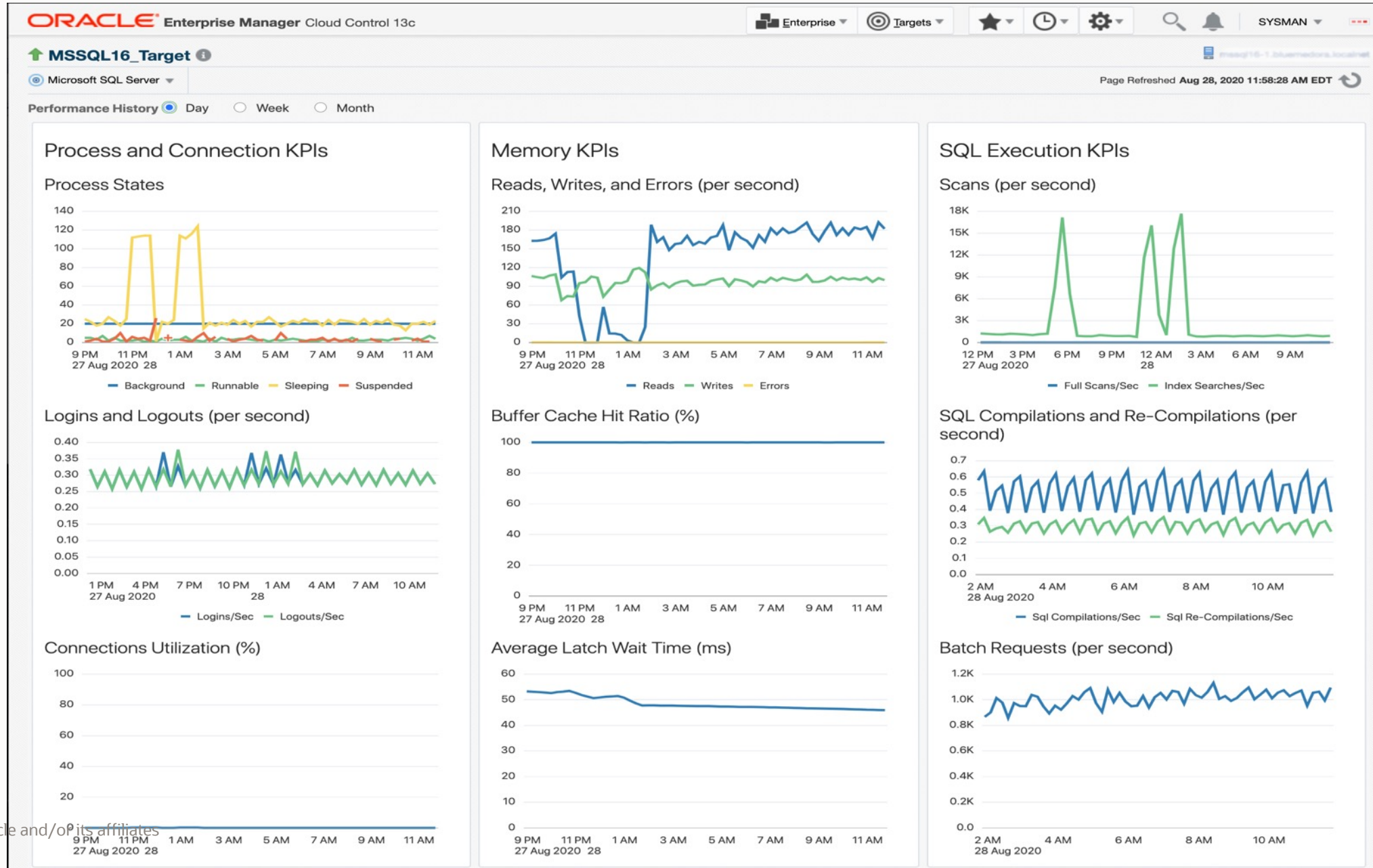
Microsoft SQL Server 数据库主页

数据库的性能指标
数据库的配置度量
数据库备份和恢复操作



Microsoft SQL Server 性能主页

根据收集的指标构建各种性能KPI图。



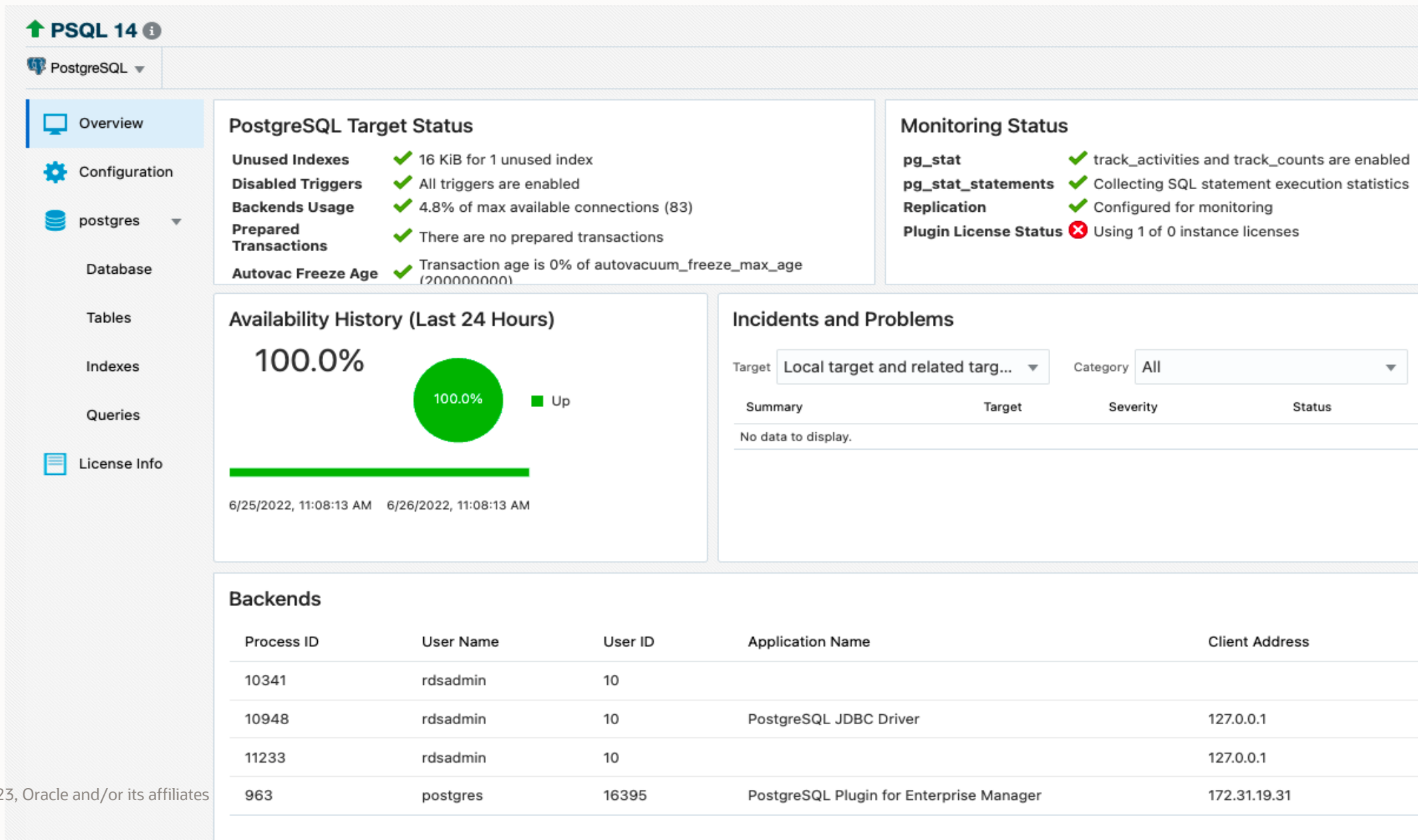
MySQL 数据库主页

- 性能仪表板显示特定指标或指标集的性能
- 配置信息
- 可链接到周和月概览的数据
- 每个指标线上的每个点表示收集的数据
- 若要查看每个单独收集点的数据，可将光标悬停在该线上。将显示一个工具提示，列出数据类型、收集数据的时间和收集的度量值。



PostgreSQL 监控主页

概览信息
监控状态
报警信息
Integration
Plumber 团队
提供 plugin



PostgreSQL 数据库监控

监控关键性能指标

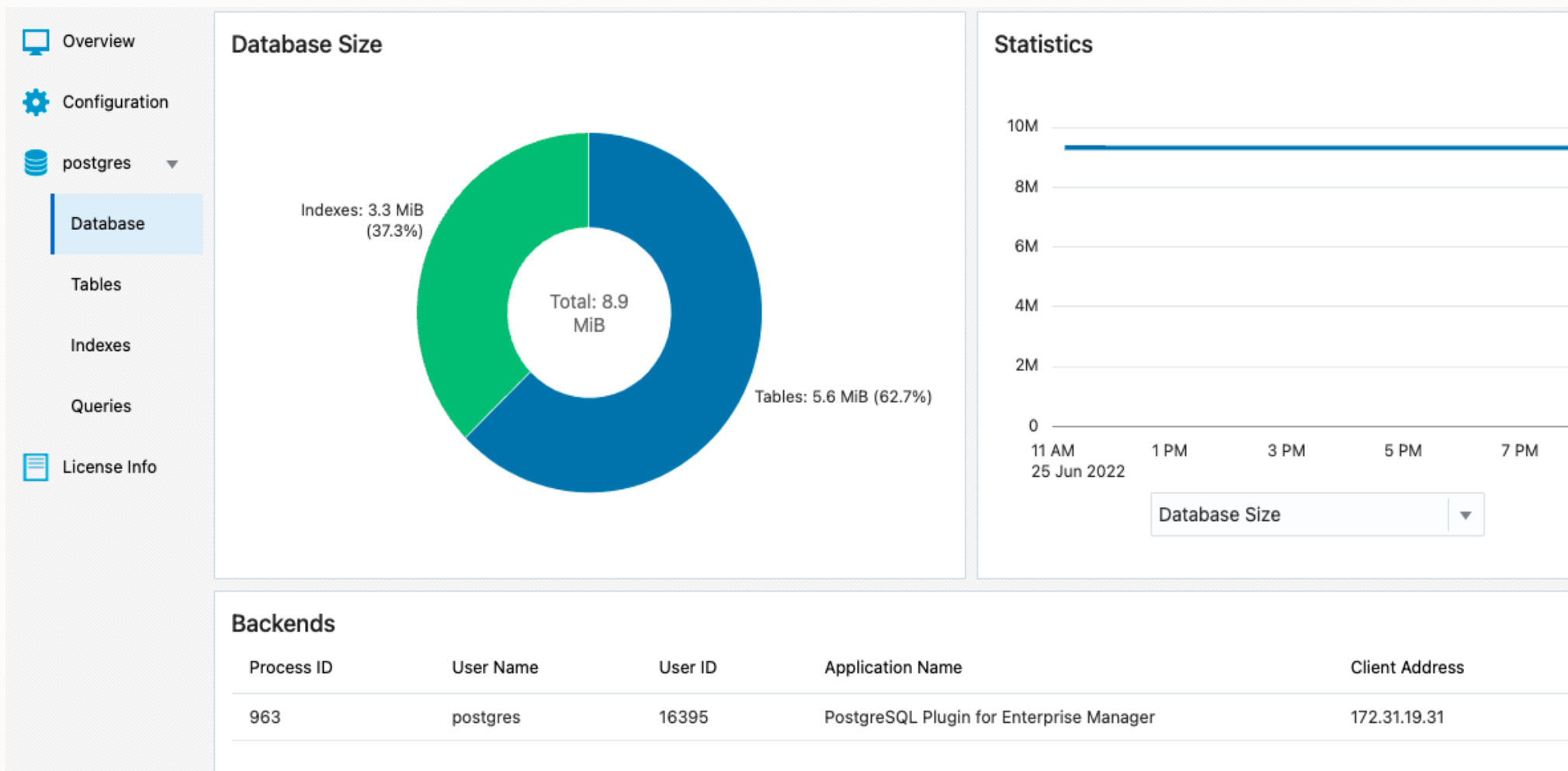
Databases

Tables

Indexes

Queries

Configuration
information



PostgreSQL 数据库告警

告警指标的阈值定制

如：对死锁、数据库大小或性能不佳的查询等关键指标发出警报

| Database | Alert Type | Alert Threshold | Alert Action |
|---|------------|---------------------------------|----------------------|
| ▼ Databases | | | |
| Backends Connected | >= | <input type="text"/> | <input type="text"/> |
| Block Read Time per Hour | >= | <input type="text"/> | <input type="text"/> |
| Blocks Hit per Hour | >= | <input type="text"/> | <input type="text"/> |
| Blocks Read per Hour | >= | <input type="text"/> | <input type="text"/> |
| Block Write Time per Hour | >= | <input type="text"/> | <input type="text"/> |
| Committed Transactions per Hour | >= | <input type="text"/> | <input type="text"/> |
| Conflicts due to Deadlocks per Hour | >= | <input type="text"/> | <input type="text"/> |
| Conflicts due to Dropped Tablespaces per Hour | >= | <input type="text"/> | <input type="text"/> |
| Conflicts due to Lock Timeouts per Hour | >= | <input type="text"/> | <input type="text"/> |
| Conflicts due to Old Snapshots per Hour | >= | <input type="text"/> | <input type="text"/> |
| Conflicts due to Pinned Buffers per Hour | >= | <input type="text"/> | <input type="text"/> |
| Database Name | | | |
| Database Size | >= | <input type="text"/> | <input type="text"/> |
| Database Size (MB) | >= | <input type="text"/> | <input type="text"/> |
| Deadlocks per Hour | >= | <input type="text" value="10"/> | <input type="text"/> |
| Is Template DB | | | |
| Queries Cancelled per Hour | >= | <input type="text"/> | <input type="text"/> |
| Rolled Back Transactions per Hour | >= | <input type="text"/> | <input type="text"/> |
| Rows Accessed per Hour | >= | <input type="text"/> | <input type="text"/> |
| Rows Deleted per Hour | >= | <input type="text"/> | <input type="text"/> |
| Rows Fetched per Hour | >= | <input type="text"/> | <input type="text"/> |
| Rows Inserted per Hour | >= | <input type="text"/> | <input type="text"/> |
| Rows Returned per Hour | >= | <input type="text"/> | <input type="text"/> |
| Rows Updated per Hour | >= | <input type="text"/> | <input type="text"/> |
| Temporary Bytes per Hour | >= | <input type="text"/> | <input type="text"/> |
| Temporary Files per Hour | >= | <input type="text"/> | <input type="text"/> |
| Transaction Unfrozen Age | >= | <input type="text"/> | <input type="text"/> |
| ▼ Indexes | | | |
| Cumulative Index Scans | >= | <input type="text"/> | <input type="text"/> |

PostgreSQL 数据库配置参数

更改数据库配置后可能出现性能问题。可查看 PostgreSQL 数据库的所有配置参数值。

The screenshot shows the 'Runtime Parameters' interface. A search bar at the top contains 'Type to filter'. Below it is a table of parameters. The 'archive_timeout' parameter is highlighted. A 'Configuration Parameter Detail' popup window is open, showing details for 'archive_timeout'.

| Parameter | Setting |
|---------------------------------------|--|
| allow_system_table_mods | off |
| application_name | PostgreSQL Plugin for Enterprise Manager |
| archive_cleanup_command | |
| archive_command | /etc/rds/dbbin/pgscripts/rds_wal_archi |
| archive_mode | on |
| archive_timeout | 300 (s) |
| array_nulls | on |
| authentication_timeout | 60 (s) |
| autovacuum | on |
| autovacuum_analyze_scale_factor | 0.05 |
| autovacuum_analyze_threshold | 50 |
| autovacuum_freeze_max_age | 200000000 |
| autovacuum_max_workers | 3 |
| autovacuum_multixact_freeze_max_age | 400000000 |
| autovacuum_naptime | 15 (s) |
| autovacuum_vacuum_cost_delay | 2 (ms) |
| autovacuum_vacuum_cost_limit | 200 |
| autovacuum_vacuum_insert_scale_factor | 0.2 |
| autovacuum_vacuum_insert_threshold | 1000 |

| Property | Value |
|--------------|---|
| Name | archive_timeout |
| Setting | 300 (s) |
| Description | Forces a switch to the next WAL file if a new file has not been started within N seconds. |
| Category | Write-Ahead Log / Archiving |
| Type | integer |
| Valid Values | 0..1073741823 |
| Boot Value | 0 |
| Reset Value | 300 |
| Source | configuration file |
| Source File | /rdsdbdata/config/postgresql.conf |
| Context | sighup |

议程

- 1 使用OEM实现全面监控，降低运维复杂度
- 2 OEM 快速定位故障和解决性能瓶颈



为什么数据库性能是一项挑战?

50%

说诊断性能问题很耗时

45%

缺少用于识别应用程序 SQL 问题的工具

68%

每月计划外停机事件报告

Source: IOUG Survey on Database Manageability

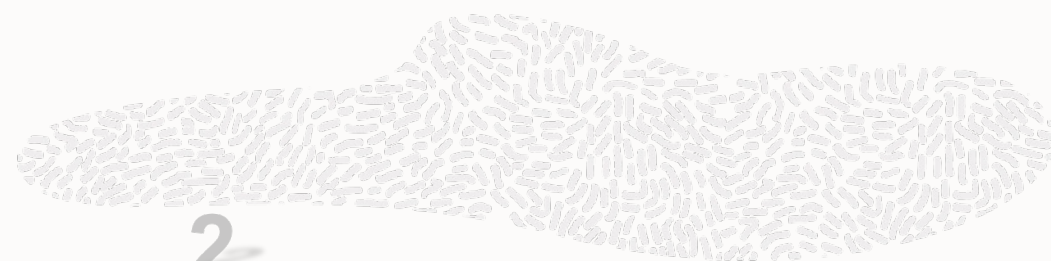


数据库性能的关键问题

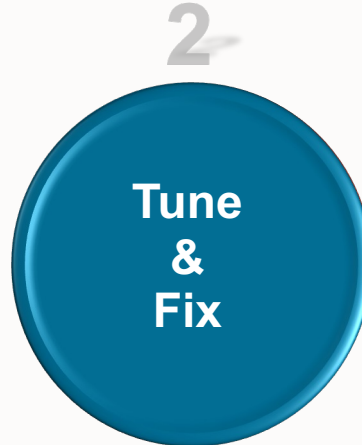
- 如何监控数据库性能?
- 如何分析瞬时性能问题?
- 哪些调优操作会给我带来最大的好处?
- 如何自动调优低效的SQL语句?
- 如何查询耗时的 SQL 在哪里消耗资源?
- 如何确保系统变更或调整能带来更好的性能?



有效、准确、自动化的性能管理



内置自诊断功能引擎
自动数据库诊断监控



性能顾问、调优建议和审查、
自动调优



测试和确认修复



如何监控数据库性能？

挑战

- 如何监控数据库并在出现问题时意识到问题?
- 如何捕获关联的数据库统计信息以进行问题检测和调优?



解决方案

- Automatic Workload Repository (AWR)

- **优点:**

通过自动收集数据库统计信息以进行问题检测和调整, AWR 是数据库自我管理的基础。



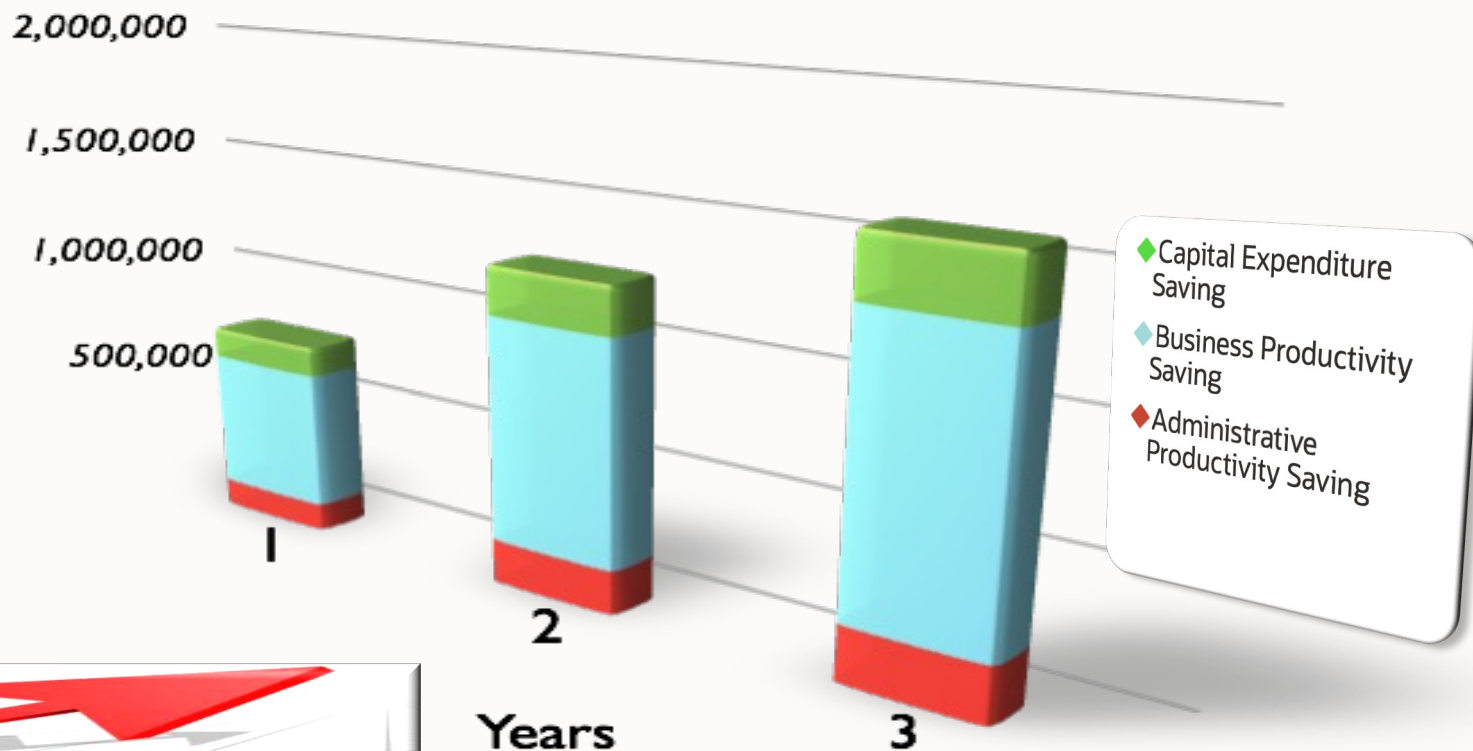
Diagnostics Pack 诊断包

- 数据库管理包系列的一部分
 - **Diagnostics**, Tuning, Life Cycle Management, Cloud Management packs
- 提供实时和自动的性能诊断和监控功能
- 核心功能内置于 Oracle 数据库内核中，并通过 EM 接口公开
- 诊断包无缝集成调优（Tuning）包与 Real Application Testing 功能
- <http://www.oracle.com/technetwork/database/manageability/forrester-packs-tei-white-paper-ow0-134611.pdf>
- <http://www.oracle.com/technetwork/database/manageability/forrester-packs-roi-ow07-134239.pdf>

诊断包的优势

降低性能管理成本

- 提高 DBA 工作效率
- 减少系统停机时间并提高可用性
- 减少服务器上的资本支出



- 3年内实现 122% 的投资回报率
- 15个月投资回收期



AWR 仓库

挑战

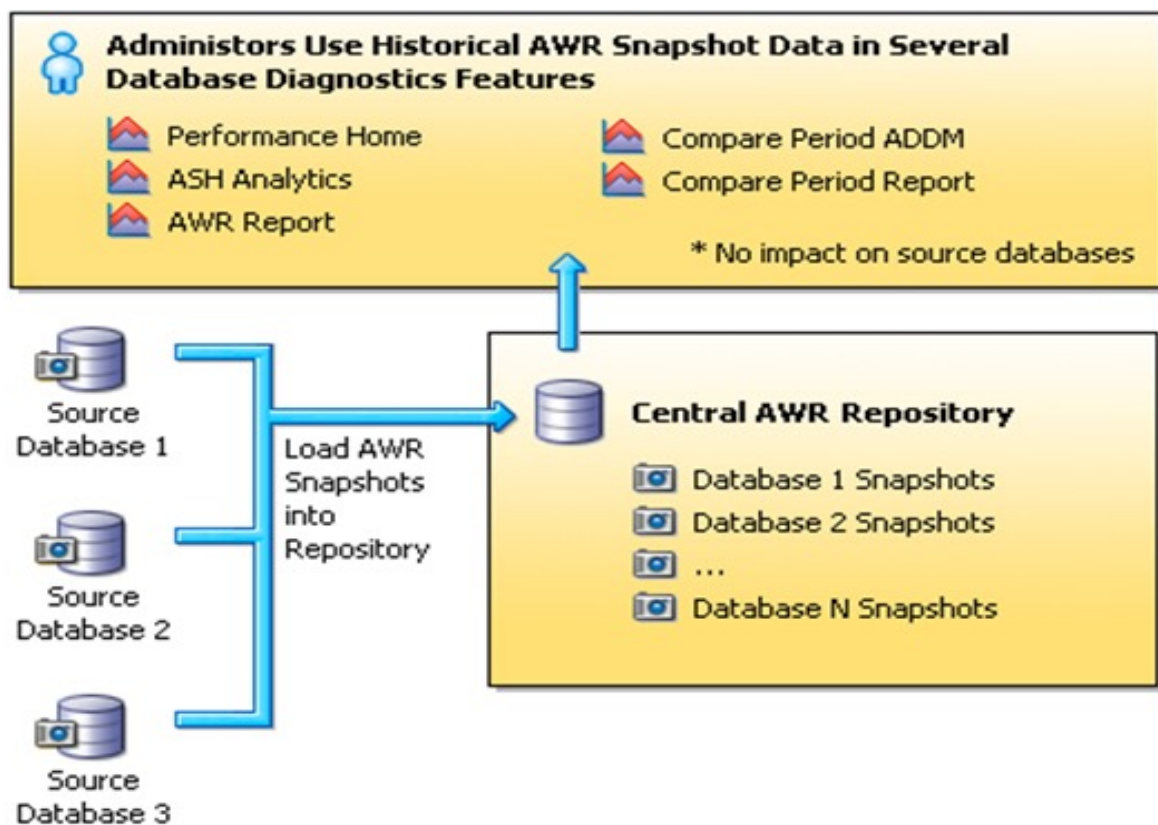
- AWR 默认保留期为 8 天，诊断长时期性能问题有挑战
- 比较本季度与上一季度期间的性能
- 增加 AWR 保留期会增加数据库中的存储开销和成本



解决方案

- AWR 仓库
- **优势:**
AWR 仓库使用标准 AWR 架构中相同的对象进行设置。增强功能在于分区，它允许快速加载、高效查询以及在需要时有效清除不需要的数据。

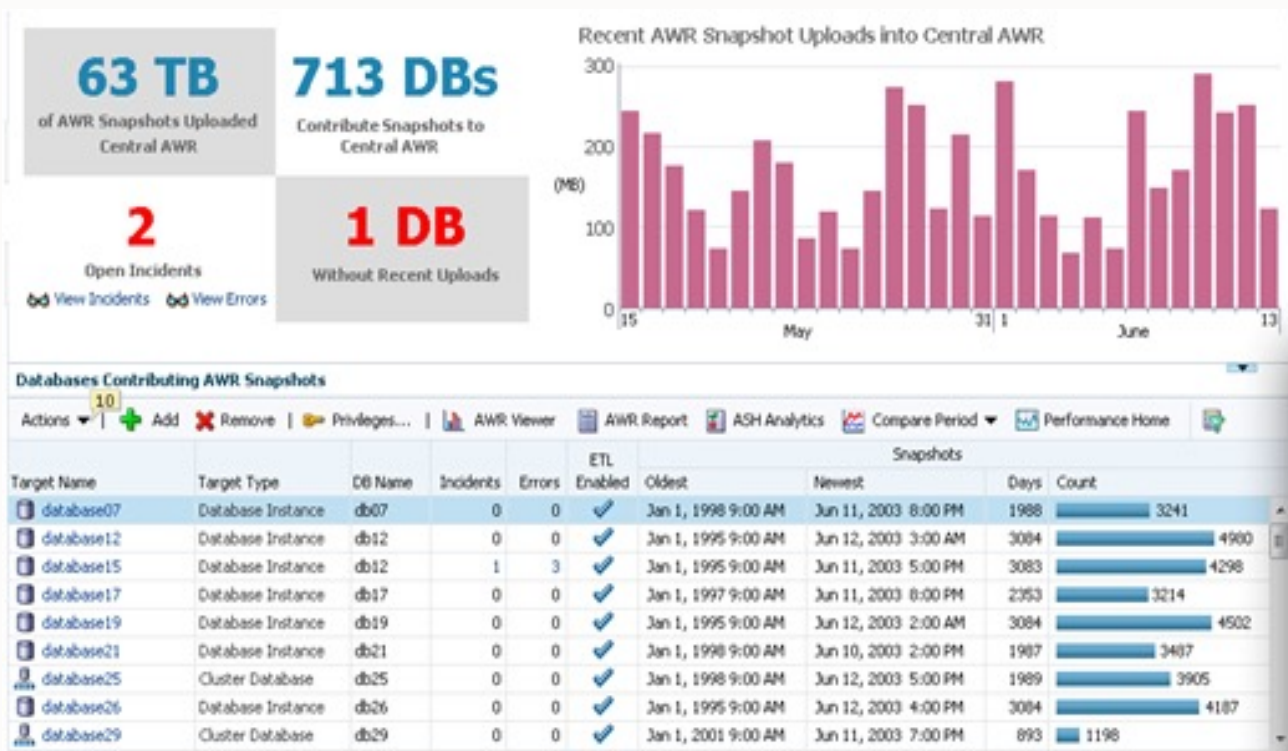
AWR 仓库



- 为长期 AWR 数据保留配置的中央仓库
- AWR 仓库为从数据库收集的历史和正在进行的 AWR 快照
- ETL 作业使用 Oracle 数据泵高效地将快照从源数据库移动到 AWR 仓库
- 保留期可配置为数周、数月、数年或永久（默认）



AWR 仓库-功能



- 仓库仪表板跟踪 ETL 作业
- 提供的所有 AWR 功能
 - 性能主页
 - AWR 报告
 - ASH 分析
 - ADDM 期间比较
 - AWR 比较期间报告
- 无缝集成到 EM UI 中
- 源生产数据库上的零开销



如何查看和分析瞬时性能问题？

挑战

- DBA接到紧急电话：“数据库非常慢！”
- 实时或在过去某个精确点确定性能问题的根本原因，即使会话已断开连接

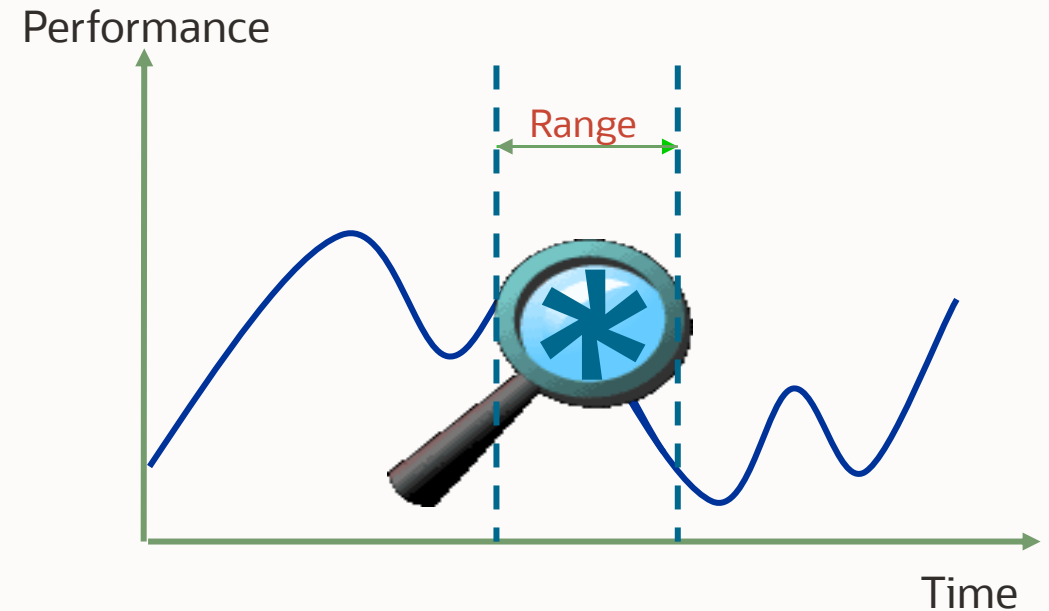


解决方案

- Active Session History (ASH)
- **优势:**
支持对瞬时性问题进行有针对性的性能分析
- 内置于 Oracle 内核中并高度优化

活动会话历史记录Active Session History (ASH)

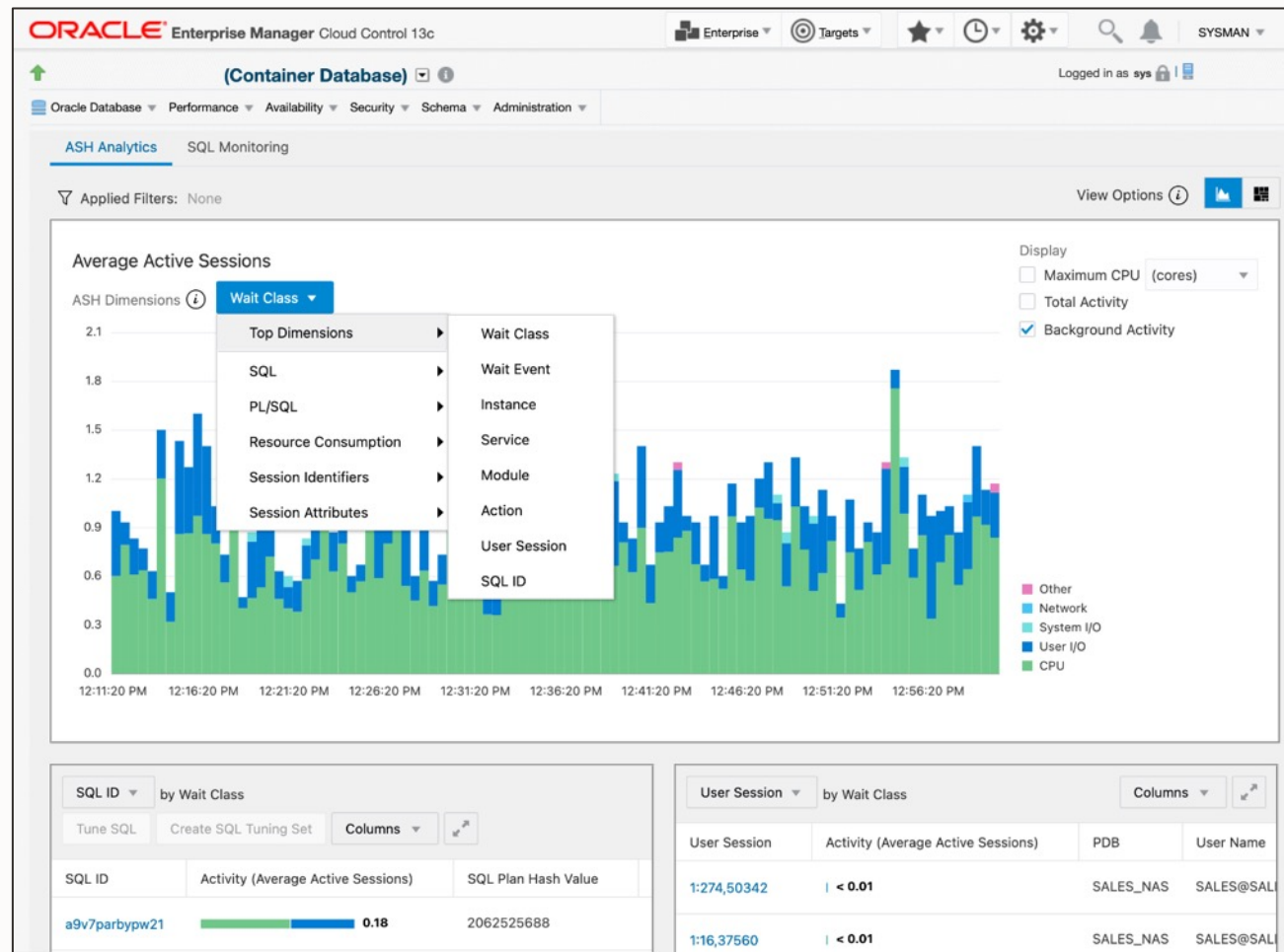
- 每秒将活动会话采样到内存中 (v\$active_session_history)
- 帮助回答以下问题：
 - “随着时间的推移，这个SQL会变慢吗？”
 - “哪些 SQL 或会话导致当前高负载？”
- 直接访问内核结构
- 每个快照刷新到 AWR 的 10 个样本中的一个
- 捕获的数据包括许多维度，例如：
 - SID
 - SQL ID
 - Program, Module, Action
 - Wait event#
 - Object, File, Block
 - actual wait time (if captured while waiting)



支持有针对性的性能分析

ASH 分析

- 用于高级分析的图形 ASH
- 选择任何时间段进行分析
- 跨多个维度分析性能
- 为递归向下钻取提供可视化筛选
- 不同的可视化效果：堆积图和树状图



哪些调优操作会给我带来最大的好处？

挑战

- 在对系统进行任何更改之前，对性能问题进行准确及时的诊断
- 诊断性能问题的根本原因



解决方案

- Automatic Database Diagnostics Monitor (ADDM)
- **Benefit:** ADDM使 Oracle 数据库能够诊断其自身的性能，并确定如何解决任何已识别的问题。
- 根本原因分析、纠正建议、影响和收益分析



Automatic Database Diagnostics Monitor 自动数据库诊断监视器

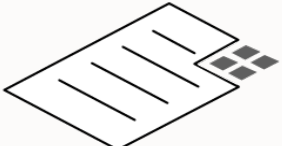
- 每个 AWR 快照后自动分析
- 确定对数据库收益最高的方式调整操作
- 就如何提高数据库性能提出具体的可操作建议

The screenshot displays the Oracle Enterprise Manager Cloud Control 13c interface. The main content area shows the 'Performance Finding Details: Top SQL Statements' for a finding titled 'SQL statements consuming significant database time were found'. The finding has an impact of 1.1 and a percentage of 54.1. Below this, there are recommendations for SQL tuning, including a table with columns for 'Select', 'Details', 'Category', and 'Benefit (%)'. The table lists several SQL tuning actions with their respective benefits. The interface also includes a 'Findings Path' section at the bottom.


| Select | Details | Category | Benefit (%) |
|-------------------------------------|---------|------------|-------------|
| <input checked="" type="checkbox"/> | Hide | SQL Tuning | 17.4 |
| <input checked="" type="checkbox"/> | Show | SQL Tuning | 12.9 |
| <input checked="" type="checkbox"/> | Show | SQL Tuning | 11.1 |
| <input checked="" type="checkbox"/> | Show | SQL Tuning | 6.8 |
| <input checked="" type="checkbox"/> | Show | SQL Tuning | 6 |



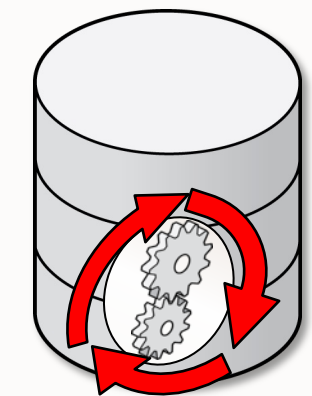
ADDM周期比较



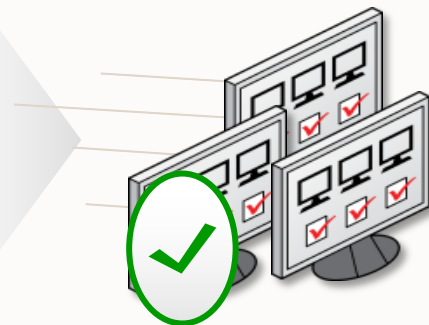
AWR Snapshot
Period 1







AWR Snapshot
Period 2



Compare
Period ADDM



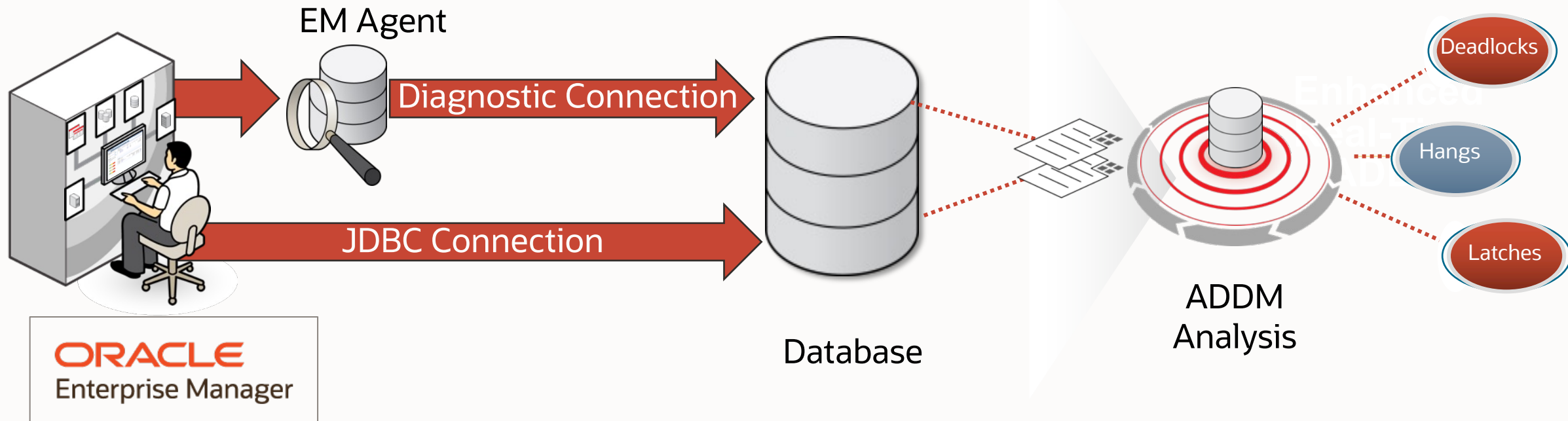
Analysis Report

| | |
|---|-----------------|
|  | SQL Commonality |
|  | Regressed SQL |
|  | I/O Bound |
|  | Undersized SGA |

- 跨两个 AWR 快照周期的完整 ADDM 分析
- 检测原因，评测影响，然后关联
 - 原因：工作负载更改、配置更改
 - 效果：低效 SQL，达到资源限制（CPU、I/O、内存、interconnect互连）
- 提出可行的建议以及量化的影响



实时 ADDM: 架构



- 在不获取额外锁和资源的情况下建立轻量级连接，通过代理绕过 SQL 层
- 也尝试启动标准 JDBC 连接
- ADDM 分析由任一连接返回的数据

实时 ADDM 增强功能

- 自动实时问题检测和分析
- 数据库自我监控严重性能问题
- 识别不良性能趋势并触发分析：
 - 高 CPU, I/O峰值, memory, interconnect, 挂起、死锁
 - 在问题威胁到应用程序性能之前发现问题
- 持续时间短（5 分钟峰值）ADDM 分析
 - 针对关键问题的可行建议
 - 更丰富的数据集可供分析
- 报告（分析和数据）存储在 AWR 中，用于历史分析
 - ADDM, SQL Monitoring reports



如何识别并自动调优低效的 SQL 语句？

挑战

- 严重低效的 SQL 查询会影响整个数据库
- DBA 或开发人员如何简单有效地调优 SQL 以减少其影响?
- DBA 如何管理这个周期?



解决方案

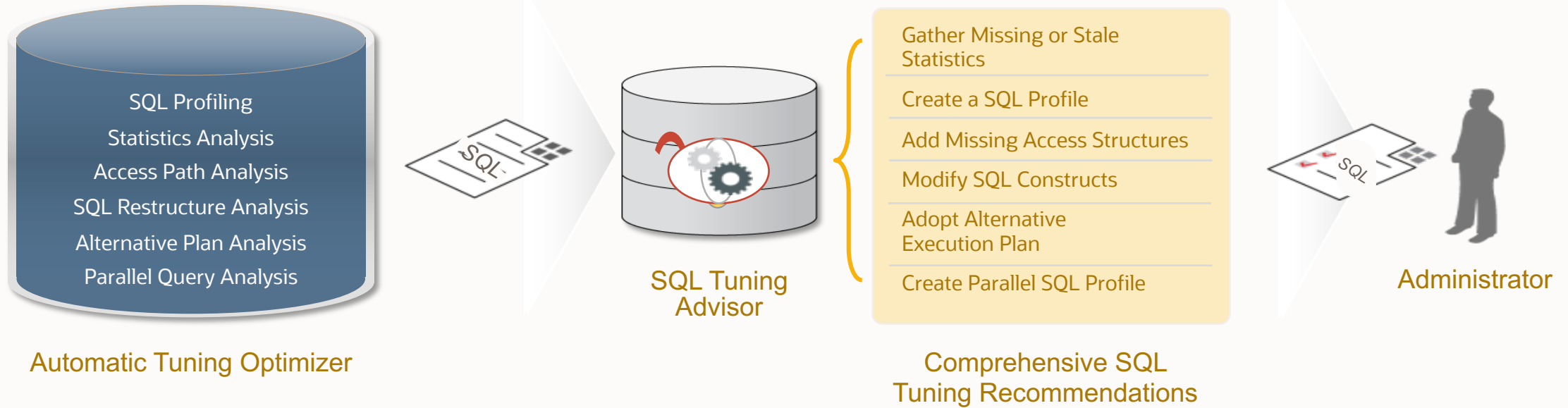
- SQL Tuning Advisor
- **Benefit:**
允许 DBA 查看问题 SQL 并获得全面的 SQL 调优建议

Tuning Pack调优包

- 数据库管理包系列的一部分
 - Diagnostics, **Tuning**, Life Cycle Management, Cloud Management packs
- 提供独特、自动和确定性的 SQL 调优功能
- 核心功能内置于 Oracle 数据库内核中，并通过 EM 接口公开
- 无缝集成 Diagnostics Pack, Real Application Testing and Automatic Tuning Optimizer
- <http://www.oracle.com/technetwork/database/manageability/forrester-packs-tei-white-paper-ow0-134611.pdf>
- <http://www.oracle.com/technetwork/database/manageability/forrester-packs-roi-ow07-134239.pdf>



Automatic SQL Tuning 自动SQL调优



SQL 优化顾问Tuning Advisor

- 就诊断阶段发现的各种问题提出建议
- 使用相同的 CBO，但有更多的时间预算来执行全面分析
- 使用实时和历史性能数据识别备用执行计划
- 如果并行配置(Profile)文件能够显著提高 SQL 性能（2 倍或更多），则会建议使用



调优包 – SQL 优化顾问

SQL 配置文件建议

The screenshot displays the Oracle Enterprise Manager Cloud Control 13c interface. The top navigation bar includes the Oracle logo, the text 'Enterprise Manager Cloud Control 13c', and several utility icons (grid, target, star, clock, gear, magnifying glass, bell). The user is logged in as 'sys'. The breadcrumb trail shows the path: Oracle Database > Performance > Availability > Security > Schema > Administration > Advisor Central > SQL Tuning Summary:SYS.SQL_TUNING_1551732084711 > SQL Tuning Result Details: SQLs with Recommended and Implemented SQL Profile.

SQL Tuning Result Details: SQLs with Recommended and Implemented SQL Profile

Status
Started 03/04 12:41:28
Completed 03/04 13:11:32
Running Time (minutes) 30

Tuning Set Owner SYS
Tuning Set Name CRM7_STS
Time Limit (seconds) 1800

Advisor Central > SQL Tuning Summary:SYS.SQL_TUNING_1551732084711 > SQL Tuning Details:SYS.SQL_TUNING_1551732084711 > **Recommendations for SQL ID:ds9nwvkvfkj3**

Only one recommendation should be implemented.

SQL Information
SQL Text `SELECT 'G' || tt1.pg_featurevalue_31_elgr_id pg_featurevalue_31_id, 'B' || tt1.ch_featurevalue_09_id ch_featurevalue_09_id, 'G' || tt1.ch_featurevalue_02_elgr_id ch_featurevalue_02_id, ...`

Select Recommendation
Original Explain Plan (Annotated)
Implement Validate with SPA

| Select | Type | Findings | Recommendations | Rationale | Benefit (%) |
|----------------------------------|-------------|---|--|-----------|-------------|
| <input checked="" type="radio"/> | SQL Profile | A potentially better execution plan was found for this statement. | Consider accepting the recommended SQL profile. No SQL profile currently exists for this recommendation. | | 87.53 |



调优包 – SQL 优化顾问

SQL 配置文件 - 执行计划比较

Advisor Central > SQL Tuning Summary:SYSTEM.SQL_TUNING_1416427883375 > SQL Tuning Details:SYSTEM.SQL_TUNING_1416427883375 > Recommendations for SQL ID:120xnyfw0h145 > Logged in As SYSTEM

Compare Explain Plans

Original Explain Plan (Annotated)
Indicates an adjustment from the original plan by the SQL Tuning Advisor
Plan Hash Value 3498848159

Expand All | Collapse All

| Operation | Line ID | Object | Object Type | Order | Rows | Bytes | Cost | Time | CPU Cost | I/O Cost |
|----------------------|---------|--------|-------------|-------|------|-----------|--------|------|---------------|----------|
| SELECT STATEMENT | 0 | | | 26 | | 0.158 | 31,321 | 376 | 1,296,351,616 | 31,236 |
| HASH GROUP BY | 1 | | | 25 | | 0.158 | 31,321 | 376 | 1,296,351,616 | 31,236 |
| VIEW | 2 | | | 24 | | 0.475 | 31,321 | 376 | 1,296,351,616 | 31,236 |
| SORT GROUP BY NOSORT | 3 | | | 23 | | 0.501 | 31,321 | 376 | 1,296,351,616 | 31,236 |
| VIEW | 4 | | | 22 | | 1.392 | 31,321 | 376 | 1,296,351,616 | 31,236 |
| WINDOW NOSORT | 5 | | | 21 | | 3.540 | 31,321 | 376 | 1,296,351,616 | 31,236 |
| SORT GROUP BY | 6 | | | 20 | | 3.540 | 31,321 | 376 | 1,296,351,616 | 31,236 |
| HASH JOIN | 7 | | | 19 | | 72.642 | 31,320 | 376 | 1,281,011,712 | 31,236 |
| NESTED LOOPS | 8 | | | 17 | | | | | | |
| NESTED LOOPS | 9 | | | 15 | | 1,492.893 | 31,194 | 375 | 1,264,931,456 | 31,111 |

New Explain Plan With SQL Profile
Plan Hash Value 618639621

Expand All | Collapse All

| Operation | Line ID | Object | Object Type | Order | Rows | Bytes | Cost | Time | CPU Cost | I/O Cost |
|----------------------|---------|--------|-------------|-------|------|-------|-------|------|---------------|----------|
| SELECT STATEMENT | 0 | | | 25 | | 0.158 | 4,727 | 57 | 1,046,785,920 | 4,658 |
| HASH GROUP BY | 1 | | | 24 | | 0.158 | 4,727 | 57 | 1,046,785,920 | 4,658 |
| VIEW | 2 | | | 23 | | 0.475 | 4,727 | 57 | 1,046,785,920 | 4,658 |
| SORT GROUP BY NOSORT | 3 | | | 22 | | 0.501 | 4,727 | 57 | 1,046,785,920 | 4,658 |
| VIEW | 4 | | | 21 | | 1.392 | 4,727 | 57 | 1,046,785,920 | 4,658 |



如何查看耗时的 SQL 在哪里消耗资源？

调优包 – 实时 SQL 监控

挑战

- 如何分析耗时的SQL，对资源消耗高的复杂查询？



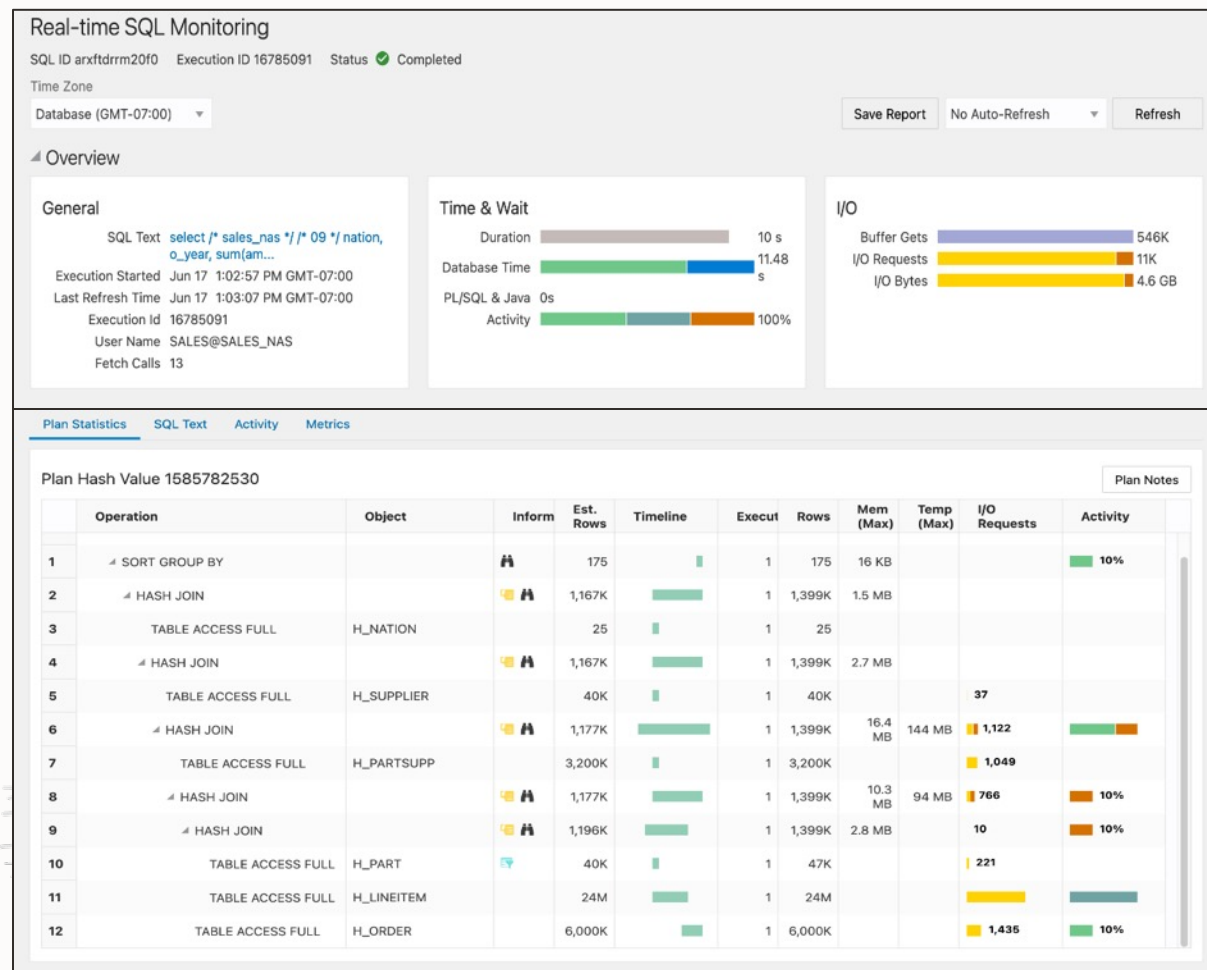
解决方案

- Real-Time SQL Monitoring
- **优点:**
提供了一种非常有效的方法来识别资源密集型长时间运行和并行 SQL 语句的运行时性能问题



实时 SQL 监控

- 深入的应用性能分析
 - 识别编写和设计不佳的 SQL 语句
 - 识别并指导数据层中应用程序调用的优化
 - 在执行计划的每一步捕获细粒度的 SQL 统计信息
 - 交互式可视化
 - 分析当前和历史 SQL 语句



如何确保系统变更或调整能带来更好的性能？

挑战

- 如何验证系统更改或调优操作是否导致相同或更好的 SQL 性能?

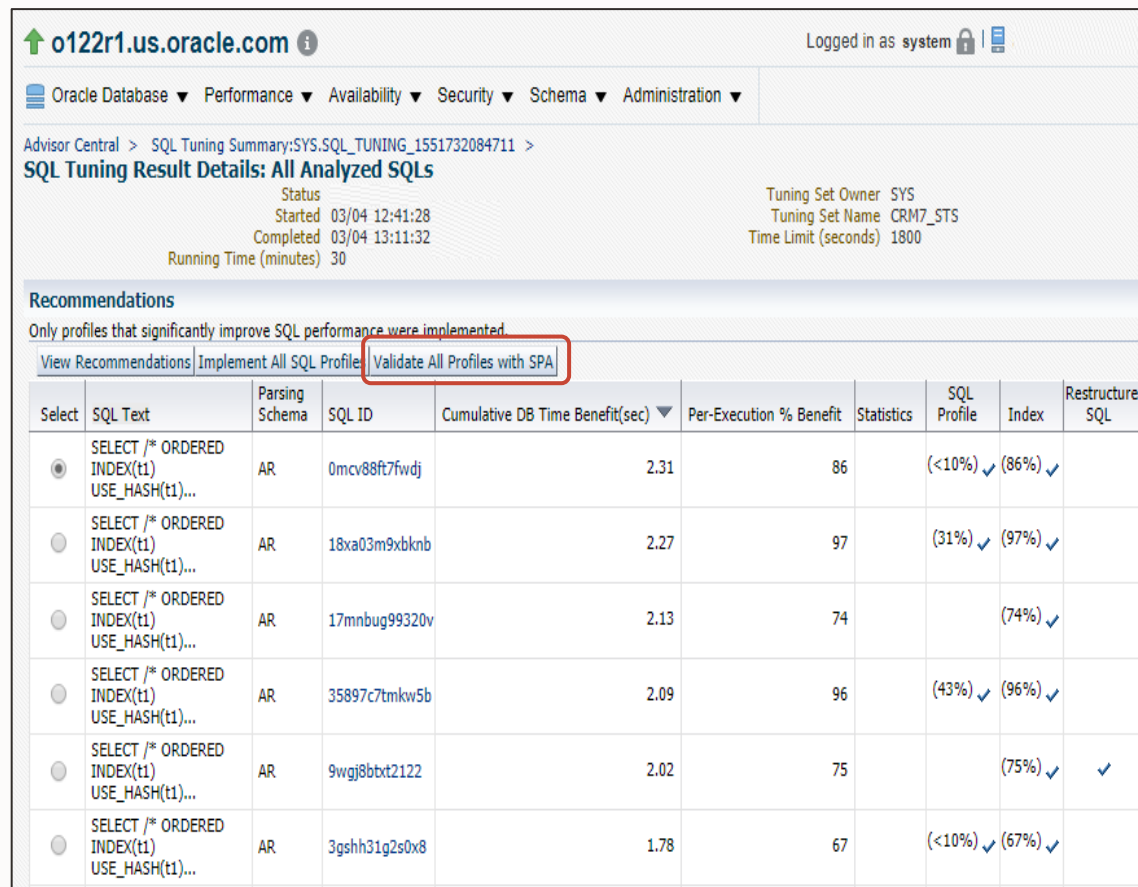


解决方案

- SQL Performance Analyzer
- **Benefit:**
验证实际 SQL 工作负载的性能在优化后是否会提高。

SQL 性能分析器 (SPA) 概述

- 帮助用户预测系统变更对 SQL 工作负载响应时间的影响
- 在生产系统上低开销捕获 SQL 工作负载到 SQL 优化集 (STS) 中
- 通过测试执行构建 SQL 语句性能的不同 SQL 试验
- 分析性能差异
- 提供对单个 SQL 的细粒度性能分析
- 与 STS、SQL 计划基线和 SQL 优化顾问集成，形成端到端解决方案



The screenshot shows the Oracle SQL Tuning Result Details page for a tuning set named CRM7_STS. It displays a table of recommendations for analyzed SQLs, sorted by cumulative DB time benefit. The table includes columns for SQL Text, Parsing Schema, SQL ID, Cumulative DB Time Benefit (sec), Per-Execution % Benefit, Statistics, SQL Profile, Index, and Restructure SQL. A red box highlights the 'Validate All Profiles with SPA' button in the 'Recommendations' section.

| Select | SQL Text | Parsing Schema | SQL ID | Cumulative DB Time Benefit(sec) | Per-Execution % Benefit | Statistics | SQL Profile | Index | Restructure SQL |
|----------------------------------|---|----------------|---------------|---------------------------------|-------------------------|------------|-------------|-------|-----------------|
| <input checked="" type="radio"/> | SELECT /* ORDERED INDEX(t1) USE_HASH(t1)... | AR | 0mcv88ft7fwdj | 2.31 | 86 | (<10%) ✓ | (86%) ✓ | | |
| <input type="radio"/> | SELECT /* ORDERED INDEX(t1) USE_HASH(t1)... | AR | 18xa03m9xbknb | 2.27 | 97 | (31%) ✓ | (97%) ✓ | | |
| <input type="radio"/> | SELECT /* ORDERED INDEX(t1) USE_HASH(t1)... | AR | 17mnbug99320v | 2.13 | 74 | | (74%) ✓ | | |
| <input type="radio"/> | SELECT /* ORDERED INDEX(t1) USE_HASH(t1)... | AR | 35897c7tmkw5b | 2.09 | 96 | (43%) ✓ | (96%) ✓ | | |
| <input type="radio"/> | SELECT /* ORDERED INDEX(t1) USE_HASH(t1)... | AR | 9wgj8bxt2122 | 2.02 | 75 | | (75%) ✓ | | ✓ |
| <input type="radio"/> | SELECT /* ORDERED INDEX(t1) USE_HASH(t1)... | AR | 3gshh31g2s0x8 | 1.78 | 67 | (<10%) ✓ | (67%) ✓ | | |



Oracle Enterprise Manager

释放数据库的全部价值

- 通过诊断问题最大限度地提高 **83%** 的性能
- 调优SQL 语句，性能提高 **56%**，以实现极端响应时间
- 减少配置管理工作量 **83-93%**
- 合规性工作减少 **93%**
- 减少 **70-80%** 的测试时间和工作量

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GoldenGate for Bigdata实践

数据库和云系列公益讲座



邹奇

- 资深GoldenGate相关技术方案专家
- 10年以上Oracle数据库解决方案经验

内容简介

- OGG for Bigdata简介
- GGBD 微服务架构
- GGBD 安装/使用
- GGBD 特性



Zoom直播

直播时间: 11月24日 11:00 - 12:00

扫描二维码进入直播

Zoom ID: 957 9669 6723

密码: 20212023



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- 维护数据库系统良好状态，保护数据资产的安全
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