

# 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：

**400-699-8888**

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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

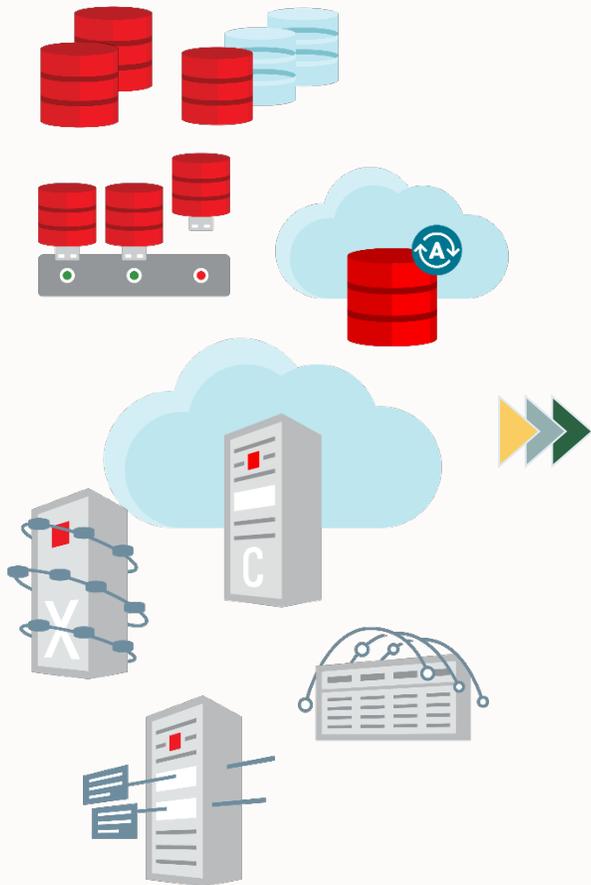
Jasper Zhu

# 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



ORACLE  
Enterprise Manager



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

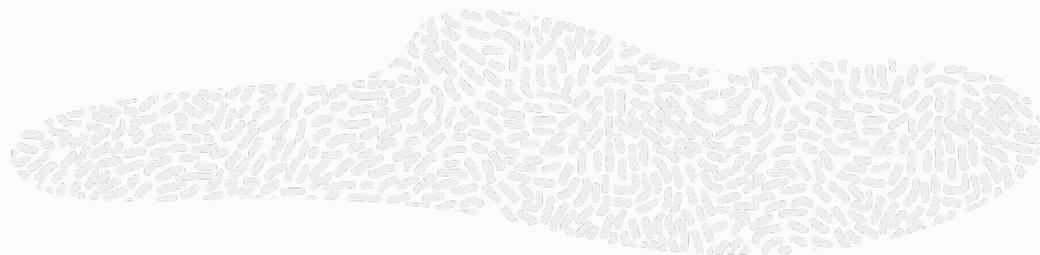
- 部门级别/团队级别使用情况
- 监控目标数量少
- 基本监控（状态、资源使用情况、性能警报）
- 电子邮件通知

## 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)

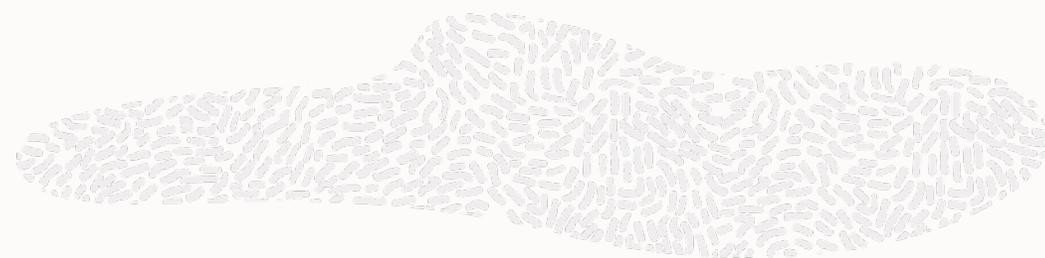
► Search

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 Space Used (%)

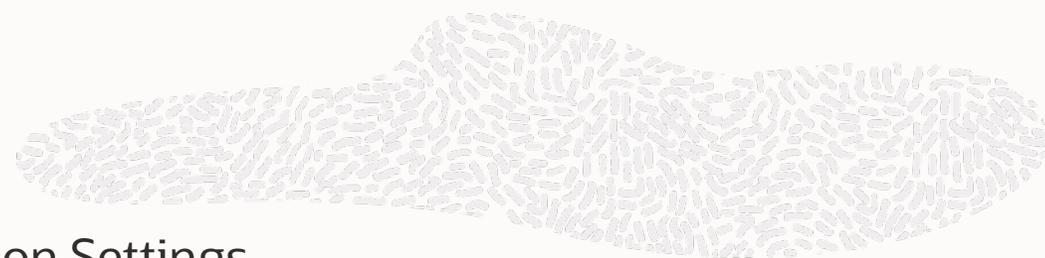
Tablespace Name	Average Value	Low Value	High Value	Last Known Value	Current Severity	Alert Triggered	Last Collection Timestamp
AQ_TBS_Q_1	62.9	62.9	62.9	62.9	✓	-	Oct 15, 2019 11:03:29 P.
AQ_TBS_Q_2	62.81	62.81	62.81	62.81	✓	-	Oct 15, 2019 11:03:29 P.
SYSAUX	1.19	1.19	1.19	1.19	✓	-	Oct 15, 2019 11:03:29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

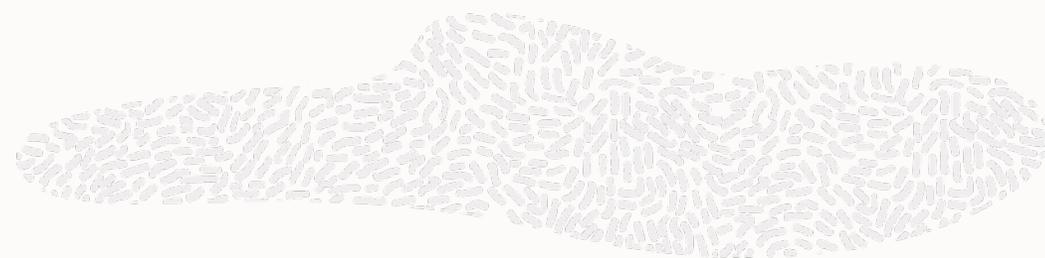
Enterprise Targets

- 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

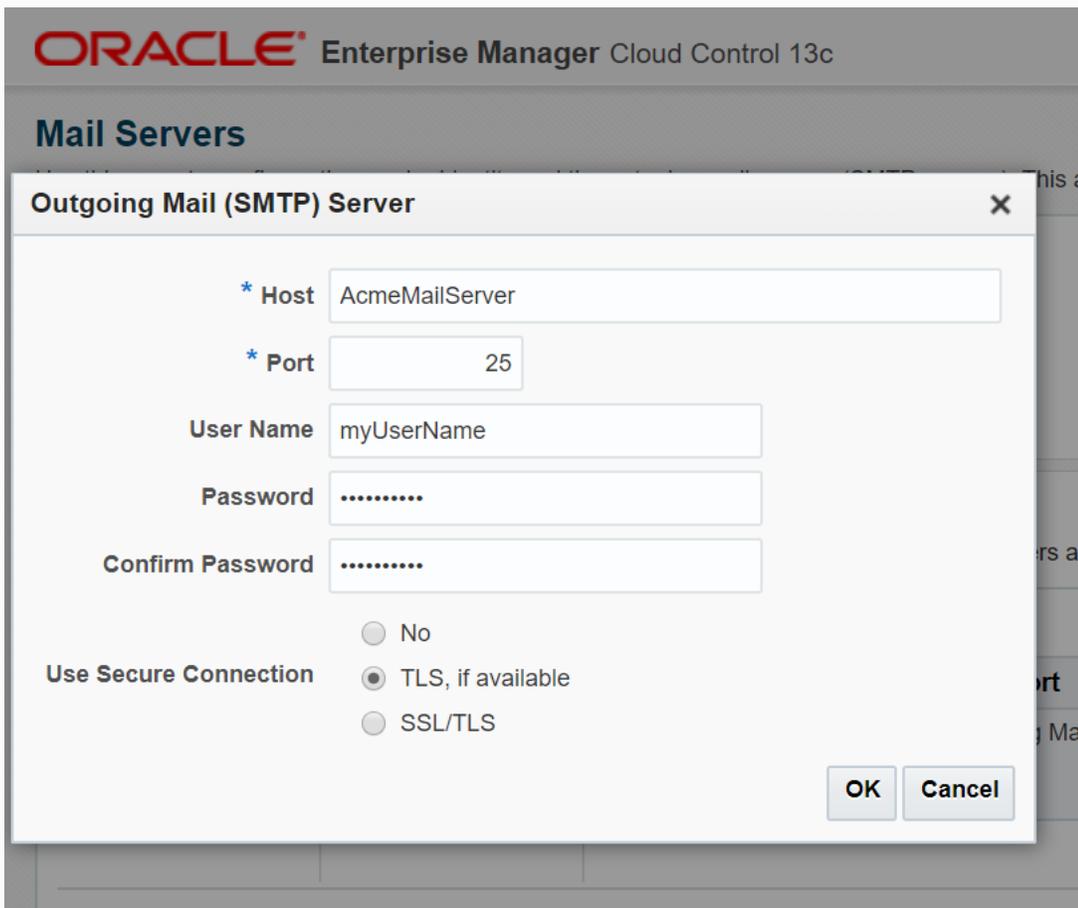
Default Template  Make this the default template for this target type

 **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 dropdown menu options:  
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

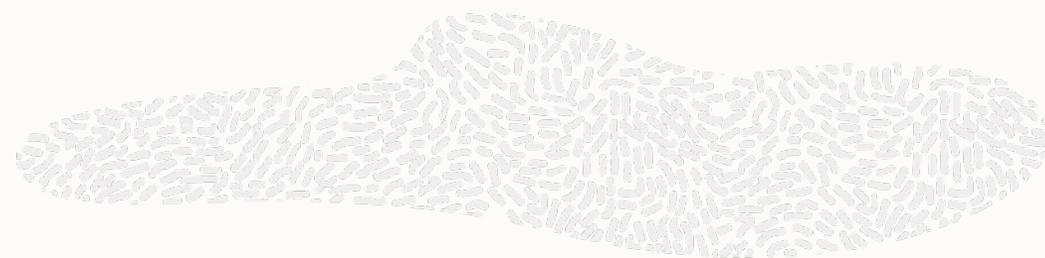


## 企业级监控

### 需求

- 覆盖所有 Oracle 技术堆栈
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- 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

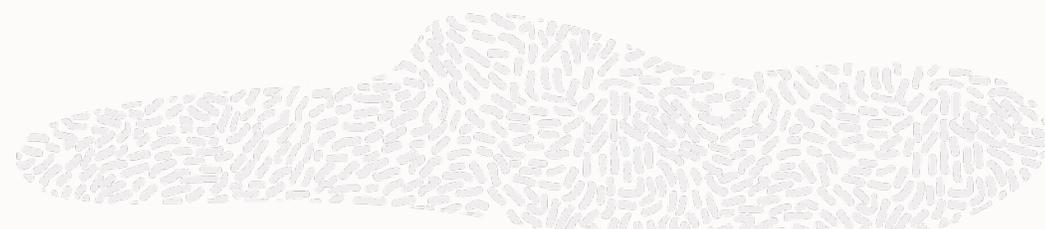
- 使用意外事件
- 压缩 Event 事件以减少 incidents 意外事件的操作
- 与您的 ticketing 系统集成
- 使用动态运行手册 Runbooks 管理意外事件
- 使用封锁 blackouts 来防止计划内维护期间出现虚假警报
- 通过始终在线监控设置 24 x 7 警报



# 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

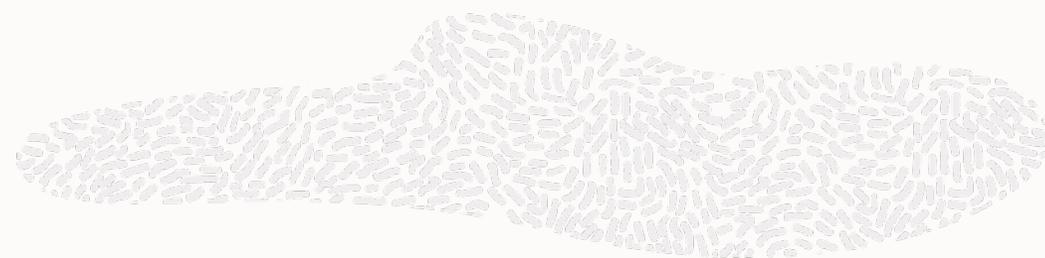
全部移动

移去

全部移去

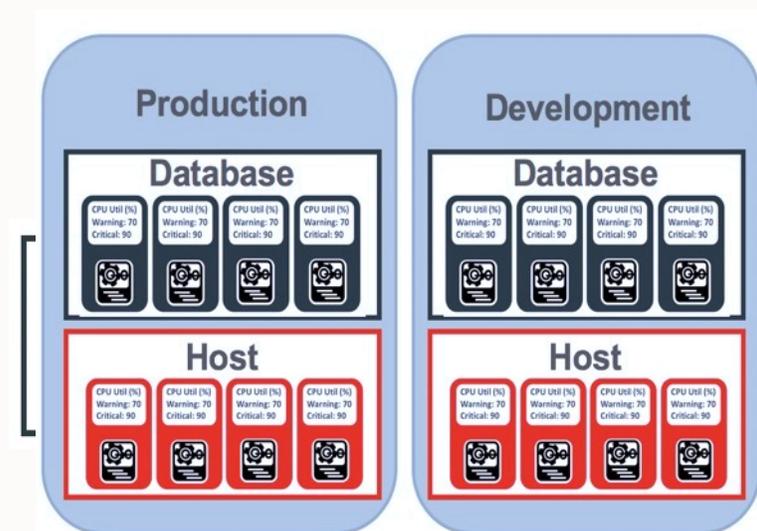


# 对每个组使用监控模板



## 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



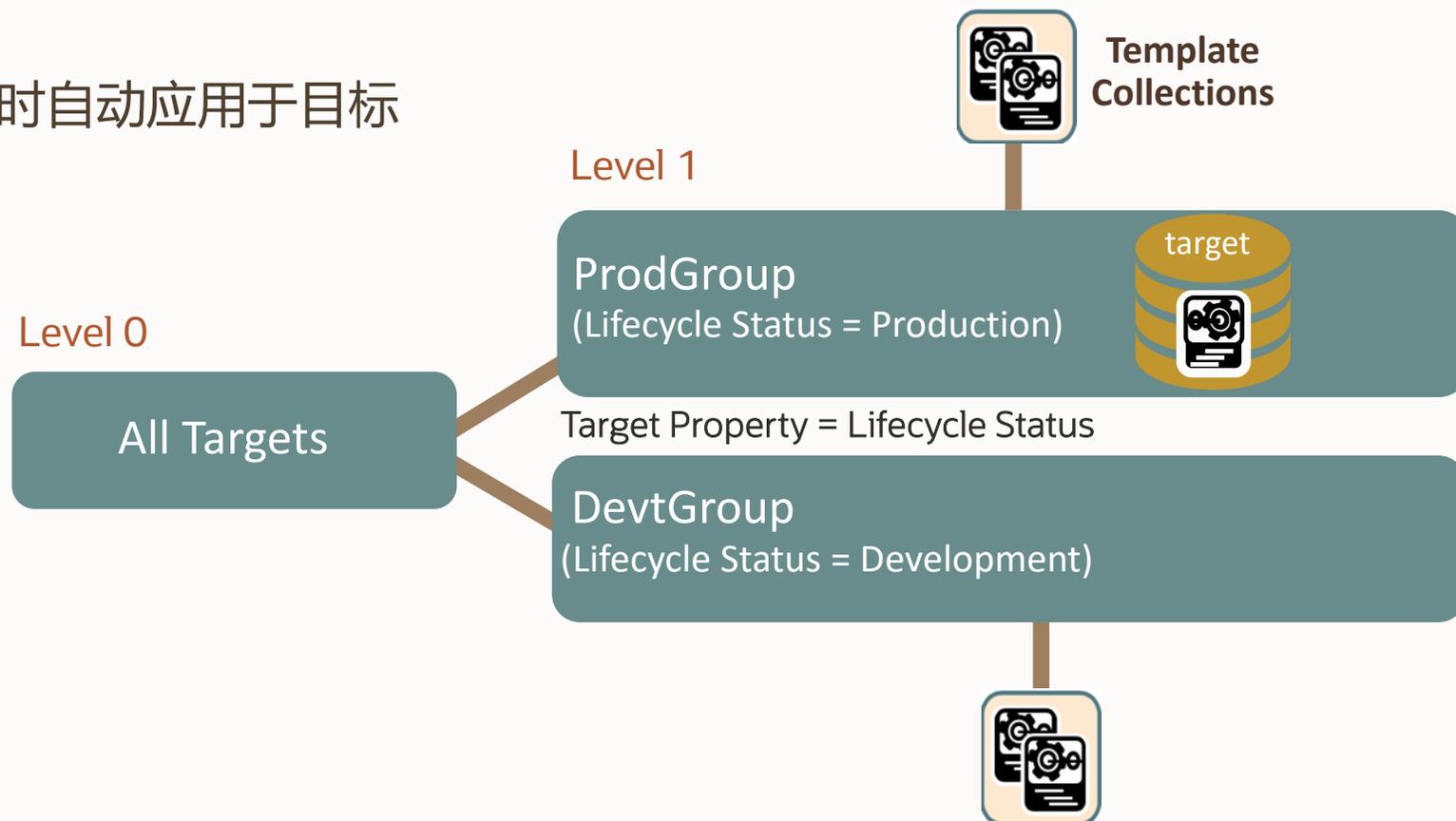
在 EM 控制台或 EMCLI 中手动将模板应用于组，或使用管理组和模板集合自动应用模板



# 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

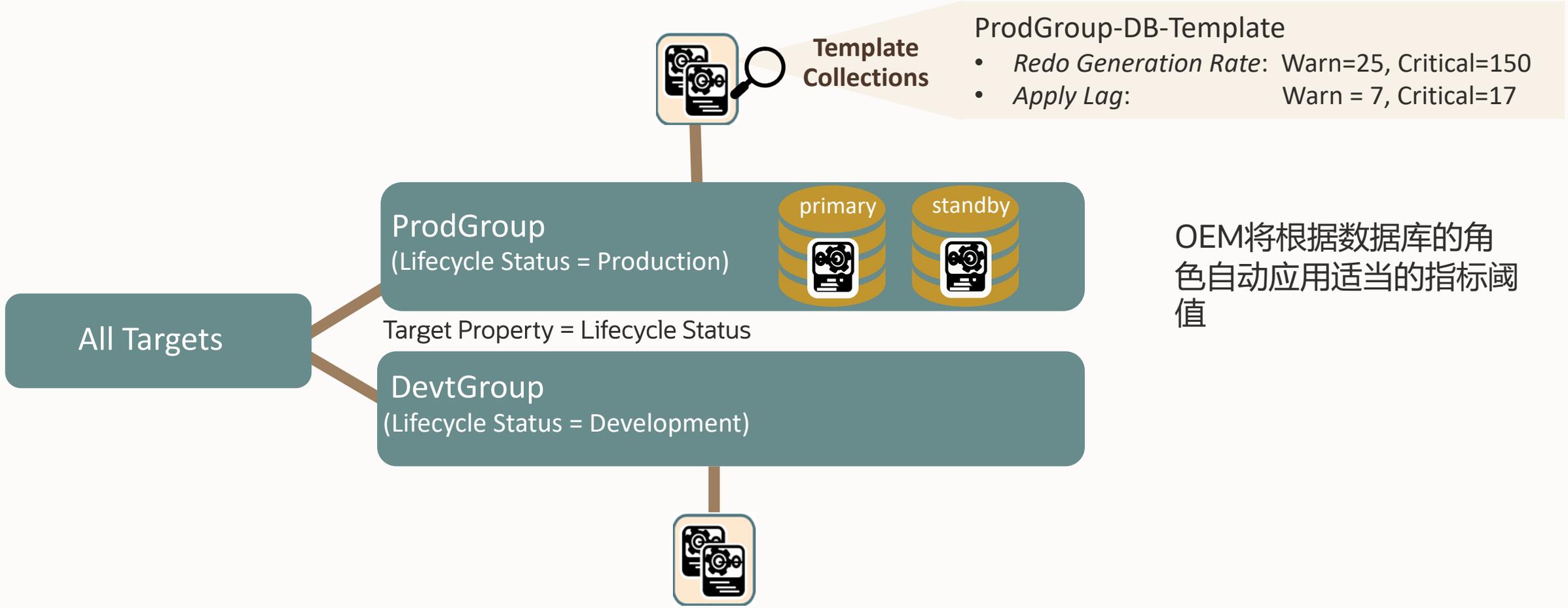
Enterprise Targets Favorites History Setup

## 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	
<b>Metric Thresholds applicable for Primary Database</b>							
<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		
<b>Metric Thresholds applicable for Standby Database</b>							
<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. The page title is 'db19c' and the breadcrumb is 'Oracle Database > Performance > Availability > Security > Schema > Administration > Database Instance: db19c > Metric and Collection Settings > Edit Advanced Settings: Tablespace Space Used (%)'. The main heading is 'Edit Advanced Settings: Tablespace Space Used (%)'. Under 'Tablespace Name', it says 'All others'. The 'Corrective Actions' section shows 'Warning <none>' and 'Critical <none>' with 'Add' buttons. There is a checkbox for 'Allow only one corrective action for this metric to run at any given time'. The 'Advanced Threshold Settings' section includes a 'Comparison Operator' dropdown set to '>=', 'Warning Threshold' set to '85', 'Critical Threshold' set to '97', 'Number of Occurrences' set to '1', and 'Collection Schedule' set to 'Every 30 Minutes'. Below this, it says 'Time before alert is triggered/cleared 30 Minutes' and a tip: 'TIP Empty Thresholds will disable alerts for that metric.' The 'Template Override' section has a checkbox for 'Prevent metric settings on this page from being changed when a monitoring template is applied to the target'. The 'Threshold Suggestion' section provides a feature description and input fields for 'Warning Threshold' (85), 'Critical Threshold' (97), 'Number of Occurrences', and 'View Data' (Last 7 days). The bottom section, 'Submit Corrective Action', includes a 'Select corrective action' button, a checked checkbox for 'Corrective action will use preferred credentials of SYSMAN (rule set owner) to execute scripts on respective targets.', and other options like '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

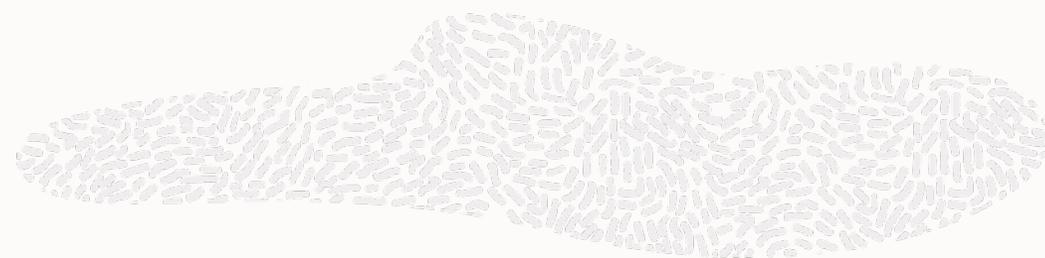
## Job

### 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

类别: [Dropdown]

单位: [Dropdown]

其他单位: [Text]

选择度量的类别, 以便以后可以按类别搜索度量或其预警。

临时:  True  False

临时度量列的数据不会上载。

#### 预警阈值

比较运算符: [Dropdown] 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。

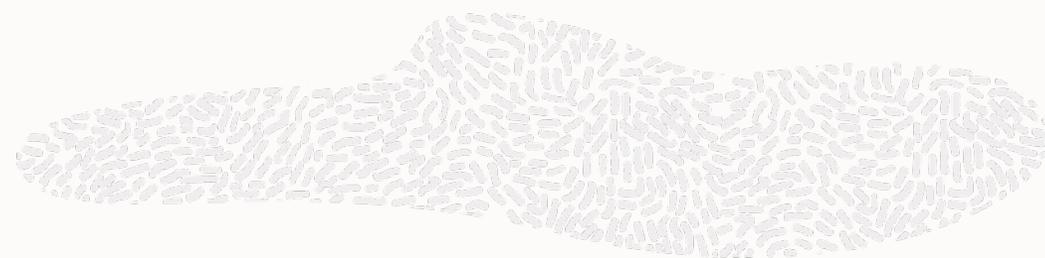
**信息**  
计算表达式有效。

**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

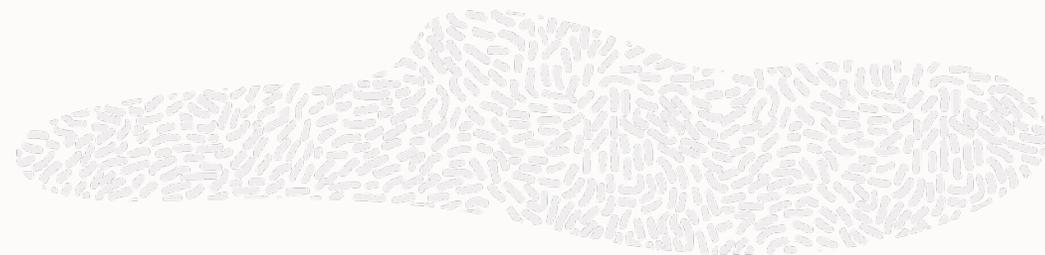
Operator	Example	Explanation
	Column1 + Column2	Returns the sum of the values of Column1 and Column2.
-	(Column1 + Column2) - Column3	First add Column1 and Column2 values, then subtract Column3 value and return the result.
*	(Column1*Column2) + Column3	First multiply Column1 and Column2 values, then 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 ▼

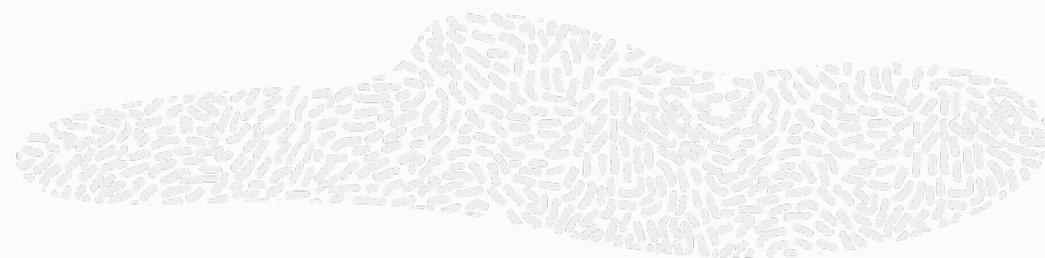
**Data Guard Status**

- 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

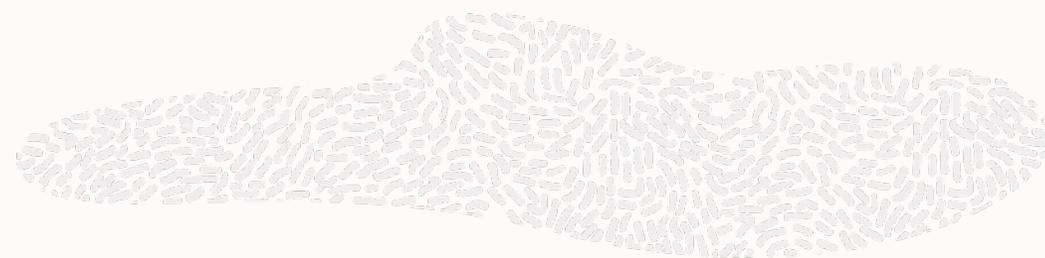
Applies to new incidents or updates to incidents (for example, an incident is escalated to level 2). The rule can take actions like send e-mails, assign an owner, and set a priority.

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

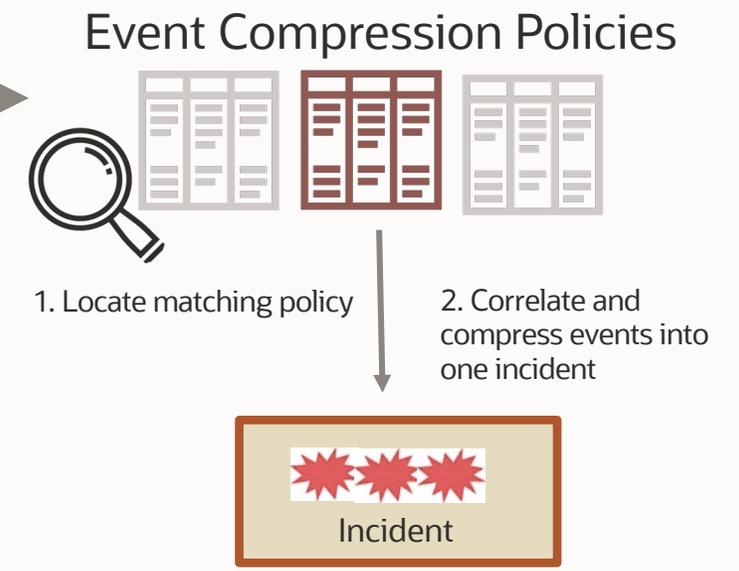
**Targets** ProdGroup

**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

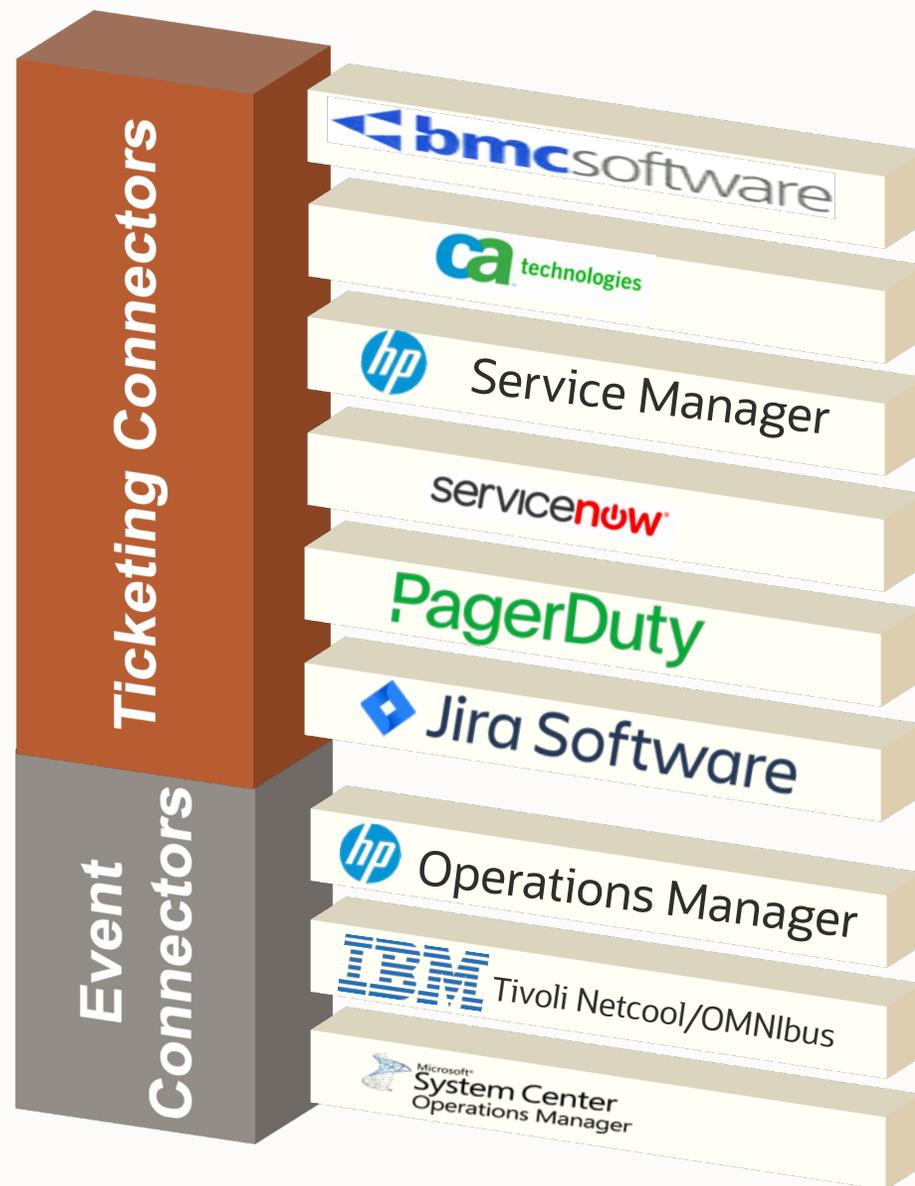
## 管理连接器

### 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](#)

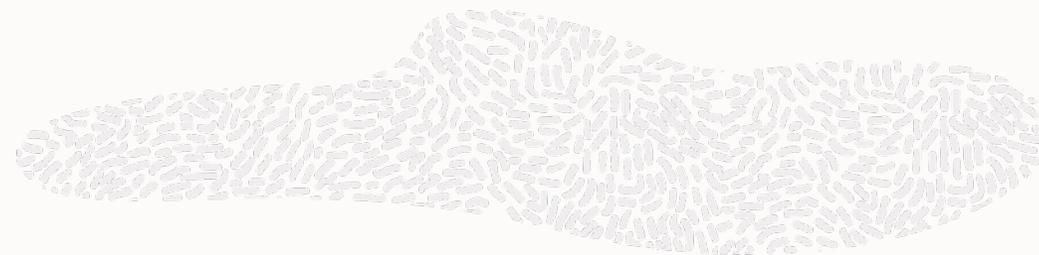
状态	类型	类别	版本	供应商	大小 (MB)	说明
可用	SCOM Connector	Event Connector	13.2.2.0.0	Oracle	24.279	Microsoft SCOM 2012, 2016 Connector - 13.2.2.0.0
可用	SCOM 2007 R2 Connector	Event Connector	13.2.1.0.0	Oracle	22.165	Microsoft SCOM 2007 R2 Connector - 13.2.1.0.0
可用	HP OMU Connector	Event Connector	13.2.1.0.0	Oracle	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

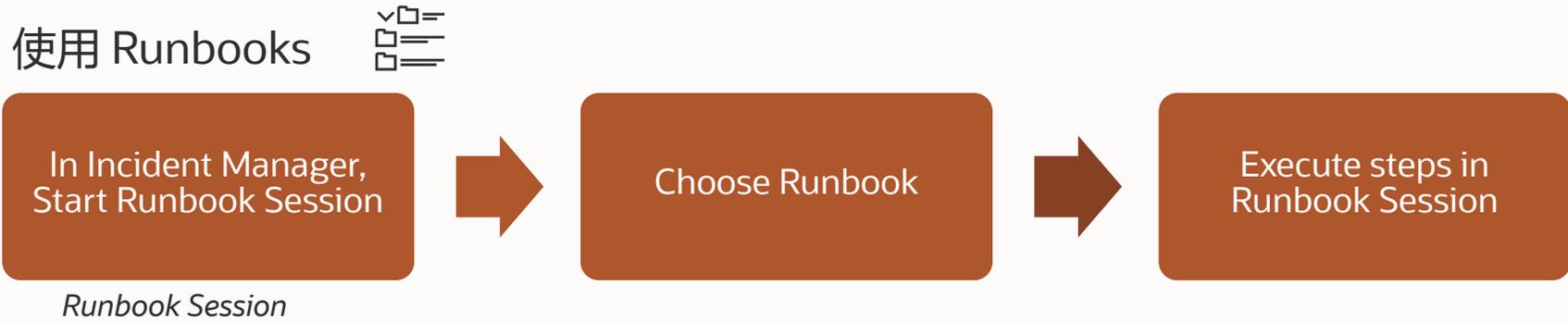
- 支持与外部系统共享事件events，例如：
  - HP Operations Manager
  - IBM Tivoli Netcool/OMNibus
  - Microsoft SCOM

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。



# 在意外事件管理器中使用动态运行手册

**Start a Runbook Session**

Incident Details

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

Choose a Runbook to start your session.

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

**Start Runbook Session**

**Runbook Sessions > Fast Recovery Area Runbook: Incident 440**

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

Incident Details

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

- Overview & Prerequisites**

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

**Prior to beginning:**

  - Set up a named credential for the target database on which the FRA incident has occurred
  - Set up a privileged named credential for the target database in case you need to reconfigure the FRA
- Review the metric that triggered the incident**

Run this step to review the latest metric value for FRAPercentUsed in MESFRA\_CHECK
- 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.
- 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.
- Reset the size of the FRA, if necessary**

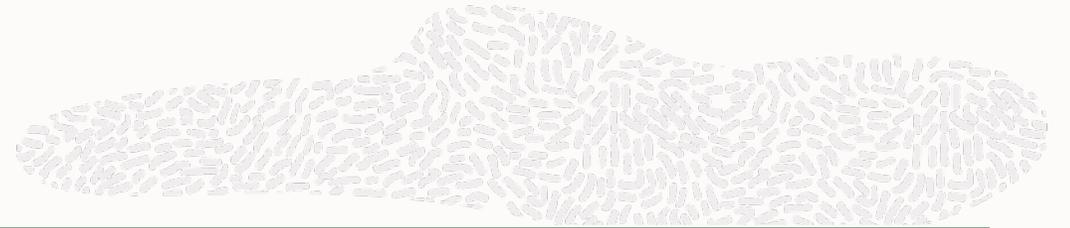
If the db\_recovery\_file\_dest\_size is less than 1 Terabyte, run this step to set that value to 1 Terabyte
- Confirm the updated value of the FRA size**

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



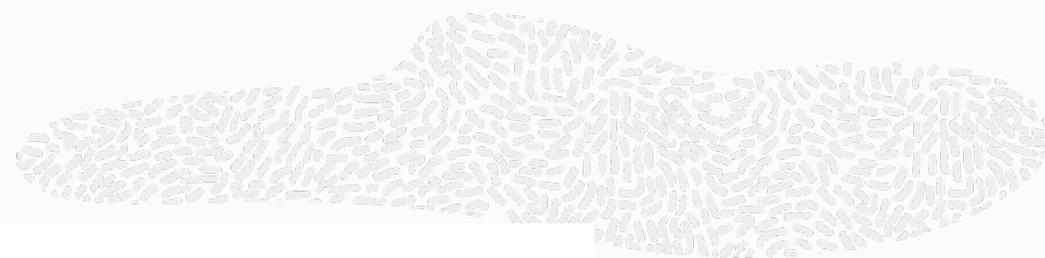
# Runbook Steps



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

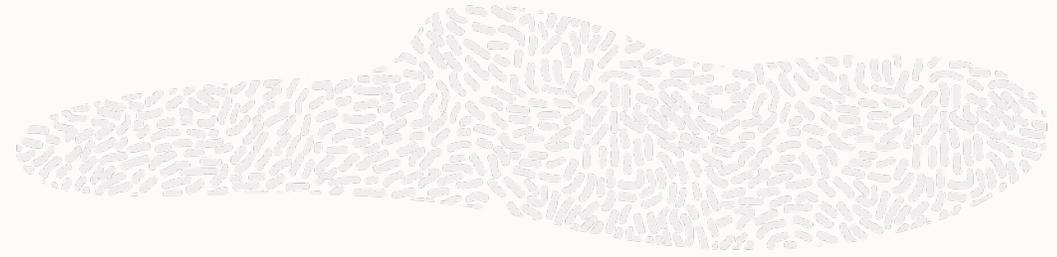


## Feature Updates

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](#)

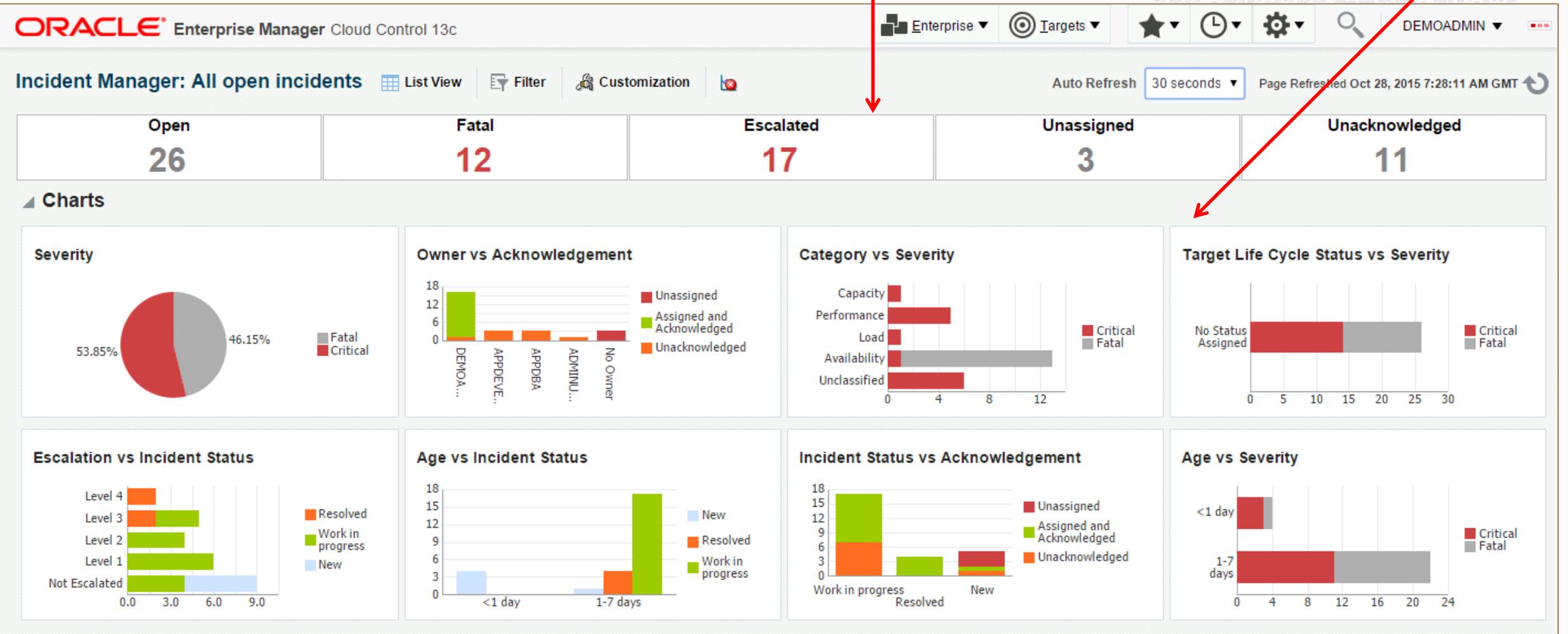
[View recent configuration changes](#) [Add corrective action](#)



# 意外事件仪表板

Summary

Charts



# 仪表盘

## Overview

Targets with Status



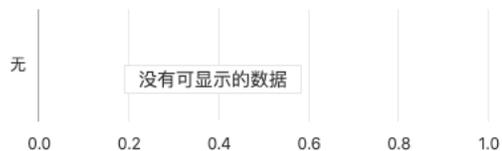
Incidents (Last 7 Days)



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)

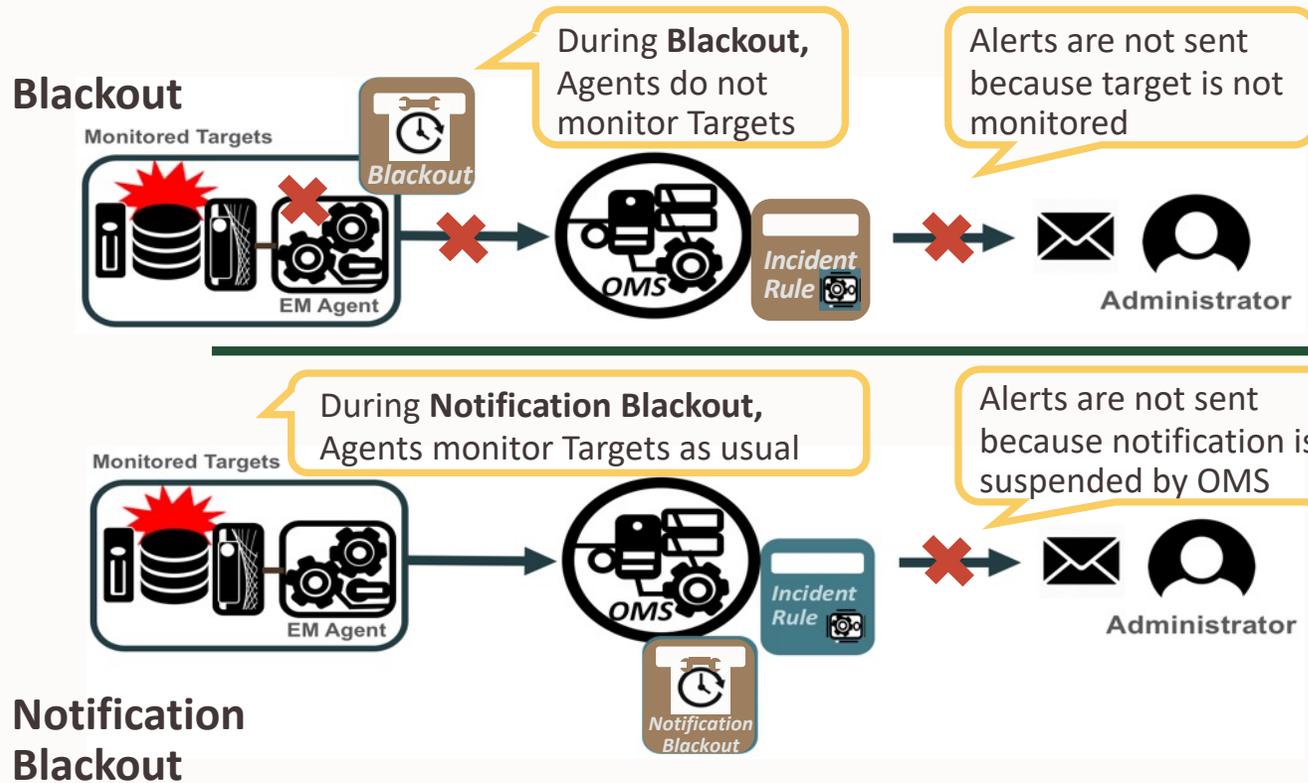


# 使用封锁Blackouts来防止计划内维护期间出现虚假警报

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*

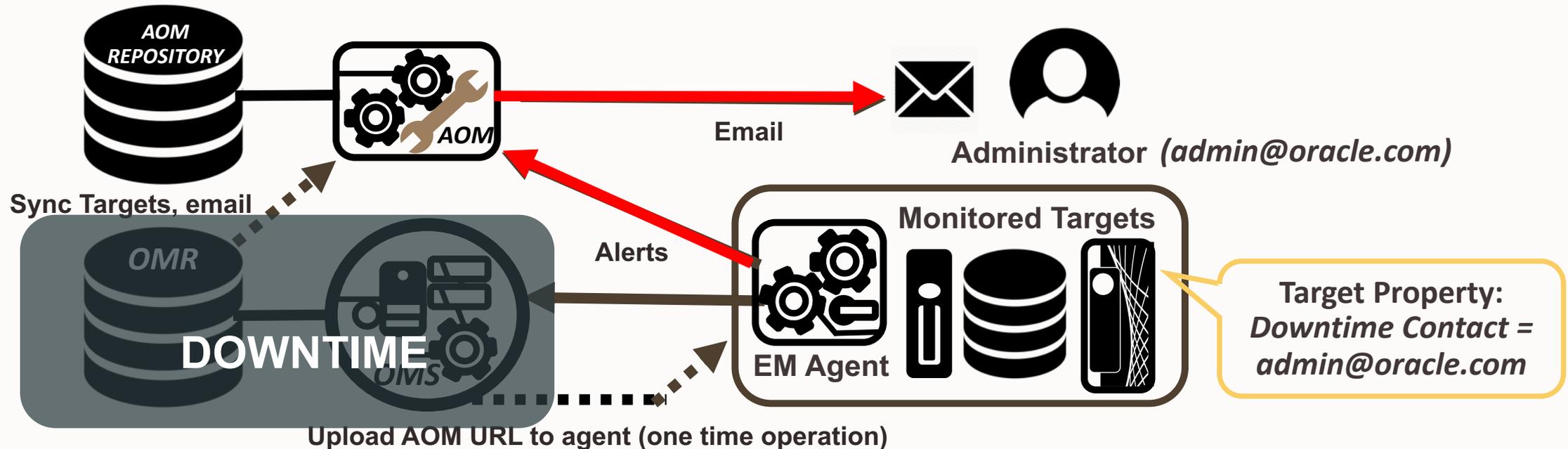
使用通知封锁*Blackout* 你可监控目标但是不想收到告警通知时



# 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“



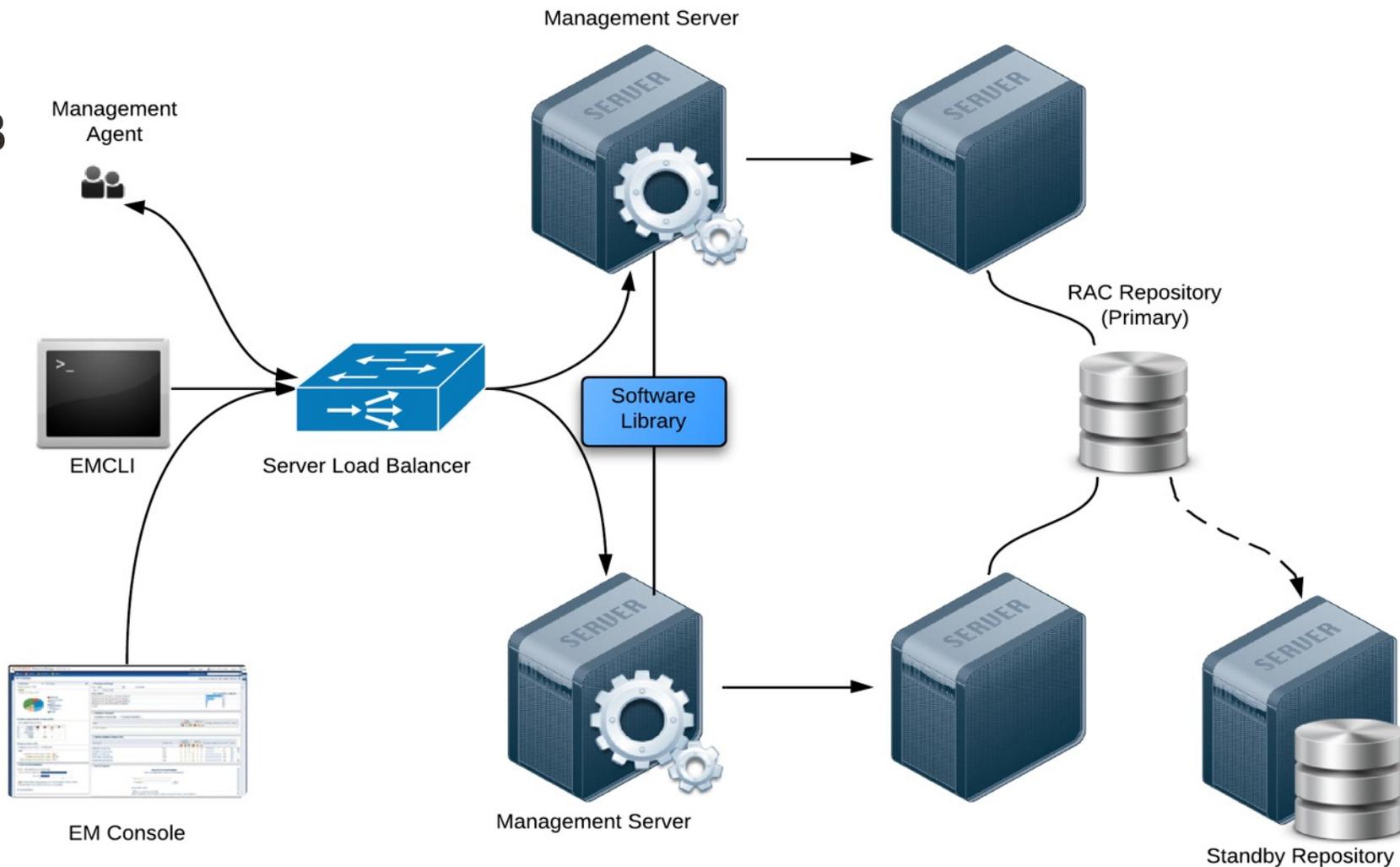
# EM13c MAA 部署--- 7 x 24 警报, 始终在线监控

- 四个级别的EM HA 部署

	Description	Load Balancer Requirements	Cost
<b>Level 1</b>	OMS and repository on their own hosts. No failover. Repository backup and OMS export config	None	\$
<b>Level 2</b>	OMS installed on shared storage with a VIP based failover. Database protected with Local Data Guard.	None	\$\$
<b>Level 3</b>	OMS in Active/Active configuration. RAC repository with Local Data Guard	SLB at primary	\$\$\$
<b>Level 4</b>	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

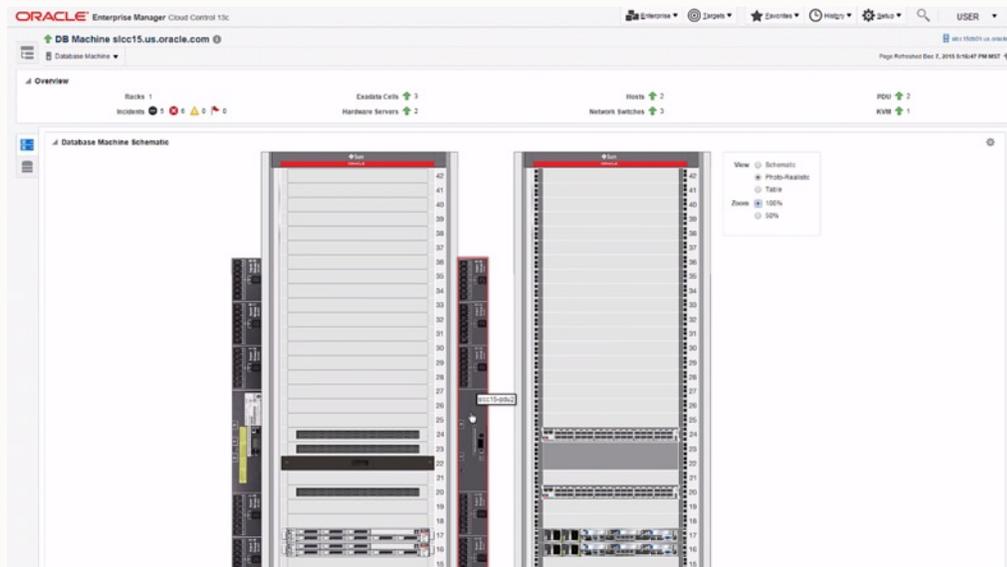




# Oracle Exadata管理

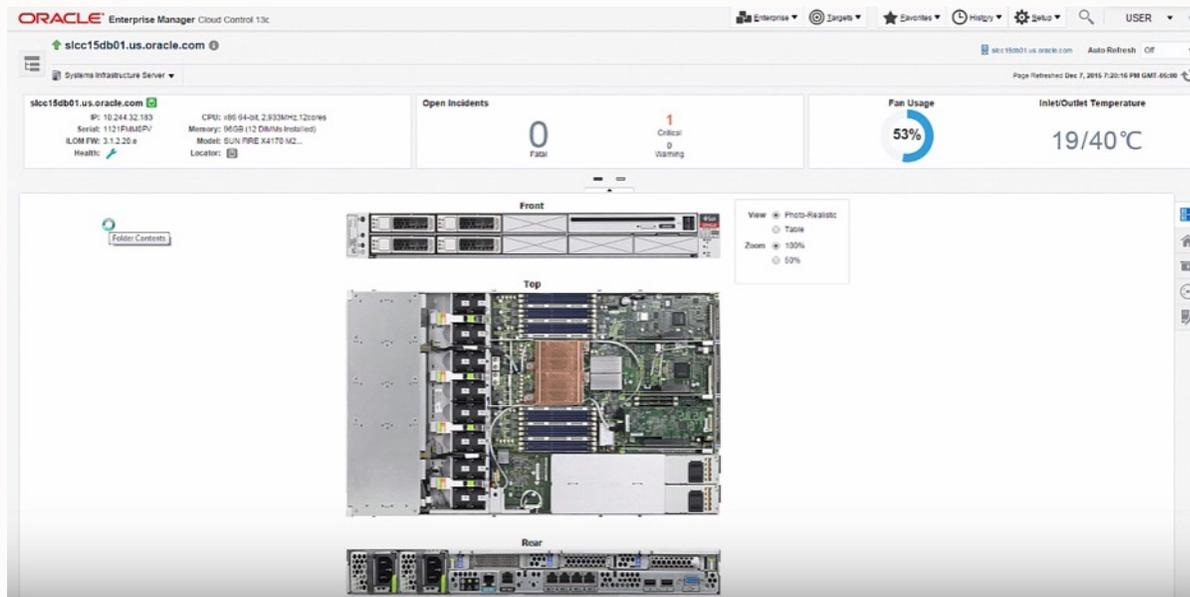
## 集成 软硬件集中管理

- 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

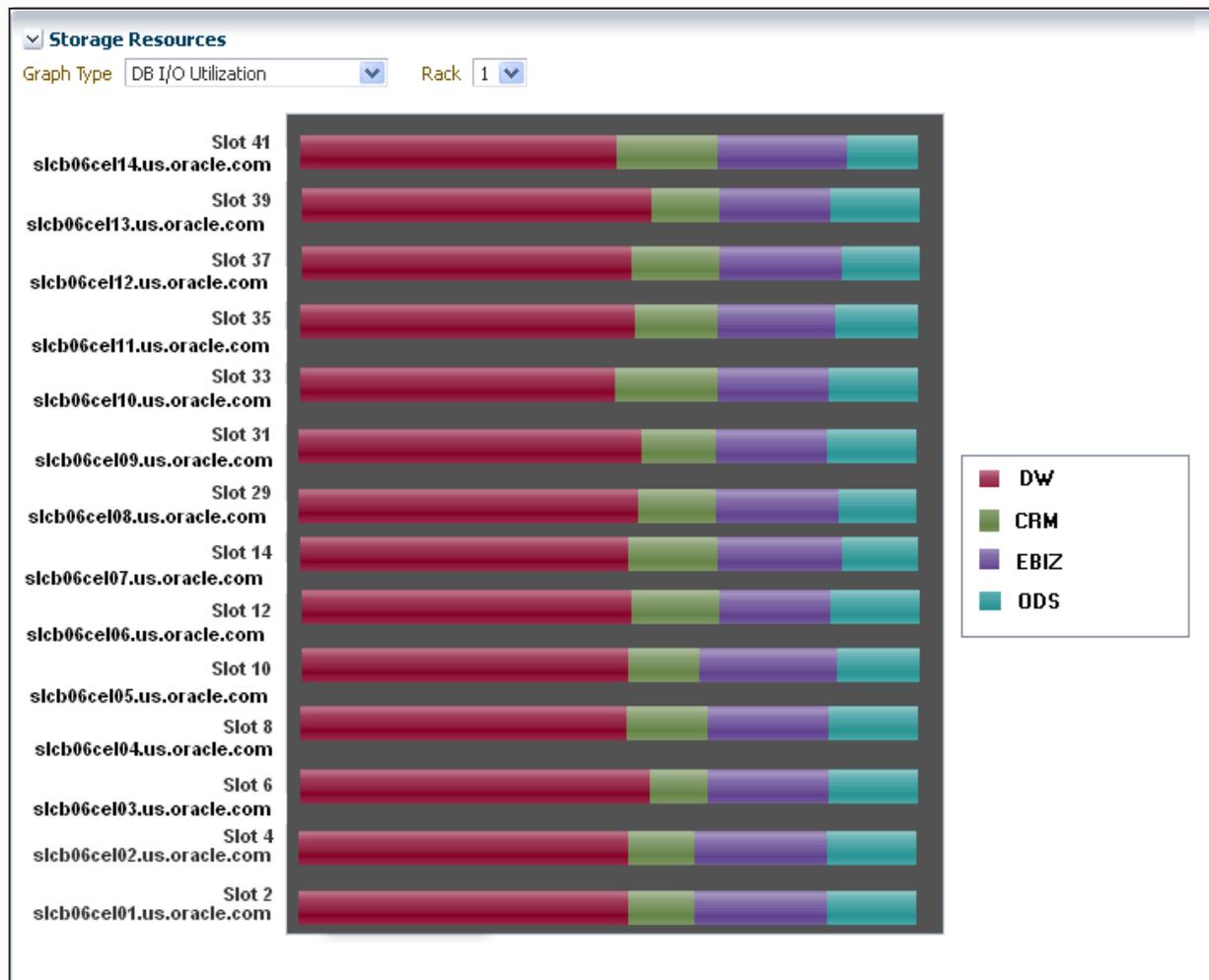
- cells, compute nodes and switches的各种图例
- 硬件组件告警

## 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

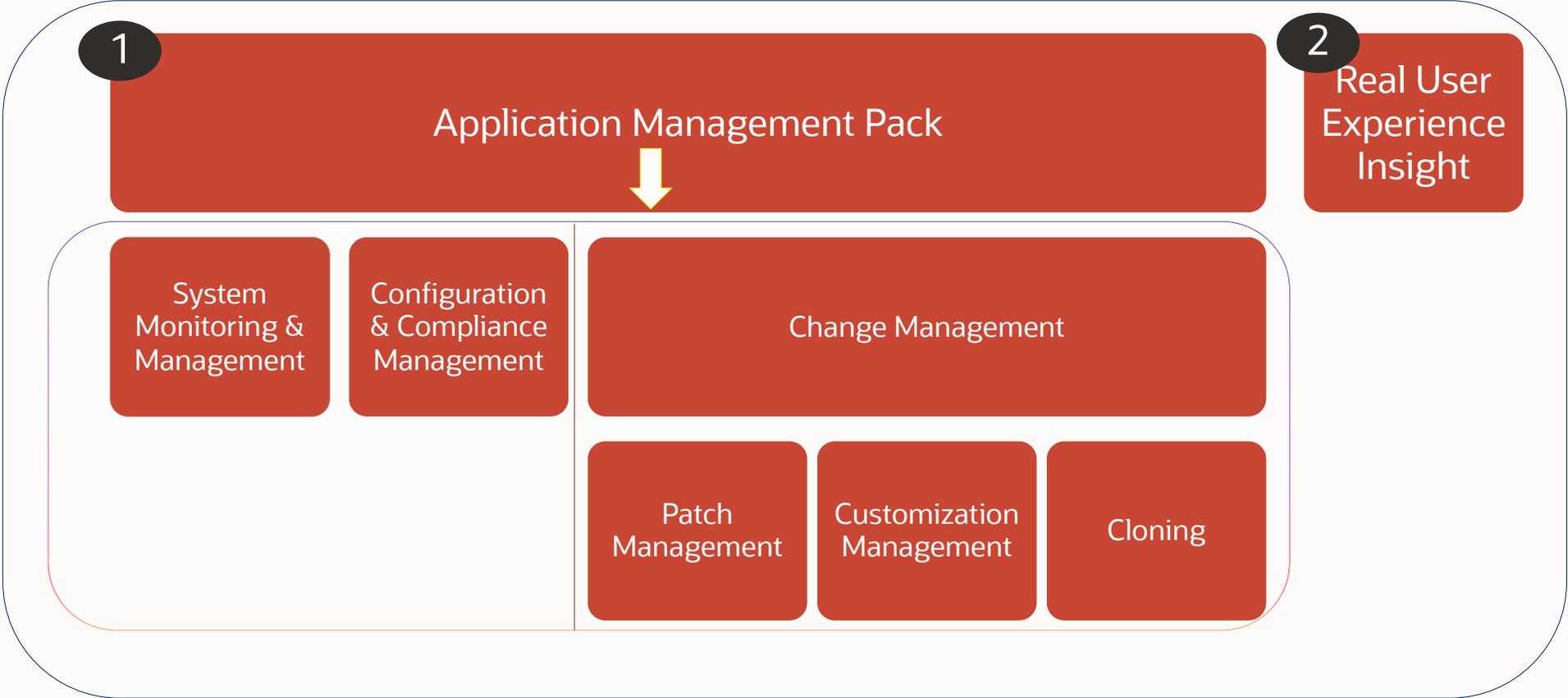
## 配置视图

- 所有组件的版本汇总，包括补丁建议



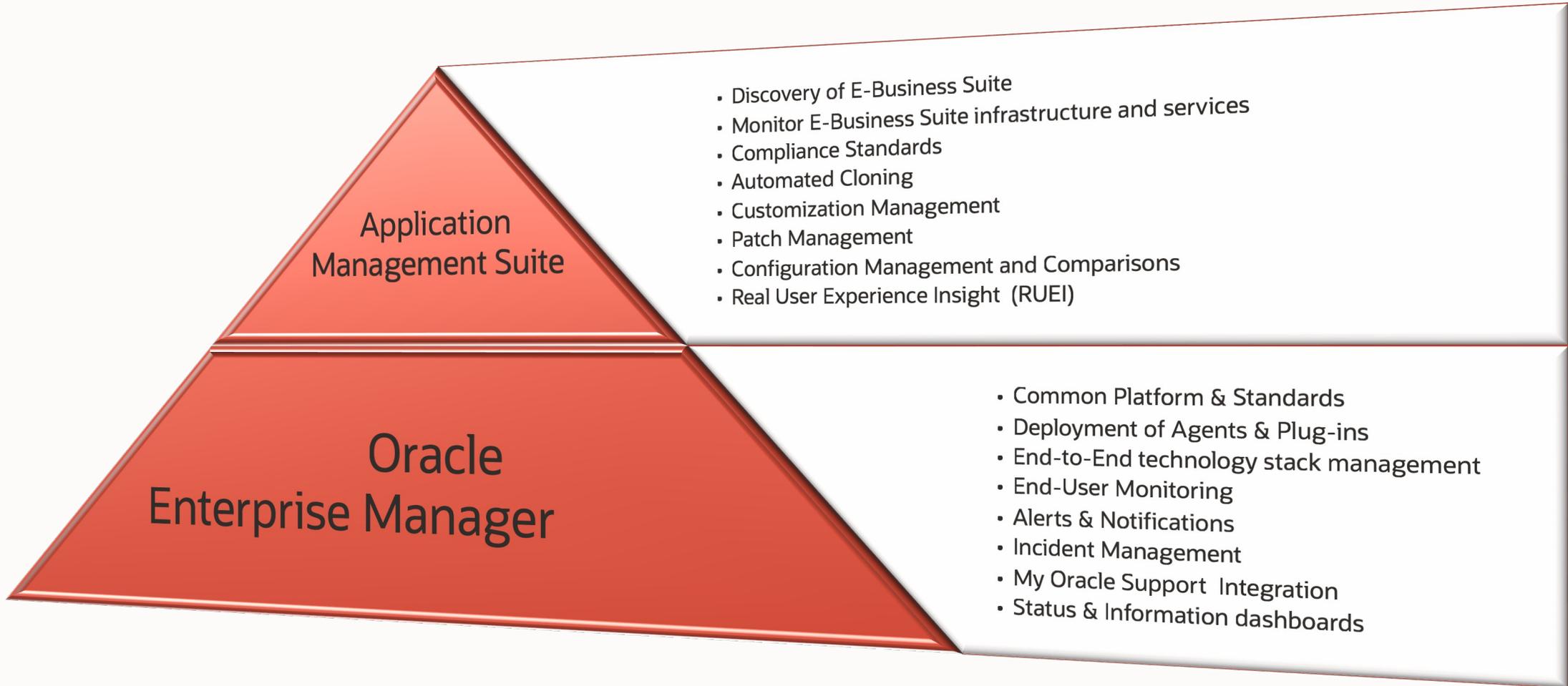
# Oracle E-Business Suite 的监控

## EBS Plug-in



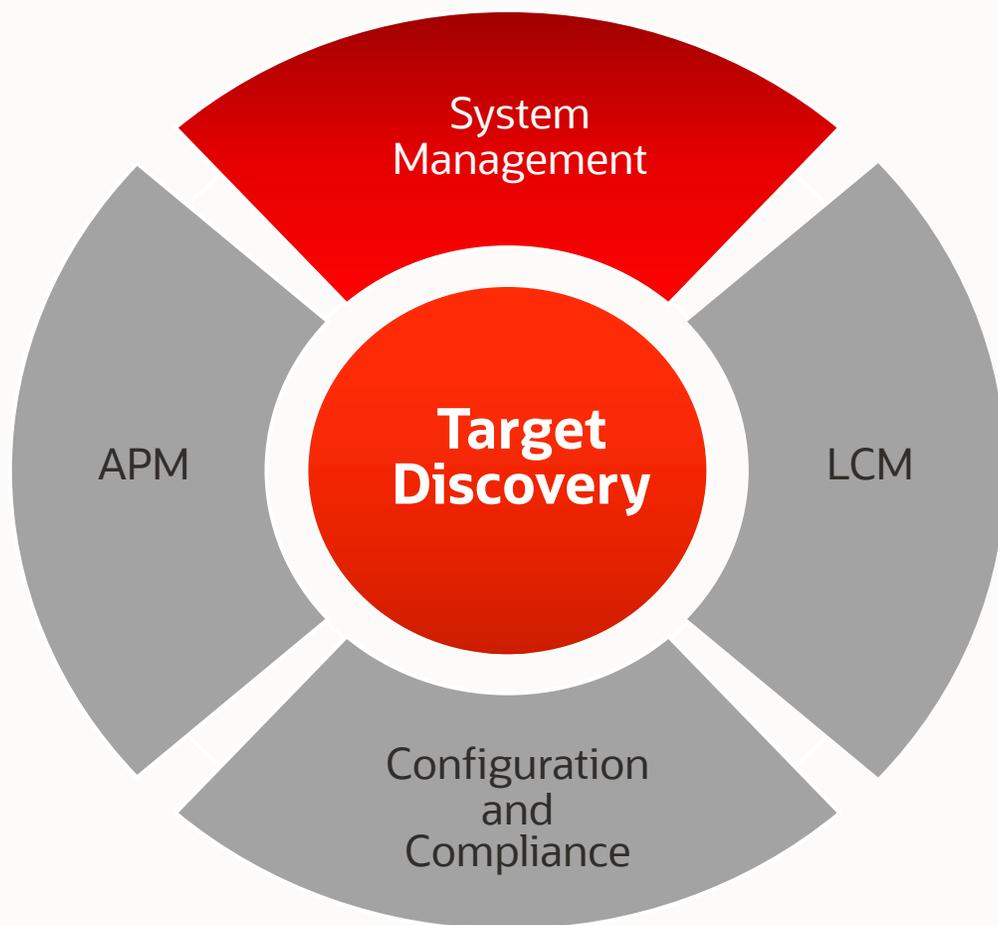
# Oracle E-Business Suite 的监控

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

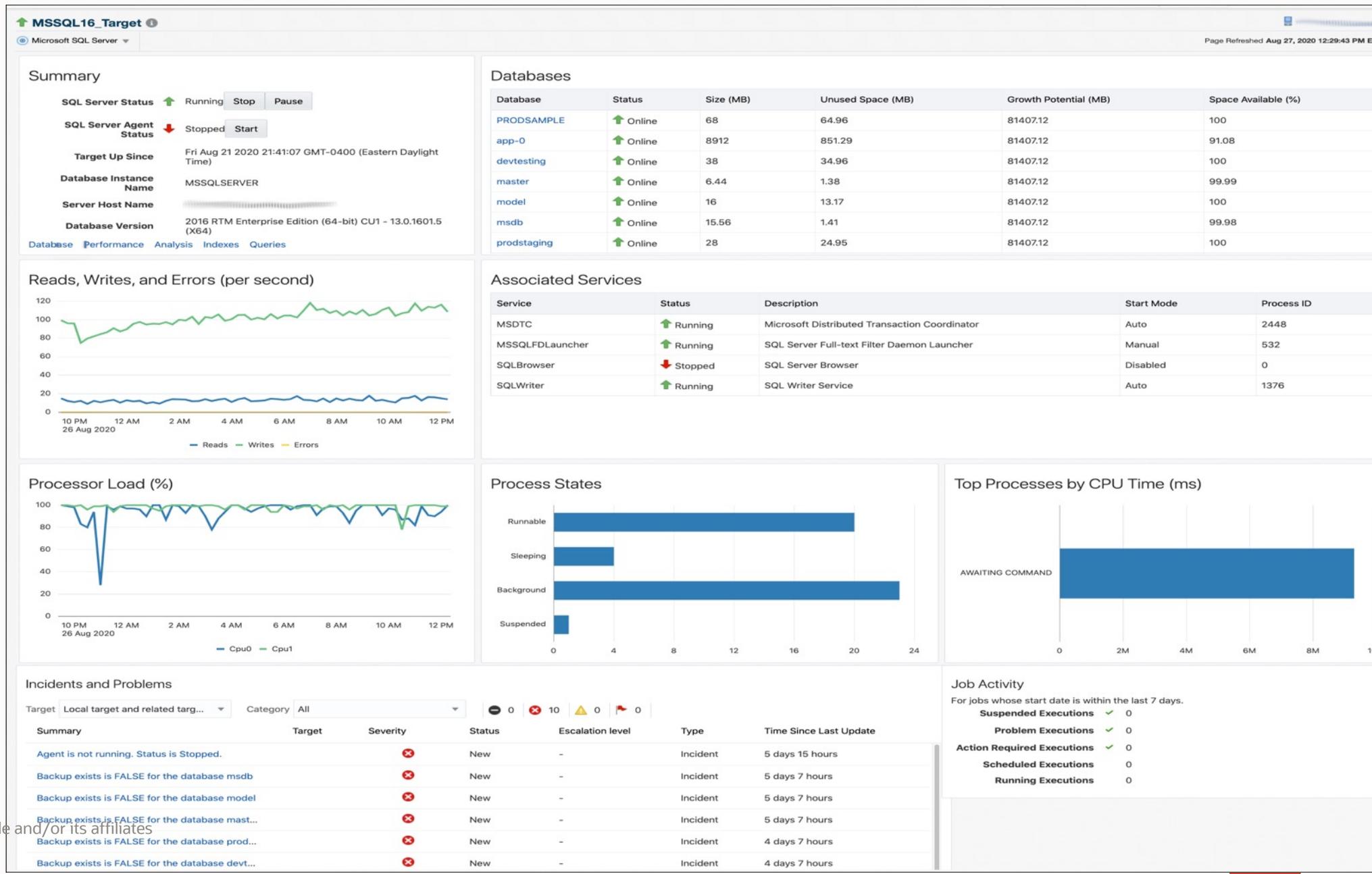
整体汇总信息

数据库状态

读写及相关进程  
负载信息

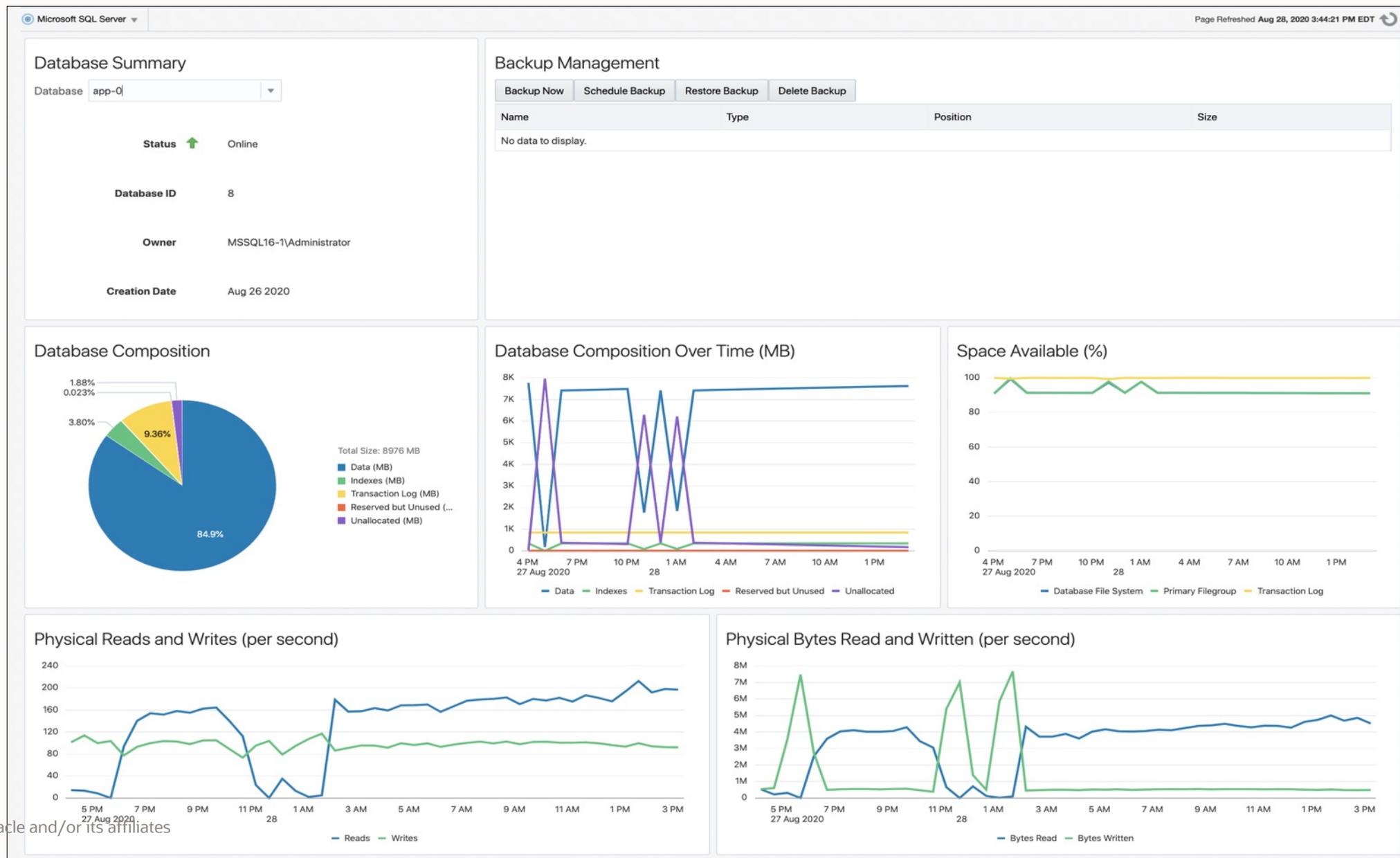
任务调度信息

故障及报错信息



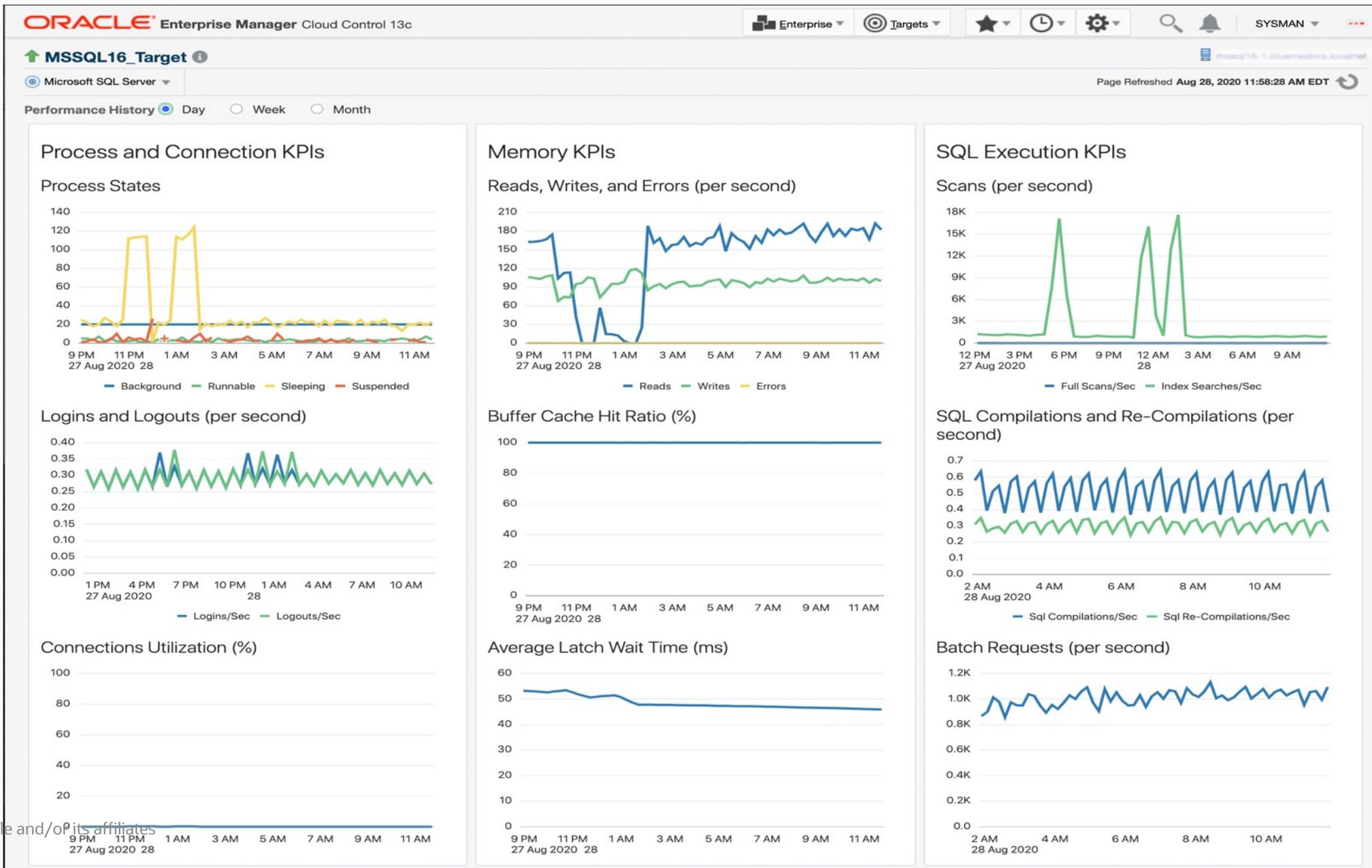
# Microsoft SQL Server 数据库主页

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



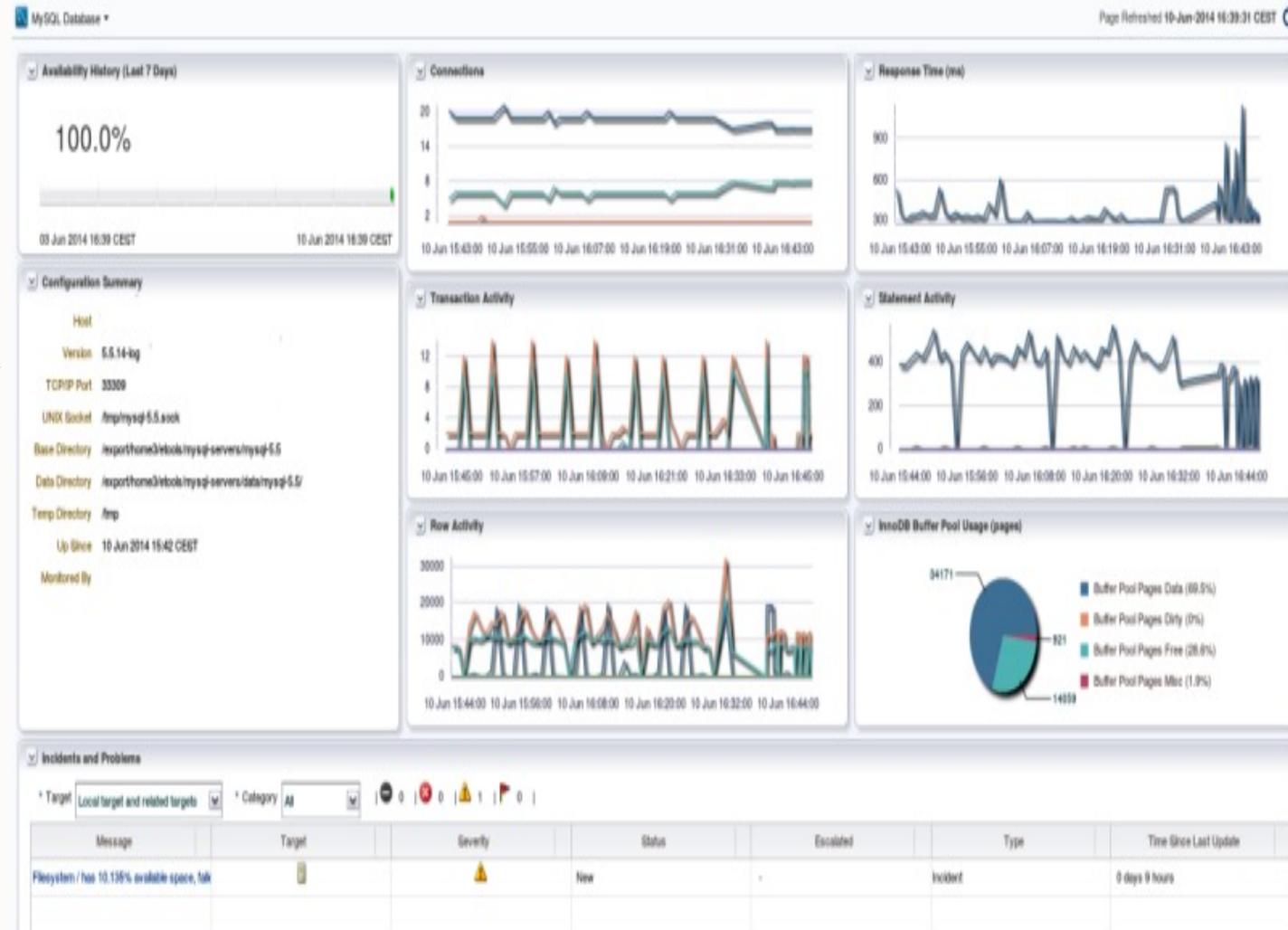
# Microsoft SQL Server 性能主页

根据收集的指标构建各种性能KPI图。



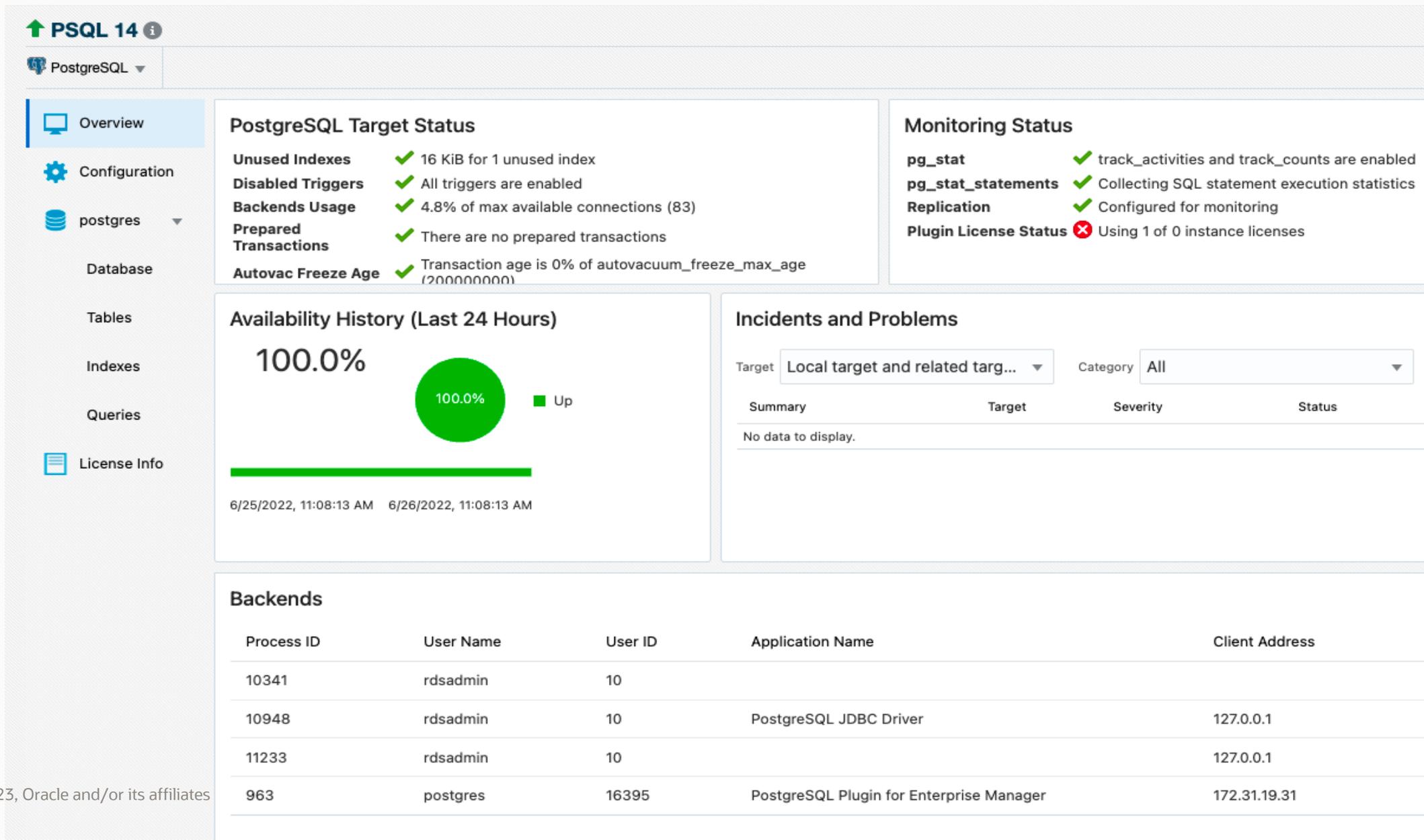
# MySQL 数据库主页

- 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

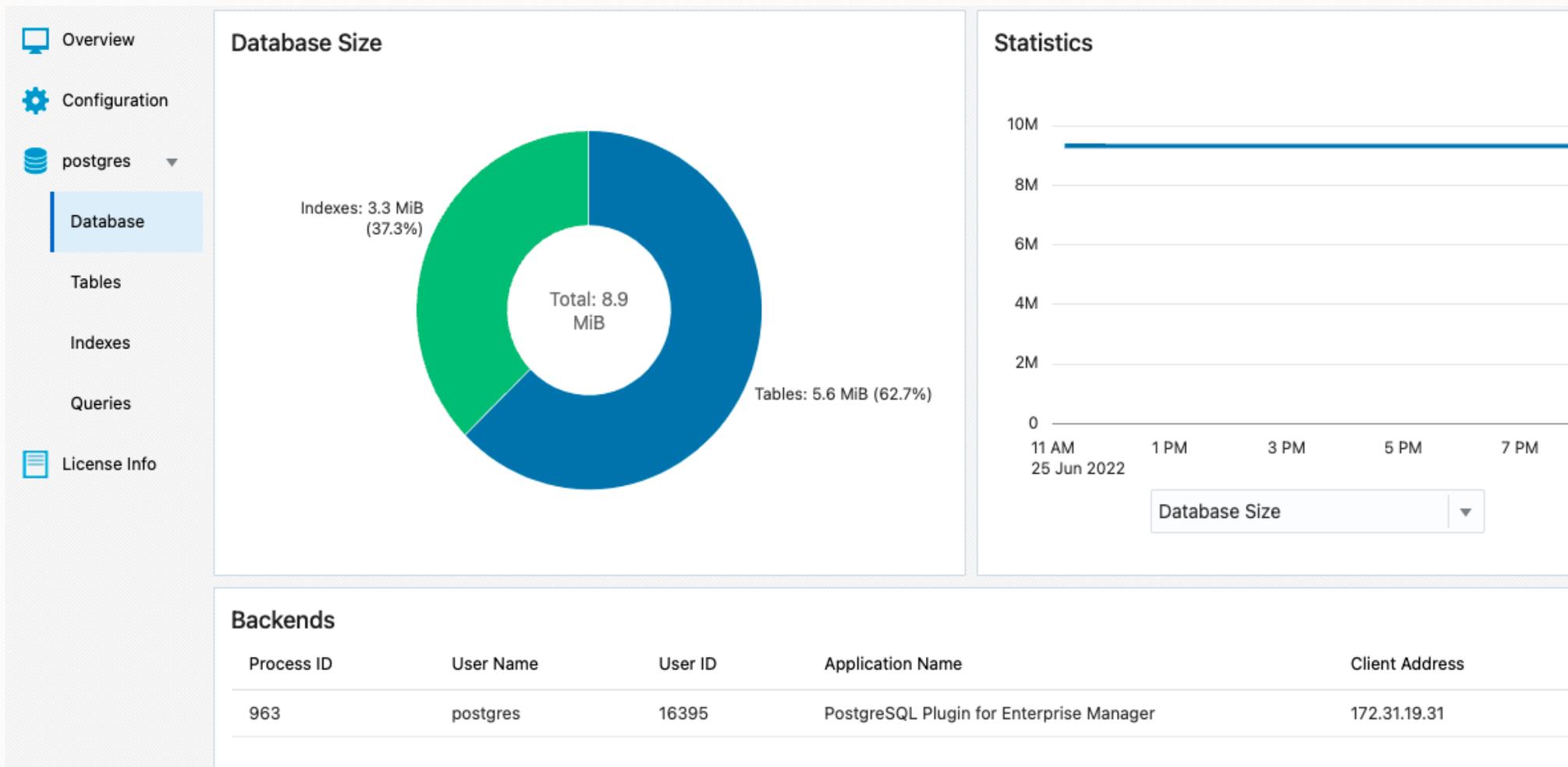
Databases

Tables

Indexes

Queries

Configuration  
information



# PostgreSQL 数据库告警

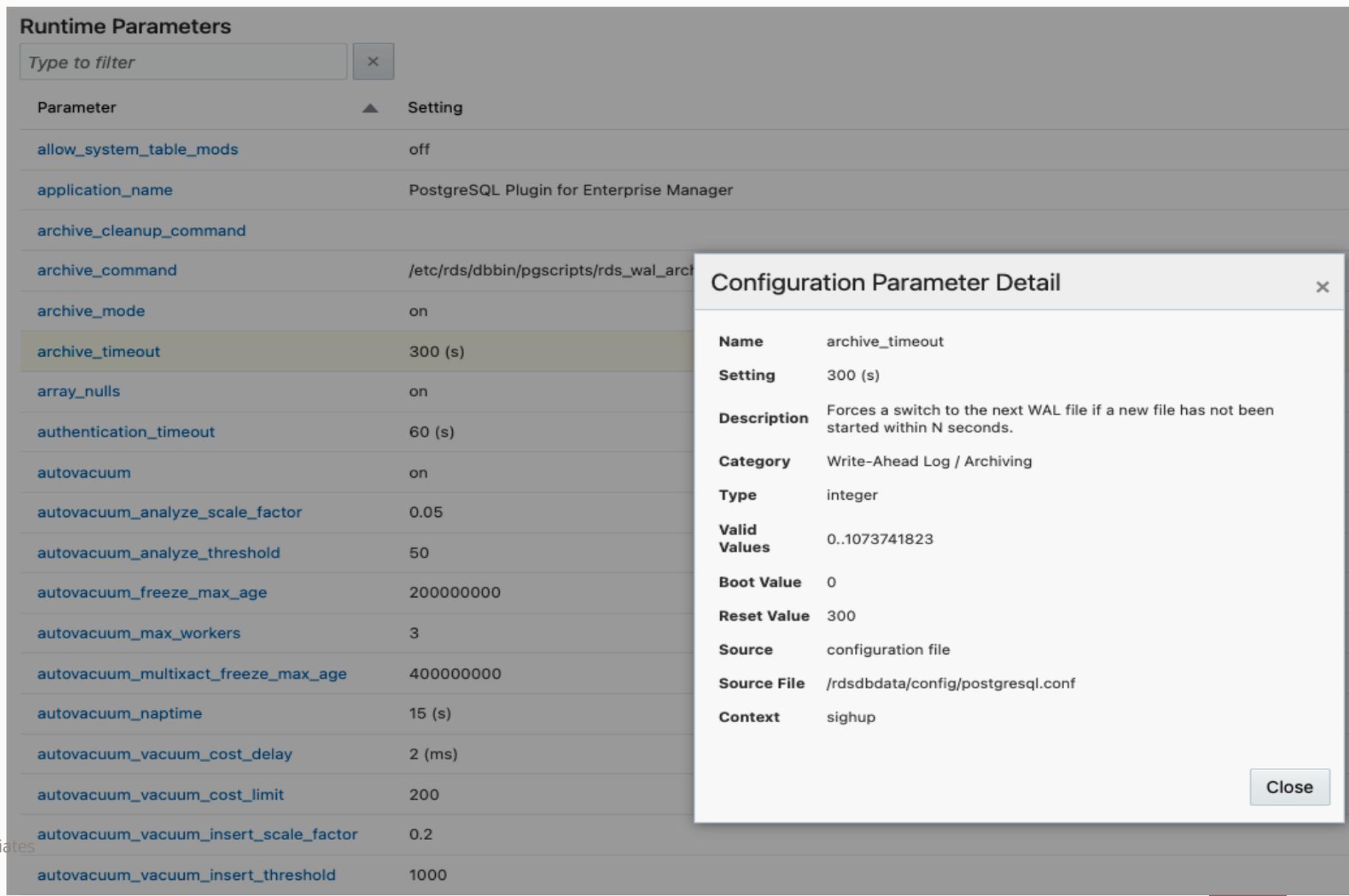
告警指标的阈值定制

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 Name	Alert Type	Alert Threshold	Alert Action
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 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"/>
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 table lists various parameters and their settings. 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_arch
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

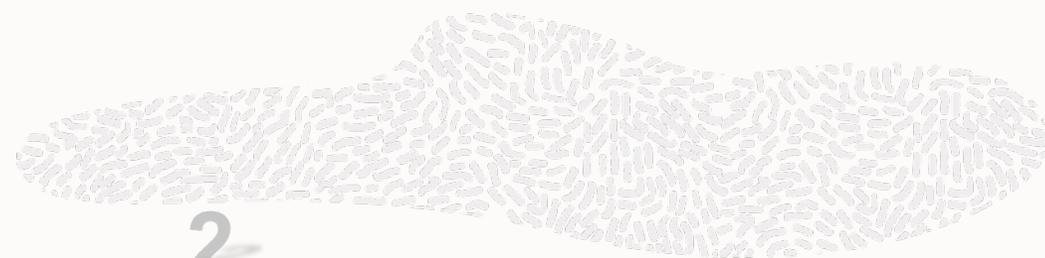


# 数据库性能的关键问题

- 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。



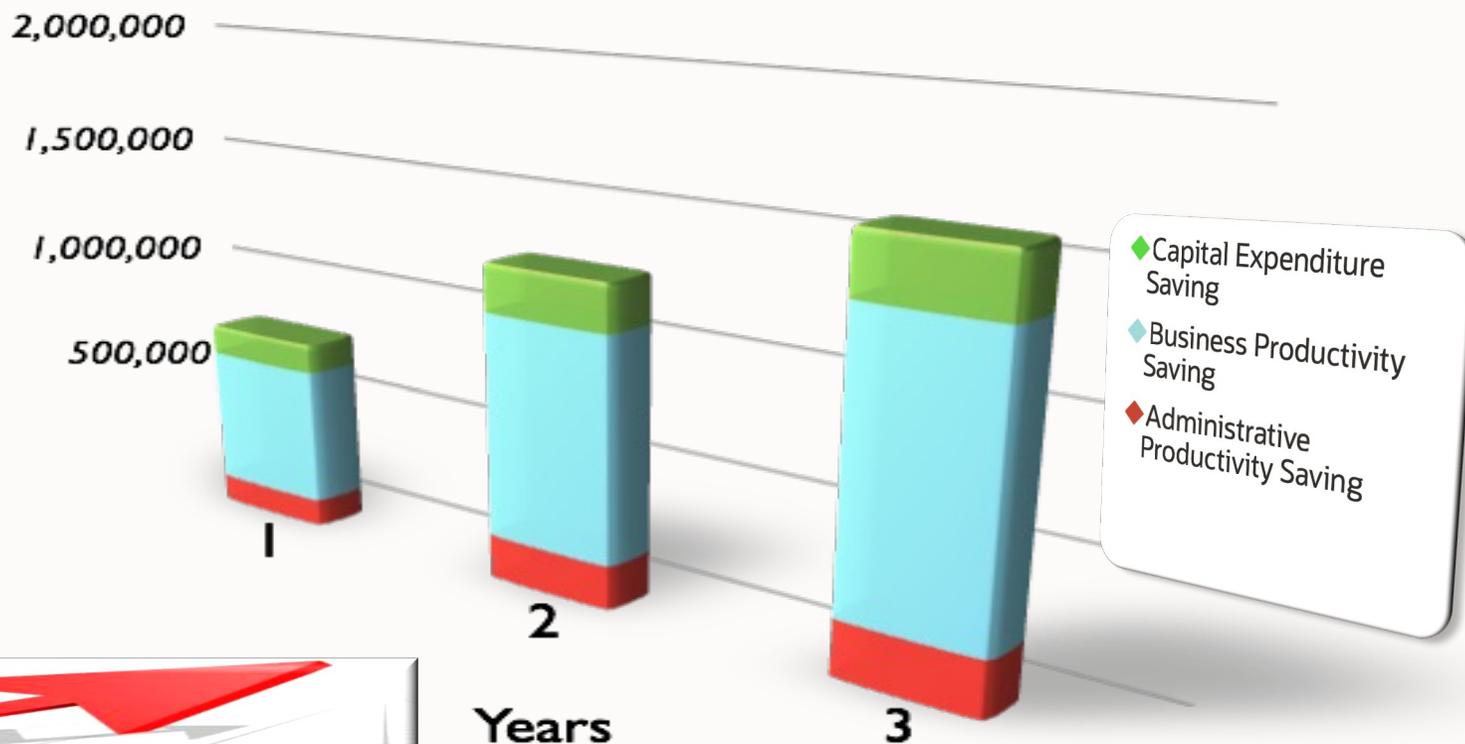
# Diagnostics Pack 诊断包

- 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

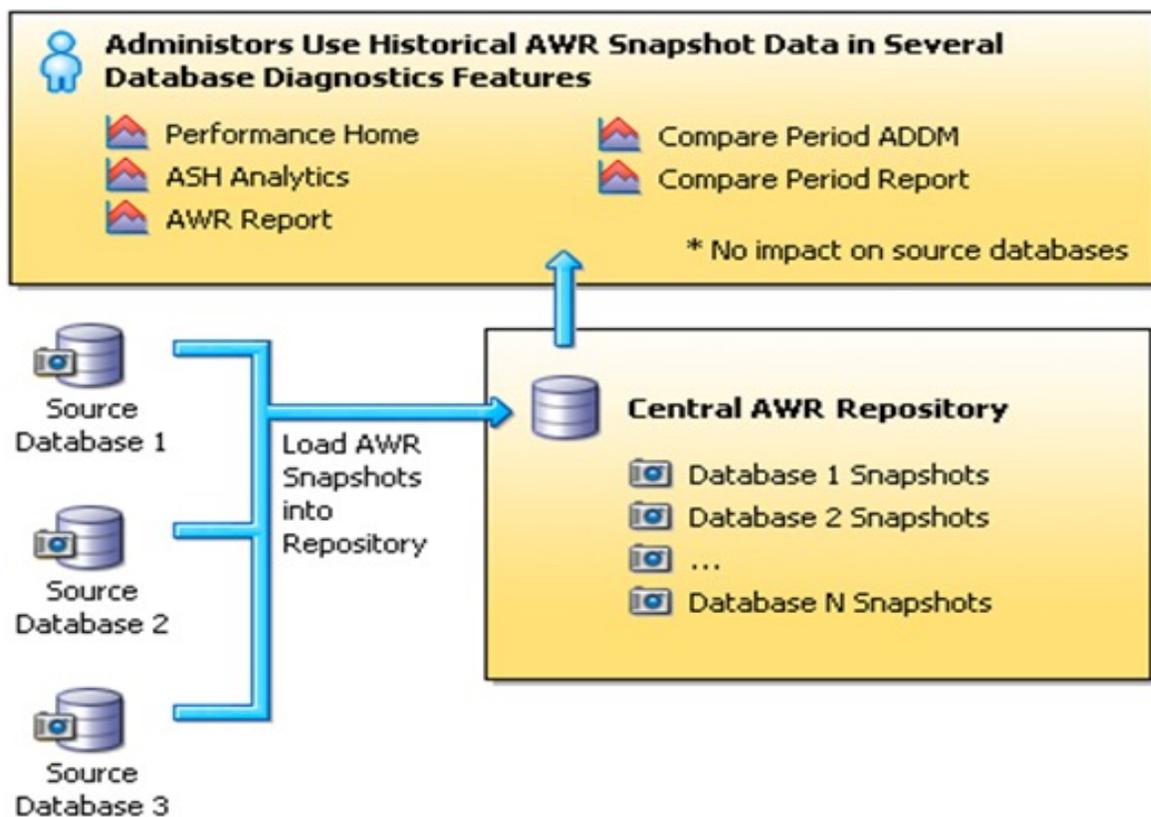


## 解决方案

- 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。



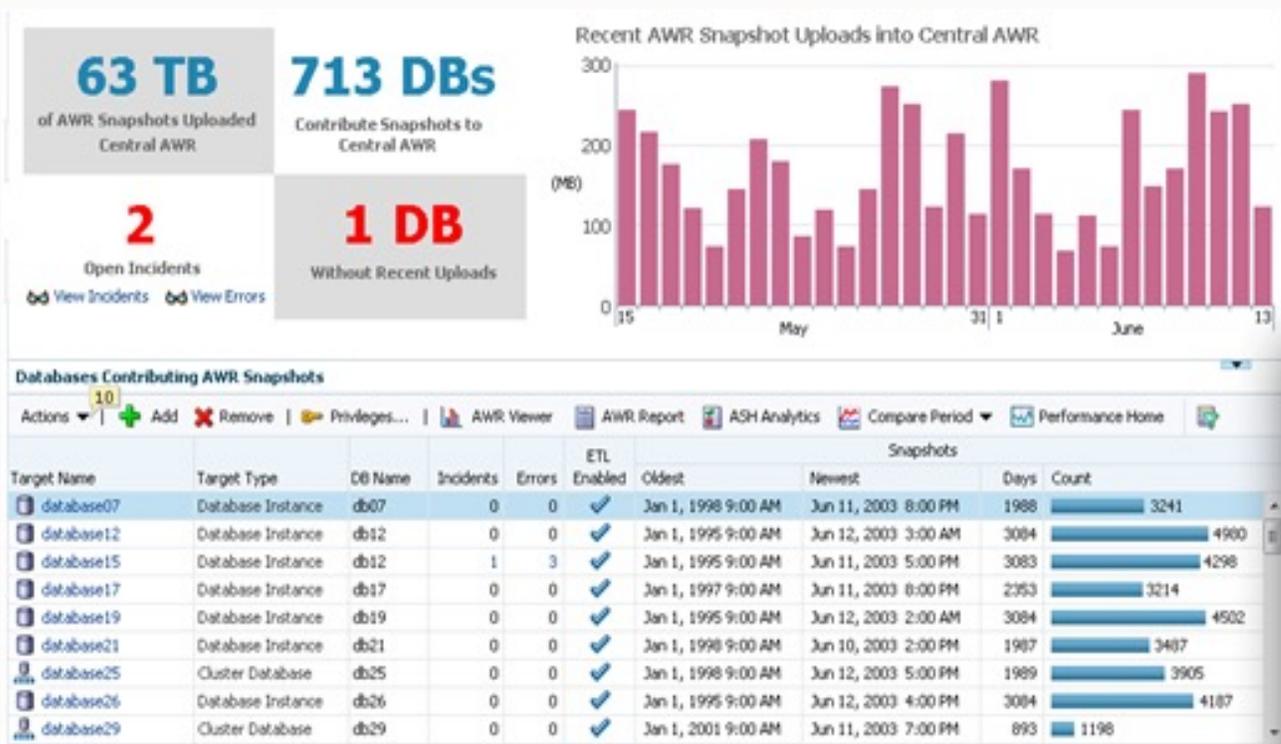
# AWR 仓库



- 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



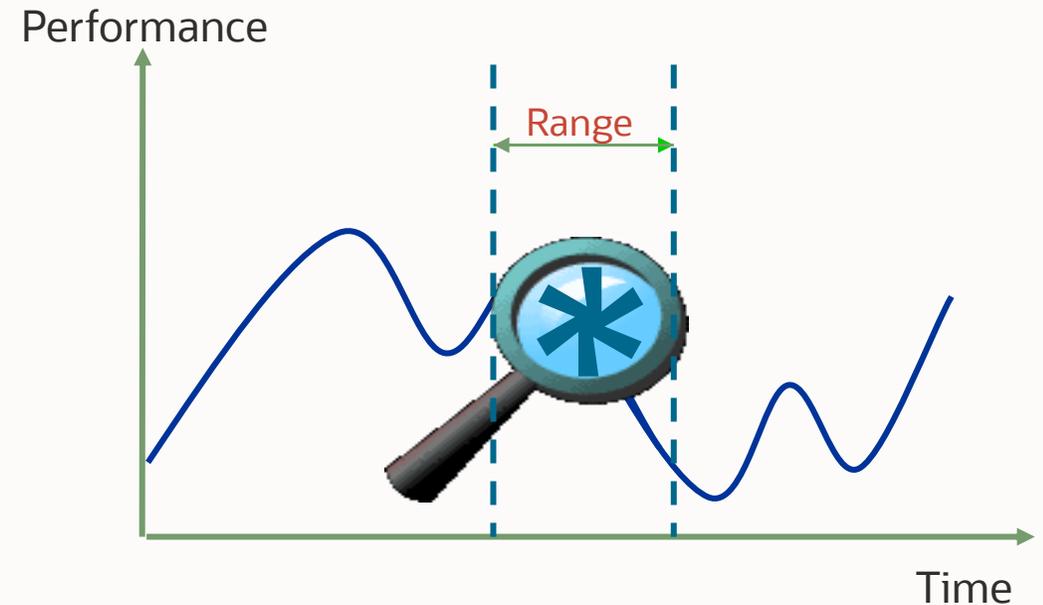
## 解决方案

- 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)

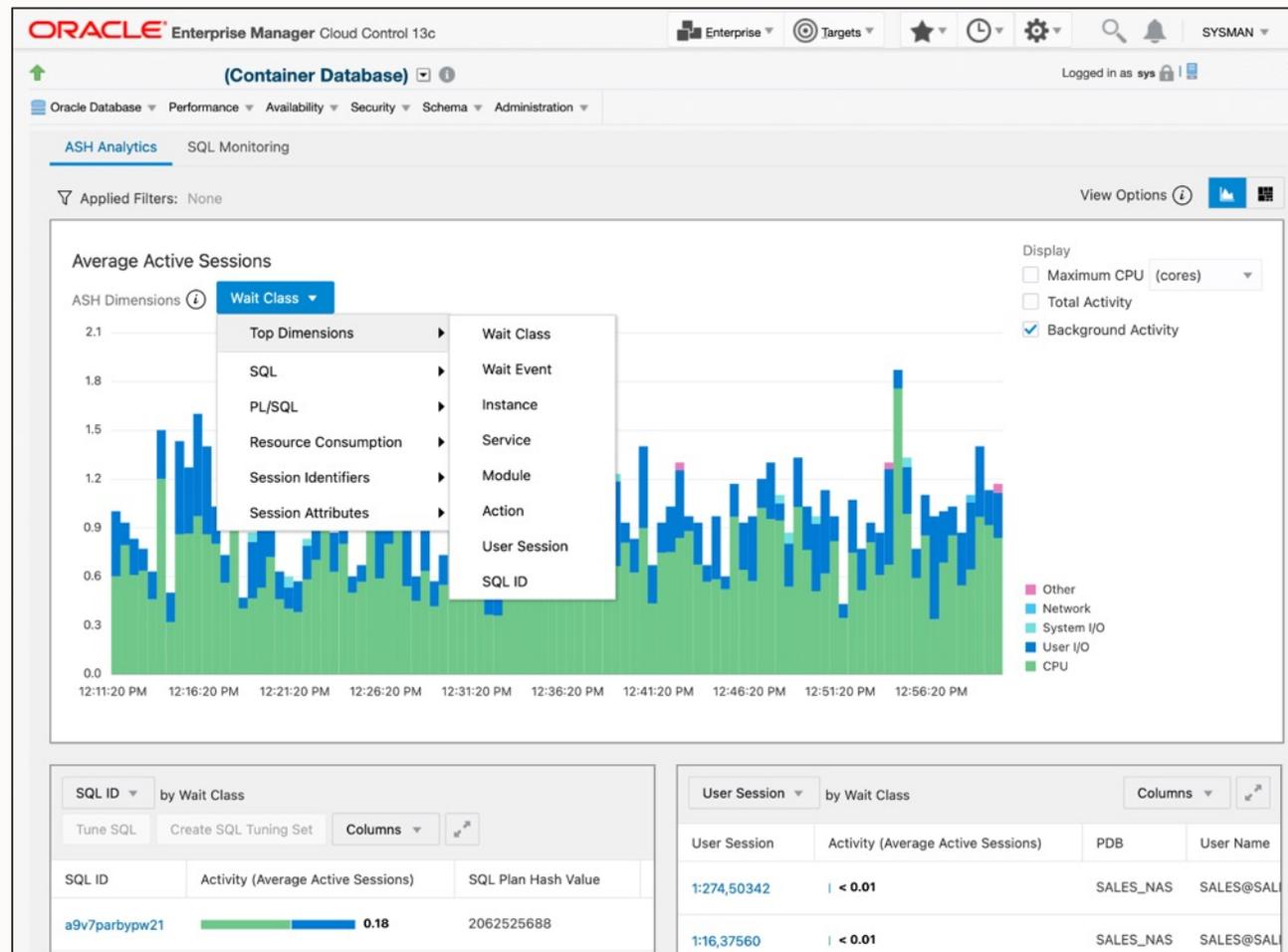
- 每秒将活动会话采样到内存中 (v\$active\_session\_history)
- 帮助回答以下问题：
  - “随着时间的推移，这个SQL会变慢吗？”
  - “哪些 SQL 或会话导致当前高负载？”
- 直接访问内核结构
- 每个快照刷新到 AWR 的 10 个样本中的一个
- 捕获的数据包括许多维度，例如：
  - SID
  - SQL ID
  - Program, Module, Action
  - Wait event#
  - Object, File, Block
  - actual wait time (if captured while waiting)



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

ORACLE Enterprise Manager Cloud Control 13c

Enterprise Targets Favorites History Setup SYSMAN

exadb1 (Container Database)

Cluster Database Performance Availability Security Schema Administration

Advisor Central > Automatic Database Diagnostic Monitor (ADDM):SYS.ADDM:3677014829\_9439 > Performance Finding Details

Performance Finding Details: Top SQL Statements

Finding: SQL statements consuming significant database time were found. These statements offer a good opportunity for performance improvement. [Finding History](#)

Impact (Active Sessions): 1.1

Percentage of Finding's Impact (%): 54.1

Period Start Time: Oct 23, 2020 6:00:36 AM

End Time: Oct 23, 2020 7:00:47 AM

Filtered: No [Filters](#)

Recommendations

[Schedule SQL Tuning Advisor](#)

Select All | Select None | Show All Details | Hide All Details

Select	Details	Category	Benefit (%)
<input checked="" type="checkbox"/>	Hide	SQL Tuning	17.4

Action: Run SQL Tuning Advisor on the SELECT statement with SQL\_ID "5ckxyqfvu60pj". [View Tuning History](#) [Run Advisor Now](#) [Filters](#)

SQL Text: SELECT CUSTOMER\_ID, CUST\_FIRST\_NAME, CUST\_LAST\_NAME, NLS\_LANGUAGE, NLS\_TERRITORY...  
SQL ID: 5ckxyqfvu60pj

Rationale: The SQL statement executed in container SALES with database ID 658906748.  
Rationale: The SQL spent 100% of its database time on CPU, I/O and Cluster waits. This part of database time may be improved by the SQL Tuning Advisor.  
Rationale: Database time for this SQL was divided as follows: 100% for SQL execution, 0% for parsing, 0% for PL/SQL execution and 0% for Java execution.  
Rationale: SQL statement with SQL\_ID "5ckxyqfvu60pj" was executed 307585 times and had an average elapsed time of 0.0041 seconds.  
Rationale: I/O and Cluster wait for INDEX "SOE.CUSTOMERS\_PK" with object ID 92822 consumed 51% of the database time spent on this SQL statement.  
Rationale: Top level calls to execute the PL/SQL statement with SQL\_ID "147a57cxq3w5y" are responsible for 52% of the database time spent on the SELECT statement with SQL\_ID "5ckxyqfvu60pj".  
SQL Text: BEGIN :1 := orderentry.browseproducts(:2, :3, :4); END;  
SQL ID: 147a57cxq3w5y

<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

Findings Path

Expand All | Collapse All

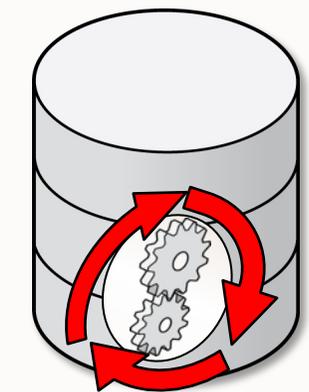
Findings	Percentage of Finding's Impact (%)	Additional Information
SQL statements consuming significant database time were found. These statements offer a good opportunity for performance improvement.	54.1	



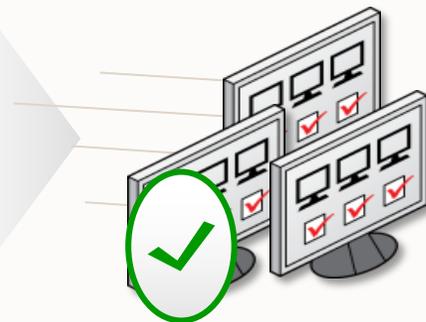
# ADDM周期比较

  
AWR Snapshot  
Period 1

  
AWR Snapshot  
Period 2



Compare  
Period ADDM



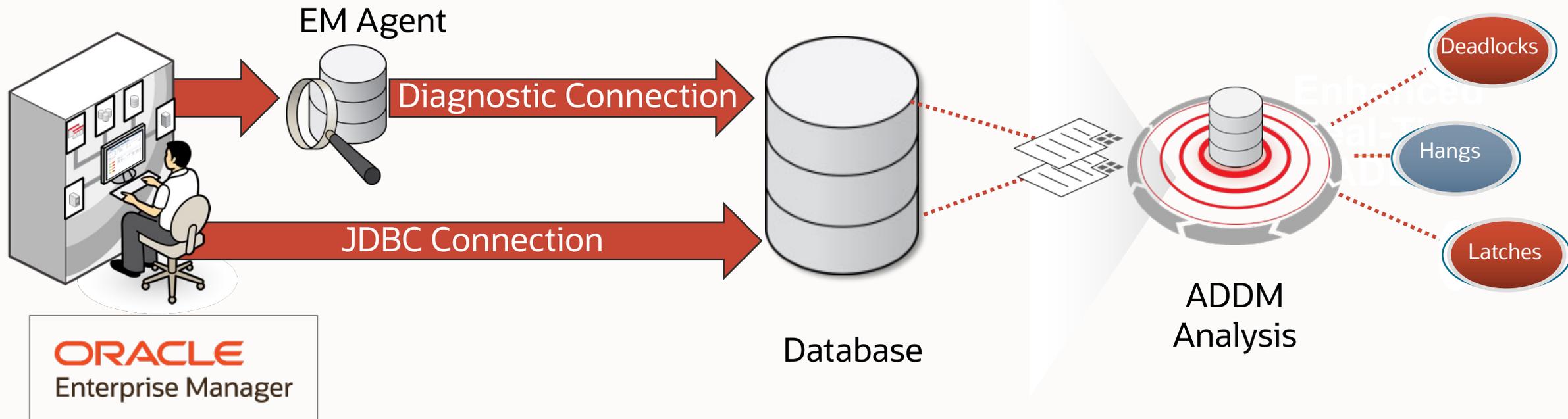
Analysis Report

	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？

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## 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

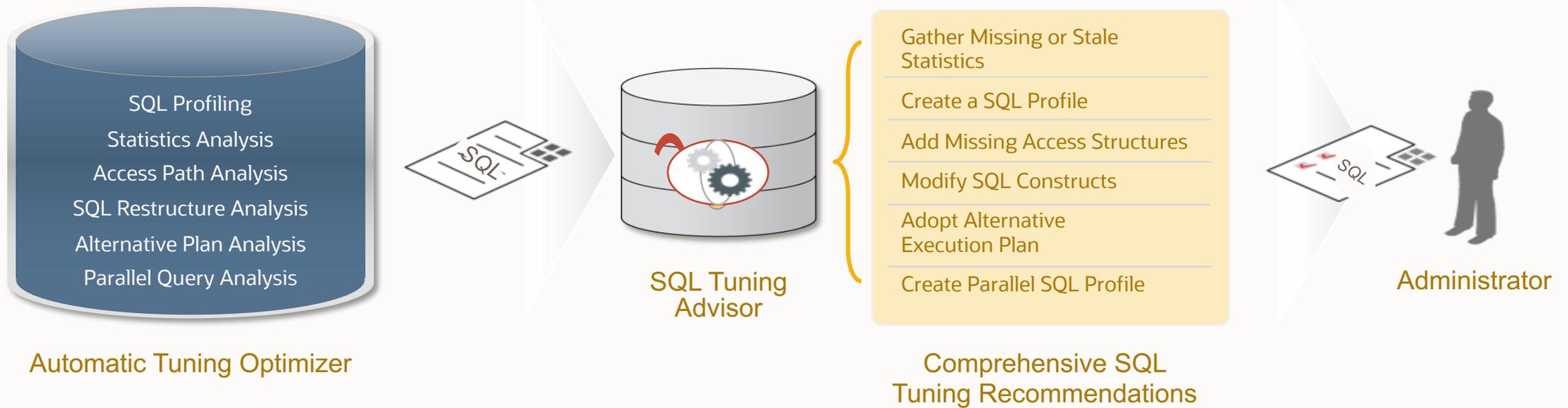
- SQL Tuning Advisor
- **Benefit:**  
允许 DBA 查看问题 SQL 并获得全面的 SQL 调优建议

# 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. At the top, the Oracle logo and 'Enterprise Manager Cloud Control 13c' are visible. The user is logged in as 'sys'. The breadcrumb trail shows 'Advisor Central > SQL Tuning Summary:SYS.SQL\_TUNING\_1551732084711 > SQL Tuning Result Details: SQLs with Recommended and Implemented SQL Profile'. The main content area shows the 'SQL Tuning Result Details' for a specific tuning set. It includes a status section with 'Started' (03/04 12:41:28) and 'Completed' (03/04 13:11:32) timestamps, and a 'Running Time (minutes)' of 30. To the right, it lists 'Tuning Set Owner' as SYS, 'Tuning Set Name' as CRM7\_STS, and 'Time Limit (seconds)' as 1800. Below this, the 'Recommendations for SQL ID:ds9nwvkvfkj3' section is shown. It states 'Only one recommendation should be implemented.' and provides the 'SQL Text' as a SELECT statement. Under 'Select Recommendation', the 'Original Explain Plan (Annotated)' is selected. At the bottom, a table lists the recommendation with a 'Benefit (%)' of 87.53, which is circled in red.

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**

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？

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# 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？



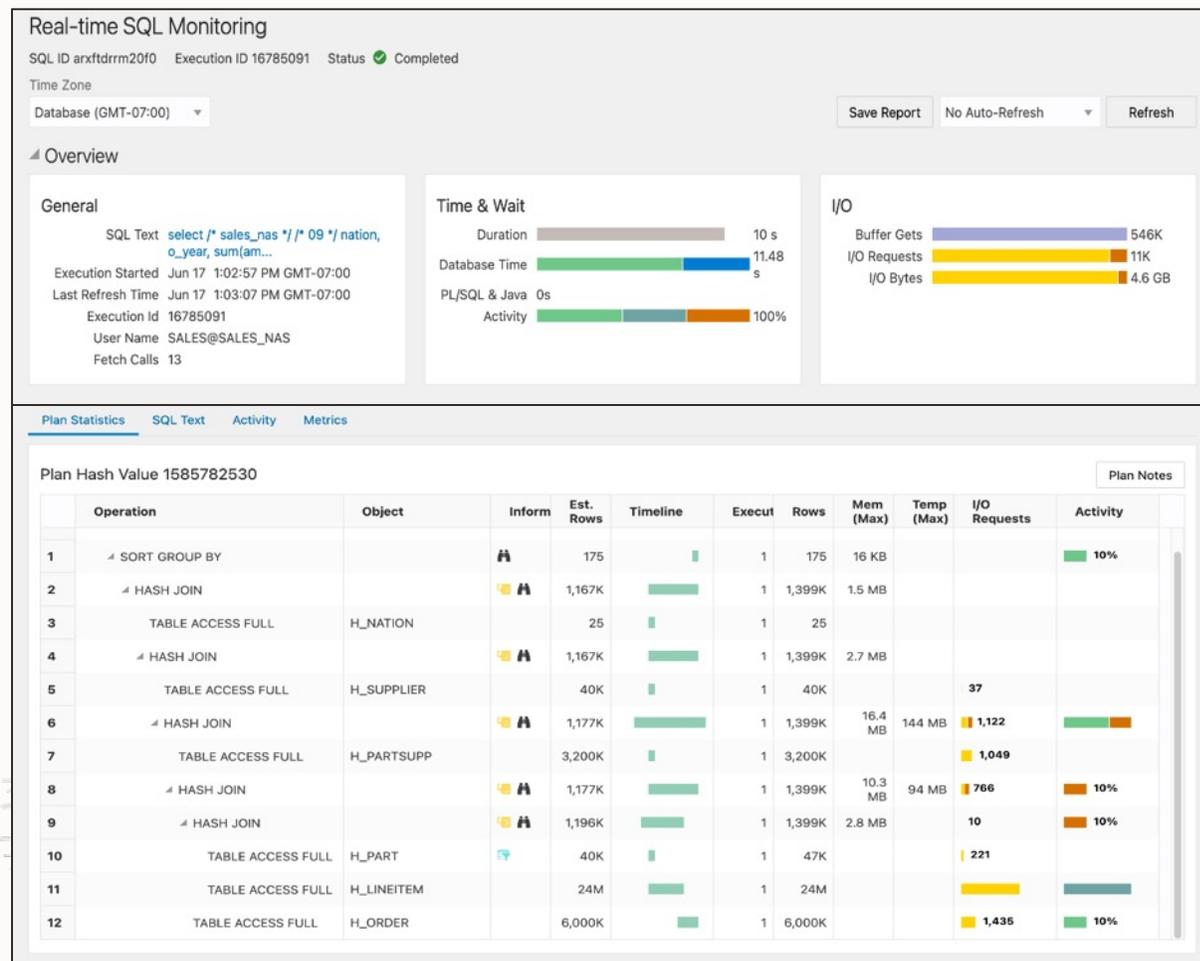
## 解决方案

- 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?

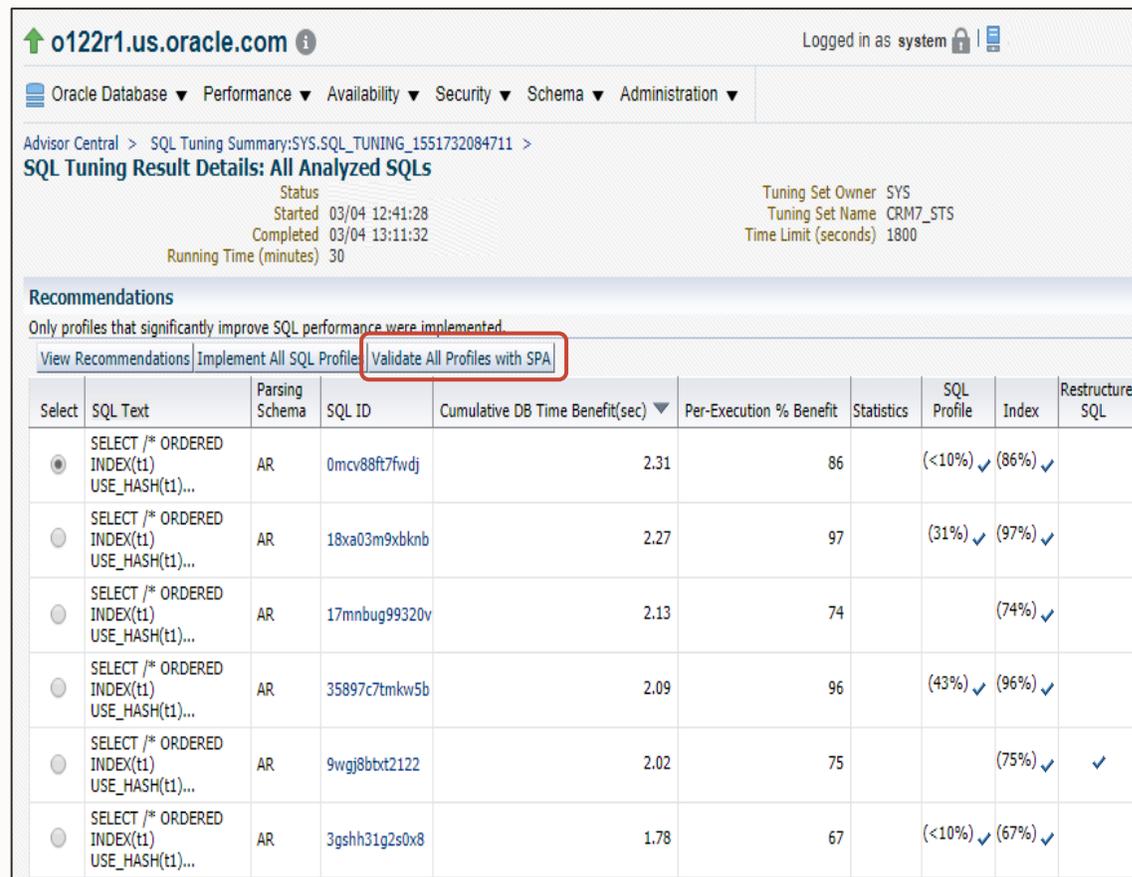


## 解决方案

- 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.

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

ORACLE  
甲骨文

# 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



微信扫一扫预约



数据库和云讲座群



甲骨文云技术公众号



技术专家1V1深入交流





# 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：

**400-699-8888**

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