

ORACLE®

Way Beyond the Basics: Oracle Enterprise Manager Monitoring Best Practices

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WORLD

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Total Cloud Control

ORACLE
ENTERPRISE MANAGER **12^c**



**Superior Enterprise-Grade
Management**



**Integrated Cloud Stack
Management**



Complete Cloud Lifecycle Management

Scalable, Secure

Optimized, Efficient

Agile, Automated

Next Release Builds on a Solid Foundation

NEW:
Continuous
Monitoring



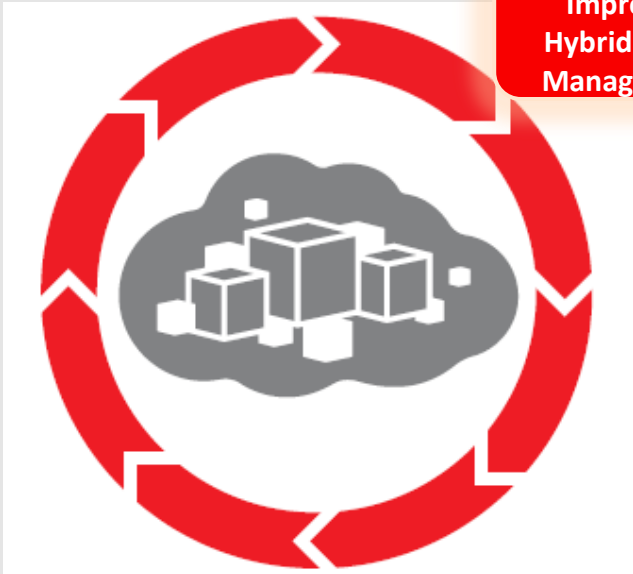
**Superior Enterprise-Grade
Management**

NEW:
Infrastructure
Management



**Integrated Cloud Stack
Management**

NEW:
Improved
Hybrid Cloud
Management



Complete Cloud Lifecycle Management

Scalable, Secure

Optimized, Efficient

Agile, Automated

Program Agenda

- 1 Enterprise Monitoring Overview
- 2 Beyond the Basics: Enhancements in Enterprise Manager 13c
- 3 Always-On Monitoring
- 4 Monitoring At Scale: Lessons from Enterprise Manager at Oracle Cloud

Enterprise Monitoring Overview

Set up Monitoring

- Set thresholds for metrics you care about
- Extend monitoring using Metric Extensions
- Auto-fix alerts using Corrective Actions
- Automate deployment of metric settings across targets using Administration Groups & Template Collections

Manage events and incidents

- Create incidents to manage events (assign owner, track status, escalate, etc.)
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Beyond the Basics: Change Alert Semantics

- Change of Alert Operator
 - Flexibility in changing metric alert operator
 - Enables new semantics to be supported:
 - CPU Utilization(%) > 80%
 - Monitor for high CPU consumption on host
 - CPU Utilization(%) < 10%
 - Monitor lack of usage of the host
 - Only set thresholds for metrics you care about

Host: adc6140792.us.oracle.com > Metric and Collection Settings > Edit Advanced Settings: CPU Utilization

Edit Advanced Settings: CPU Utilization (%)

Corrective Actions

Warning <none>

Critical <none>

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	<=
Time before alert is triggered/cleared	>=
	!=

Every 5 Minutes

10 Minutes


Edit Alert Message Reset Alert Message

Alert Message: CPU Utilization is %value%%, crossed warning (%warning_threshold%) or critical (%critical_threshold%) threshold.



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

Beyond the Basics: Advanced Threshold Management

- **Time-based Static Thresholds**

- Different thresholds to match target workload based on time of day
 - Example: OLTP during day (lower thresholds), batch during night (higher thresholds)
- Support for user-defined Day/Night (time and timezone)
-  – Day of Week (optional: multiple thresholds per day)
- Day of the Month (including LAST)

- **Adaptive Thresholds**

- Signals abnormal behavior of target as expressed by unusual metric value
- Threshold statistically calculated: N% percentile (e.g. 99th percentile)
-  – Support for user-defined Day/Night (time and timezone)
-  – New threshold option: Percentage of Average
- Enhanced 'Test Data Fitness': more details to determine if you have enough data points for calculation of thresholds

Beyond the Basics: Monitoring the DBSNMP account

- DBSNMP database account used to monitor database targets
- *Monitoring User Expiry* metric
 - Monitors pending expiry of DBSNMP's password
 - Alert threshold: Hours before DBSNMP user account expires
 - Default Warning threshold : 72 hours
 - To resolve: EMCLI `update_db_password` (updates password at DB and in EM credential store)
- *Monitoring User Connectivity Issue* metric
 - Monitors DBSNMP user that is already expired or locked
 - Raises critical alert (Default Critical threshold: Critical: ORA-*)
 - Alert message will include the ORA-28000 (locked) or ORA-28001 (expired)
 - To resolve: EMCLI `update_db_account_status`
- Add these 2 metrics to your standard database monitoring templates (Template Collection)
- Proactively prevent and detection issues with DBSNMP which could result in lapse in database monitoring

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Beyond the Basics: Metric Extension Enhancements

- Compute Expressions
 - Calculate metric column value based on mathematical operations on previous metric columns
 - Example: Metric Extension *SpaceUsage*
 - *UsedDiskSpace* (from script)
 - *TotalDiskSpace* (from script)
 - *FreeDiskSpace* = ***TotalDiskSpace* – *UsedDiskSpace***
 - *PctFreeSpace* = ***(TotalDiskSpace == 0) ? 0: ((FreeDiskSpace/TotalDiskSpace)*100)***
 - Basic syntax checking
 - More flexibility in calculating values of metric columns
- Additional option for metric extensions on databases
 - Example: Metric applies to single instance database, not RAC instance

Compute Expression Usage

This table shows some operators which can be used while defining compute expression.

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.
difference	difference between the current value and the value of Column1.	
contains	if the value of Column1 contains the string	

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: Database Instance Only

Container Database Scope: Database Instance Only, RAC Instance Only

Enterprise Monitoring Overview

Set up Monitoring

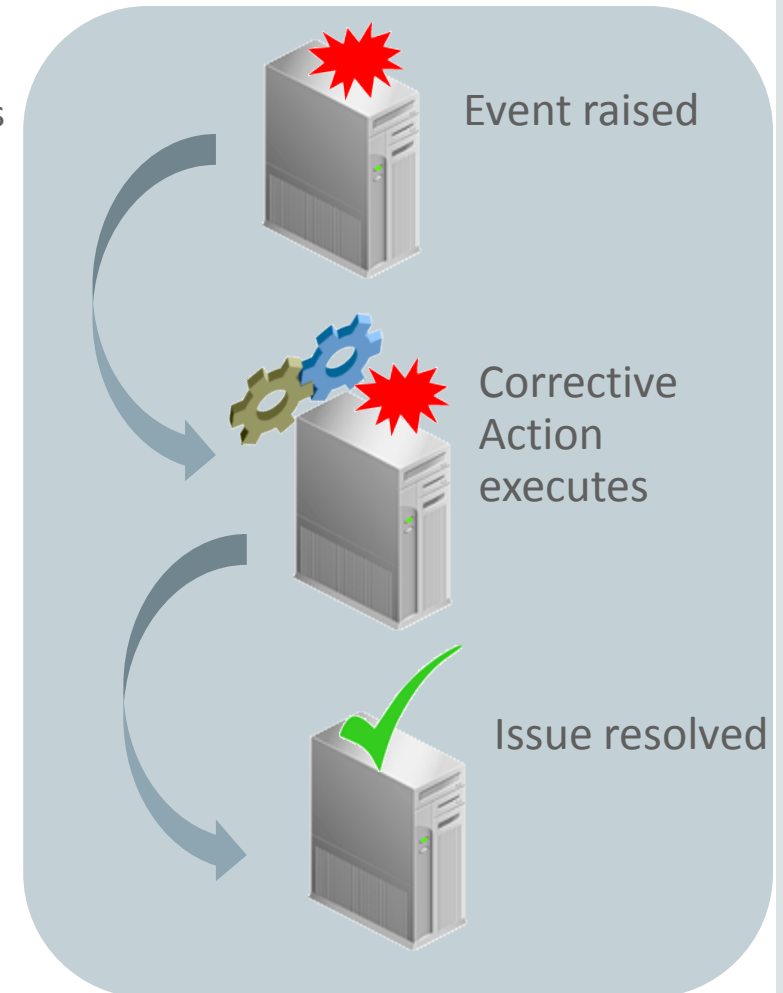
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Beyond the Basics: Corrective Action Enhancements

- Support for ALL event types
 - Extended to Compliance Rule Violation, Compliance Std Score Violation, ADP Alert, APM KPI Alert, JVM Diagnostics Threshold Violation, Service Infra Alert, SLA Alert, User Reported events
- Lifecycle of Corrective Actions
 - Developed by users with Create Corrective Action privilege
 - Test, then Publish for general use
 - Versioning support
- Reference model for better control and consistent semantics
 - Create once in the library
 - Reference the same corrective action in: metric settings, event rules, etc.
- Execution
 - Automatically: specify with metric settings, event rules
 - On demand (invoke manually in Incident Manager)
- Enhances event management / operator efficiency
 - Automate typical resolution actions without manual intervention
 - Automate collection of diagnostic information



Out-of-box Corrective Action: 'Add Space to Tablespace'

- Automatically adds space to tablespace by extending existing datafiles or creating new datafiles
- Customizable
 - Limit disk space consumption
 - Add space by % or MB
 - Limit maximum datafile size
- Can Be Associated With All Tablespace Full Metrics
 - Space Used %, Free Space (MB) for Locally Managed, Dictionary, Temp, Undo
 - Per Tablespace or Tablespaces (wildcard supported with tablespace name)

Create 'Add Space to Tablespace' Corrective Action

General Parameters Access

How to Measure Free Space For % Full, the Maximum Disk Usage (%) parameter is required. For MB Free, the Minimum Free Space (MB) parameter is required.

Maximum Disk Usage (%) Enter the maximum percentage of disk or disk group (ASM) space that can be consumed. If usage exceeds this maximum, the tablespace size will not be increased.

Minimum Free Space (MB) Enter the minimum amount of free disk or disk group (ASM) space that must be present. If free space is below this amount, the tablespace size will not be increased.

How to Increase Space For Increase By %, the Increase Tablespace Size (%) and Increase Bigfile Size (%) parameters are required. For Increase Tablespace Size (MB) and Increase Bigfile Size (GB), the Increase Tablespace Size (MB) and Increase Bigfile Size (GB) parameters are required.

Increase Tablespace Size (%) Enter the percentage of current tablespace size to add to an existing datafile in a smallfile tablespace. If not specified, a new datafile will be created.

Increase Tablespace Size (MB) Enter the number of megabytes to add to an existing datafile in a smallfile tablespace. If not specified, a new datafile will be created.

Maximum Datafile Size (GB) 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.

Maximum Tablespace Size (GB) Enter the maximum size in gigabytes that a smallfile tablespace can grow to. If not specified, the Oracle maximum will be used.

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Beyond the Basics: Target Property Enhancements

- Support for master list of values, enabled on per target property basis
- New CLI verbs to enable it and maintain the list
 - use_master_list (with -copy_from_targets)*
 - add_to_property_master_list*
 - delete_from_property_master_list*
 - list_property_values*
- Applies to out-of-box global target properties, user-defined target properties for all target types
 - Cannot add or delete values from Lifecycle Status because its values have special semantics
- Can pre-populate list from existing values set on the targets
- Auditing of target property changes
- More control over valid values, prevent errors resulting in targets not joining the appropriate administration group/ dynamic group

Host: > Target Properties > Edit Target Properties

Edit Target Properties

Administration Groups and Dynamic Groups are created using membership criteria specified in the Administration Groups Hierarchy. Administration Groups are created automatically when its property values match with the respective Administration Group. Administration Groups Hierarchy is not setup in this environment.

Name	Value
Team	<input type="text" value="None"/>

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Beyond the Basics: Event Compression

- Automatic grouping of related events into 1 incident
 - Example: Group all “Filesystem full” events for a host into 1 incident
- Reduce volume of incidents, promotes more efficient management of incidents
 - These events relate to the *same issue*, want 1 incident to manage as a whole
 - These events will be managed by the *same administrator*, want 1 incident to manage as a whole
- In current Enterprise Manager, you can group events into 1 incident manually (not in automated way)

How To Use Event Compression

New Options in Event Rule's Incident Creation Action



1. **Incident Rule Set:** Choose Targets

2. Event Rule

- A. **Event Rule: Choose Event Type** (Metric Alert, Target Availability, Job Status, Compliance Violation, SLA, etc...)
- B. **Event Rule: Select specific events** (specific metrics, severity, category, target type etc)
- C. **Create incident and choose how incident will be created**

For each event, create one incident

OR

Group multiple events into one Incident

(NEXT - Choose 'event grouping' options)



Options to Group Events

- Group By Target
- Group By Event Category
 - Availability, Business, Capacity, Configuration, Error, Fault, Jobs, Load, Performance, Security
- Group By Event Name
 - Example: Metric Alerts, event name is the metric name
- Grouped events should occur within close timeframe of each other
 - By default, events should occur within 1 hour of each other
 - Can change the 1 hour default time window
 - Otherwise, new incident will be created for the event

Target Grouping Criteria

Select **ONE** of the following target grouping criteria:

() By Target

- All events for a target will be grouped into 1 incident
- Example: All *Metric Collection Errors* for a target grouped in 1 incident

() By Target's host

- All events across all targets on a host will be grouped into 1 incident
- Example: All *Agent Down* events on all targets on a host → 1 Incident

() By Ancestor of the target, choose ancestor Target Type

- Ancestor is the parent target or its grandparent or great-grandparent, etc.
- Examples of ancestors:
 - RAC instance has these ancestors: Cluster Database is parent , Database System containing Cluster DB is grandparent
 - SOA Composite has ancestors: SOA Infrastructure, SOA Infra Cluster, WebLogic Domain/Farm
 - Check topology to see who your parents are (Member of Composite)
- Example: All SOA Composite Down events within 1 WebLogic Domain → 1 Incident

() By Generic System

- Group together events from targets that are members of the same Generic System
- WARNING: A target could be part of multiple Generic Systems; potential effect that grouping results can be different in this scenario

Enterprise Monitoring Overview

Set up Monitoring

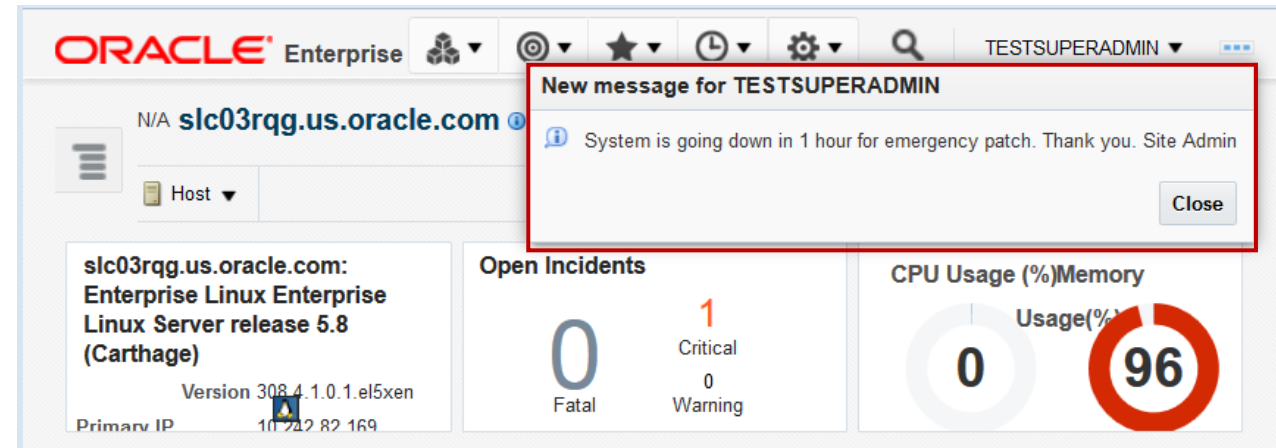
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- **Notify appropriate administrators**
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Beyond the Basics: Send directed instant messages to users

- Popup message
- Instant messages that pops up in the Console
 - Convenient way to send messages to one or all users from super administrators
- `emcli send_popup_message`
 - Recipients: Specific user or ALL
 - Message
- Use this as a custom OS Notification Method for events or incidents
 - Visually notifies users of important events



The screenshot displays the Oracle Enterprise console interface. At the top, the Oracle logo and 'Enterprise' text are visible. The user 'TESTSUPERADMIN' is logged in. A red-bordered popup message is overlaid on the console, titled 'New message for TESTSUPERADMIN'. The message content reads: 'System is going down in 1 hour for emergency patch. Thank you. Site Admin'. A 'Close' button is located in the bottom right corner of the popup. The background console shows a host 'slc03rqg.us.oracle.com' with system details: 'Enterprise Linux Enterprise Linux Server release 5.8 (Carthage)', 'Version 308.4.1.0.1.el5xen', and 'Primary IP 10.712.82.169'. There are also two summary cards: 'Open Incidents' showing 0 Fatal, 1 Critical, and 0 Warning; and 'CPU Usage (%)Memory Usage(%)' showing 0% CPU usage and 96% memory usage.

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Incident Manager

ORACLE Enterprise Manager Cloud Control 13c Enterprise ▾ Targets ▾ ★ ▾ ⌚ ▾ ⚙ ▾ 🔍 DEMOADMIN ▾ ⋮

Incident Manager: All open incidents Page Refreshed Oct 28, 2015 7:26:00 AM GMT ↻

Views Search Actions ▾ View ▾ View search criteria Acknowledge Clear ...

Out-of-box

- My open incidents and problems
- Unassigned incidents
- Unacknowledged incidents
- Escalated incidents
- All open incidents
- Unassigned problems
- All open problems
- Events without incidents
- Events recorded during blackout/brownout

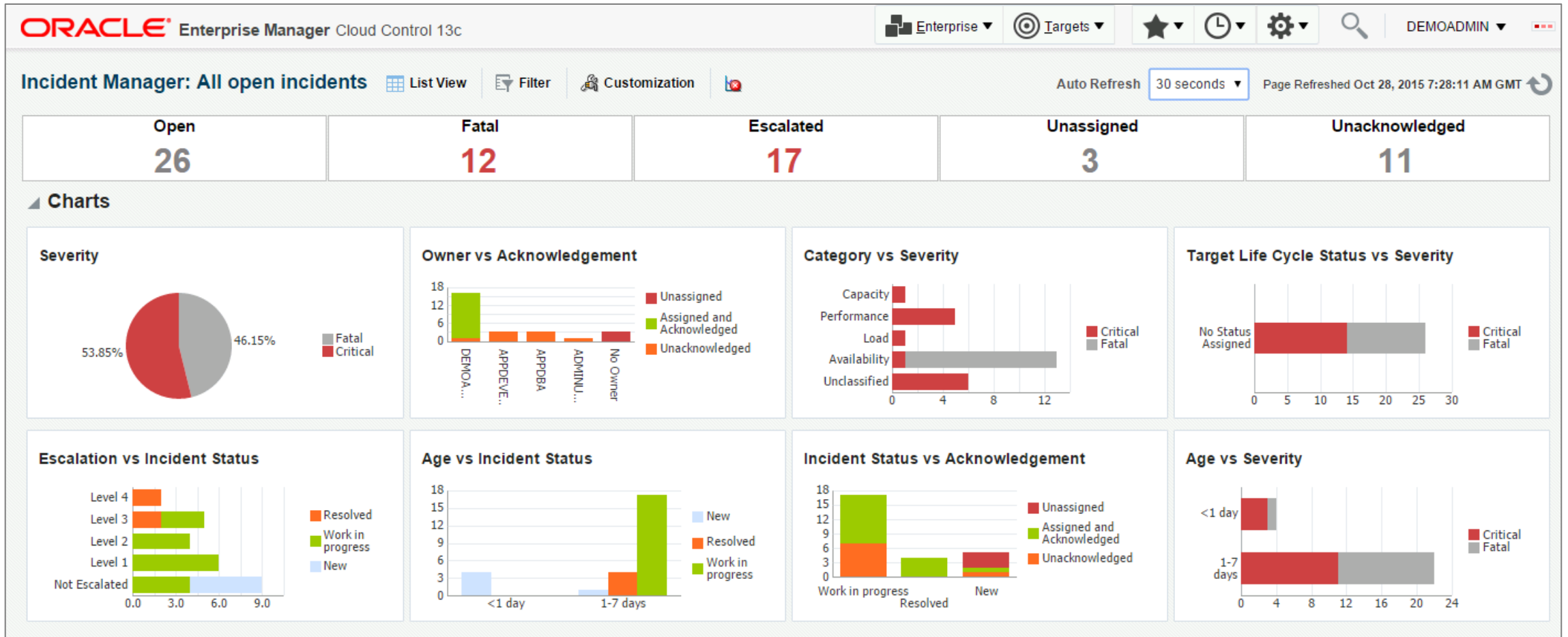
My Views + 🗨

- Weblogic Incidents & Problems 🗨
- DB Incidents & Problems
- DemoAdmin

Member Count	Severity	Summary	Target	Priority	Status	Age	Time Since Last Update	Owner	Acknc	E
1	✖	another process error on host	oemadm01.oraclelead...	None	New	2 hours ...	2 hours 30 min...	DEMOAD...	No	N
1	⊖	The following key tests are down: Mixed workload - Q1	Mixed Workload Q1	None	New	4 hours ...	4 hours 40 min...	-	No	N
1	✖	Test Mixed workload - Q1 is now down: Mixed workload - ...	Mixed Workload Q1	None	New	4 hours ...	4 hours 41 min...	-	No	N
1	✖	Mixed workload - Q1 from EM Management Beacon is dow...	Mixed Workload Q1	None	New	4 hours ...	4 hours 43 min...	-	No	N
1	✖	Workload Q5 from EM Management Beacon is down; Detai...	Workload Q5	Very High	Work i...	6 days 1...	1 days 7 hours	DEMOAD...	Yes	L
6	⊖	There are 6 Target Availability events on members of /Far...	Multiple	Very High	Work i...	6 days 1...	1 days 7 hours	DEMOAD...	Yes	L
1	✖	Workload Q4 from EM Management Beacon is down; Detai...	Workload Q4	Very High	Work i...	6 days 1...	1 days 7 hours	DEMOAD...	Yes	L
1	✖	Test Mixed workload - Q3 is now down: Mixed workload - ...	Mixed Workload Q3	None	Work i...	6 days 1...	1 days 8 hours	DEMOAD...	Yes	N
1	⊖	The following key tests are down: Mixed workload - Q3	Mixed Workload Q3	None	Work i...	6 days 1...	1 days 8 hours	DEMOAD...	Yes	N

Rows Selected 1 Columns Hidden 22 Row count

Beyond the Basics: Incident Dashboard



Beyond the Basics: Incident Management Enhancements

- Export/Import Incident Rule Sets
 - Allows sharing of rule sets between Enterprise Manager sites
 - Useful for backing up rule sets
 - Exported rule set will contain entities used: target, user, email address, notification methods
 - When importing, if entity exists, it will be kept, otherwise, it is removed from the rule
 - Rule set marked as broken with tip to user to correct the issue

Enterprise Monitoring Overview

Set up Monitoring

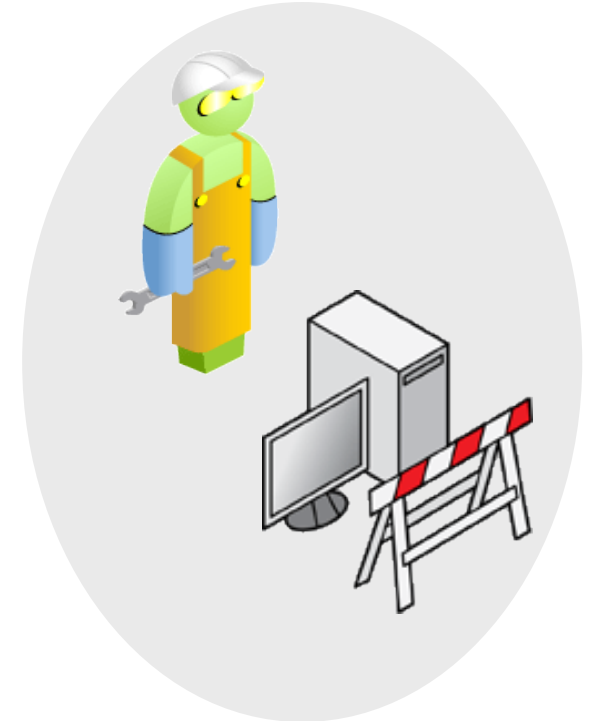
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Beyond the Basics: Blackouts Enhancements

- Enhanced UI
 - One-page blackout creation
 - Blackouts UI redesigned to maximize information shown
- Enhanced Blackouts Semantics
 - Better support for target patching
 - During blackout, agent is guaranteed **not** to interact with blacked-out target for monitoring purposes
 - Blackout will not start until agent has confirmed knowledge of blackout
 - Do not put ‘agent unreachable’ targets under blackout



Enhanced Blackout UI: Easier access to blackout data

Blackouts and Brownouts Auto Refresh Off ▼ Page Refreshed Jun 10, 2015 7:51:25 AM UTC

View By Targets Blackout or Brownout Name

Search Blackout/Brownout Timeframe All ▼ Name Type All ▼ End Date Between 🔍 And 🔍

View ▼ »

Name	Type	Status	Start Date	End Date	Duration	Repeat	Last Updated By
Blackout_rcln_17832ff5bcb3538de053da31f20aa795	Blackout	Started	Jun 2, 2015 5:27:45 AM UTC		Indefinite	Do Not ...	SBAMBO...
CREATE_GOLD_IMAGE_2015-06-09 08:16:04	Blackout	Ended	Jun 9, 2015 6:16:05 AM EDT	Jun 9, 2015 6:16:08 AM EDT	Indefinite	Do Not ...	<SYSTEM...
CREATE_GOLD_IMAGE_2015-06-09 00:53:29	Blackout	Ended	Jun 9, 2015 12:53:30 AM PDT	Jun 9, 2015 12:53:33 AM PDT	Indefinite	Do Not ...	<SYSTEM...

Rows Selected 1 Columns Hidden 2

CREATE_GOLD_IMAGE_2015-06-09 06:16:04

Selected Targets (Total-1, Ended-1)

View by Target Blackout/Brownout Status All ▼

Name	Target Type	Target Blackout/Bro Status	Message	Start Date	End Date
slc08sga.us.oracle.com	Host	Ended	-	Jun 9, 2015 6:16:05 AM ...	Jun 9, 2015 6:16:08 AM ...

Related Targets (Total-50, Ended-50)

View by Target Blackout/Brownout Status All ▼

Name	Target Type	Target Blackout/Brownout Status	Message	Start Date	End Date
/AS_TGT_soarac_domain/soarac_domain/soa_cluster/OracleBPMComposerRolesApp	Clustered Application Deployment	Ended	-	Jun 9, 2015 6:16:05 AM EDT	Jun 9, 2015 6:16:08 AM EDT
/AS_TGT_soarac_domain/soarac_domain/soa_server2	Oracle WebLogic Server	Ended	-	Jun 9, 2015 6:16:05 AM EDT	Jun 9, 2015 6:16:08 AM EDT
/AS_TGT_soarac_domain/soarac_domain/soa_server2/worklistapp	Application Deployment	Ended	-	Jun 9, 2015 6:16:05 AM EDT	Jun 9, 2015 6:16:08 AM EDT
agent13c1_18_slc08sga.us.oracle.com_4465	Oracle Home	Ended	-	Jun 9, 2015 6:16:05 AM EDT	Jun 9, 2015 6:16:08 AM EDT


Search

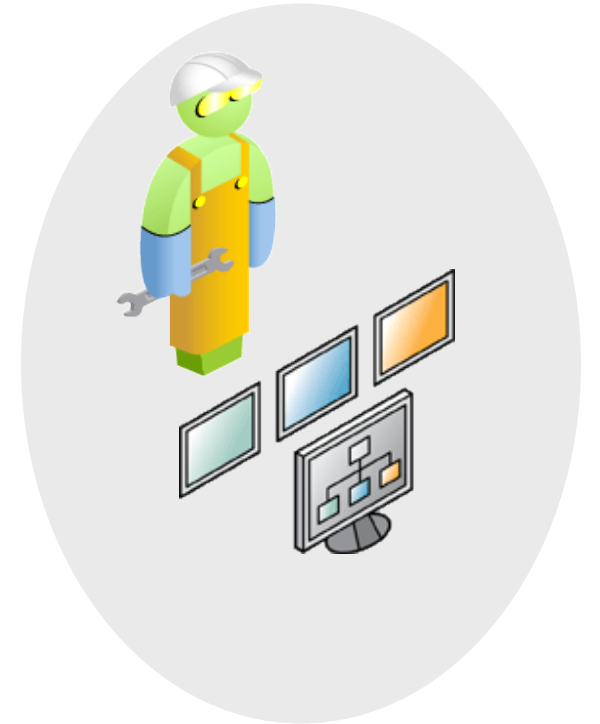
Blackout/
Brownouts list

Details of
selected
blackout


Beyond the Basics: Brownouts

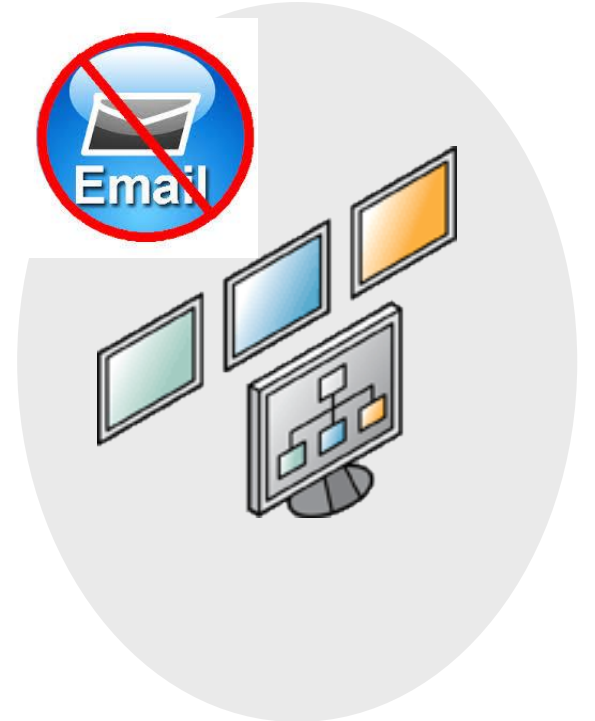
Monitoring visibility during maintenance periods

- Planned maintenance where monitoring continues but no notifications are sent
- Enables proactive monitoring of status and health of targets during maintenance
- Target monitoring (events) visibility provided in Console
- Option #1: “Brownout for maintenance”
 - Target downtime excluded from Availability(%) calculations
 - True target status will be shown with under maintenance qualifier 
- After brownout, processing/notifications of open events will occur
 - Pre-existing events before brownout
 - If cleared during brownout, notifications for clear event sent after brownout ends
 - If still open after brownout, notifications sent if severity is changed
 - New events occurred during brownout...
 - If still open after brownout, will be processed after brownout ends
 - If closed during brownout will not be processed after brownout ends




Beyond the Basics: Brownouts - 2

- Option #2: Brownouts for non-maintenance windows
 - Notifications / Incident creation is stopped
 - Target is considered as being *actively monitored*
 - *Any target downtime impacts Availability(%)* calculations
 - Target status is shown, with qualifier 
 - Used for: unexpected target outage, would like to stop notifications because outage is already known but cannot take a maintenance window on the target

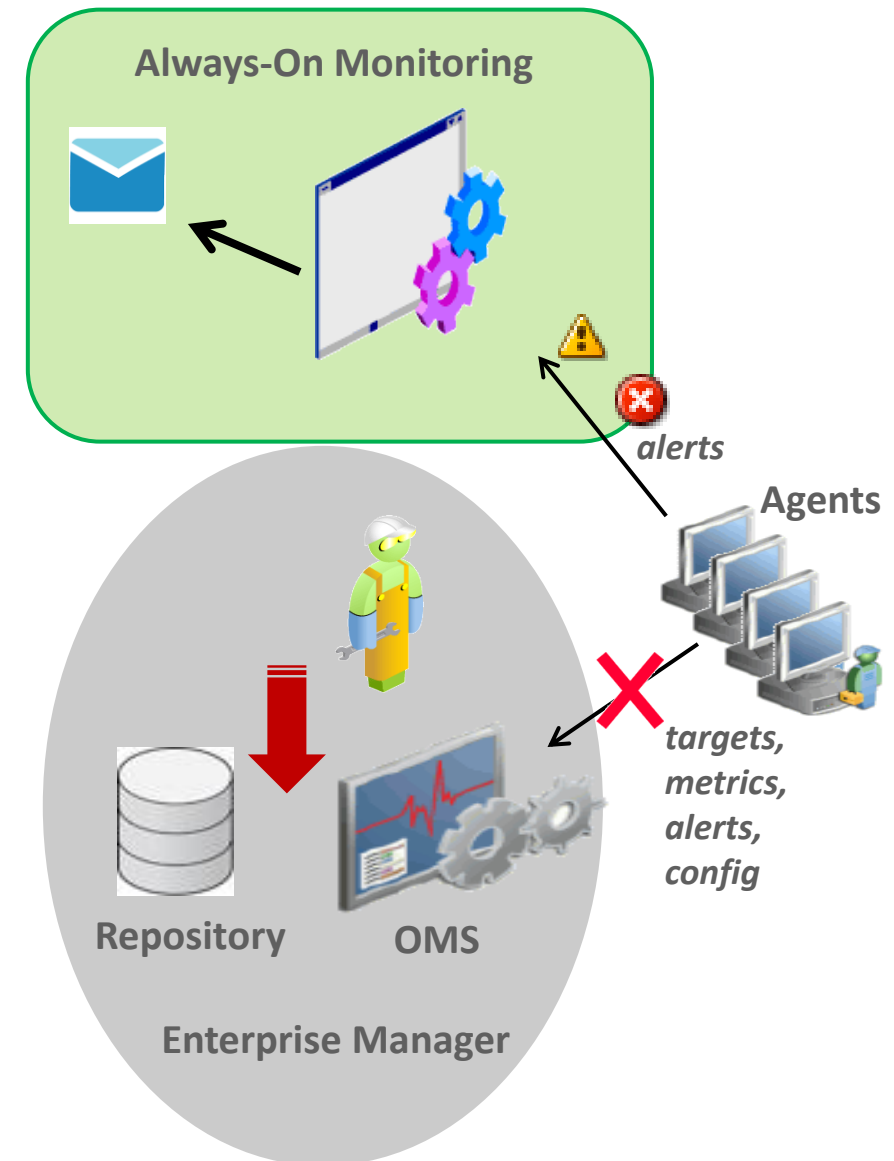


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Always-On Monitoring

- New feature that provides continuous monitoring of your targets
 - Safeguards against impact of EM downtime
 - Available as a separate java (J2SE) application (Self-Update)
 - Requires 13.1 Agents
- Key features
 - Receives target availability events and metric alerts from agents
 - Sends email notifications for target down, critical metric alerts
 - Emails sent to addresses in 'Downtime Contact' target property
 - Downtime Contact target property
 - Global level: recipients for all alerts across all targets
 - Target-specific level: recipients for all alerts on the target.
 - Can be populated based on current email recipients for target down event rule (emcli generate_downtime_contact)



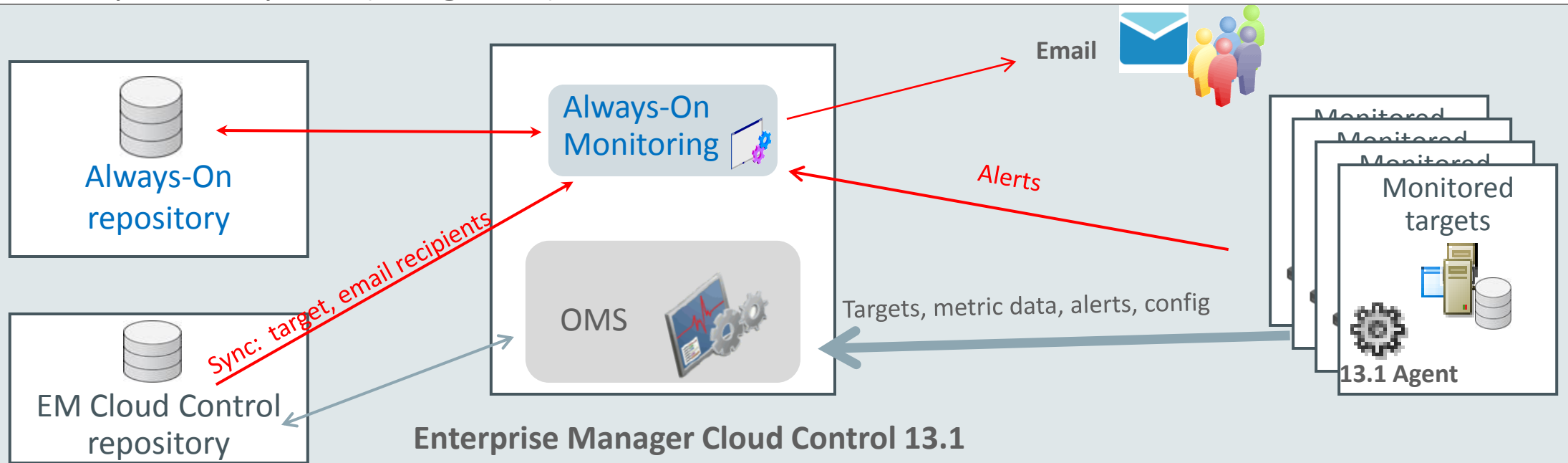
Always-On Monitoring

- **One-time initial setup:**


- Download via Self-Update
- Unzip and run script to install/configure (prereq: Oracle 12c database)
- Set email recipients(s) in Enterprise Manager Cloud Control (Downtime Contact target property)
- Sync with Enterprise Manager 13.1 repository (get latest target metadata, email addresses for Downtime Contact)
- Specify monitoring app upload URL in Enterprise Manager 13.1

- **Use:** Enable email notifications

- Auto-sync on daily basis (configurable)



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Monitoring at Scale: Lessons from Enterprise Manager at Oracle Cloud

Over 2.5M targets and 3.4 Million Events per Day

- Enterprise Manager used to monitor entire public cloud infrastructure
- Largest Monitored Site
 - Over 2.5 Million Targets
 - 51 Exadata, 11k Databases, 150K WLS servers, 900K SOA Composites, 1350 Business Applications, 5k Beacons, 24k Agents
 - 3.4 million events processed per day
- Leverage groups for everything
 - Group of group hierarchies aligned with how they manage targets. Largest group: over 150k targets
 - Use System Dashboard to monitor top level groups
 - Provides summary counts of target down, critical and warning incidents for each top level group
- Set Lifecycle Status for the most important targets
 - Guarantees rapid delivery of notifications and creation of incidents/tickets for the most important events
- Tight control over metrics and thresholds
 - Disable unused metrics
 - Put meaningful thresholds on metrics they care about, create incidents on important events. Use templates to deploy metric settings.
- Blackouts at group level, control who sets the blackouts

Monitoring with Enterprise Manager

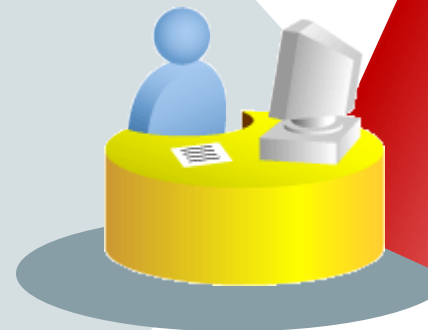
Scalable, smarter monitoring
and always available!



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