

12

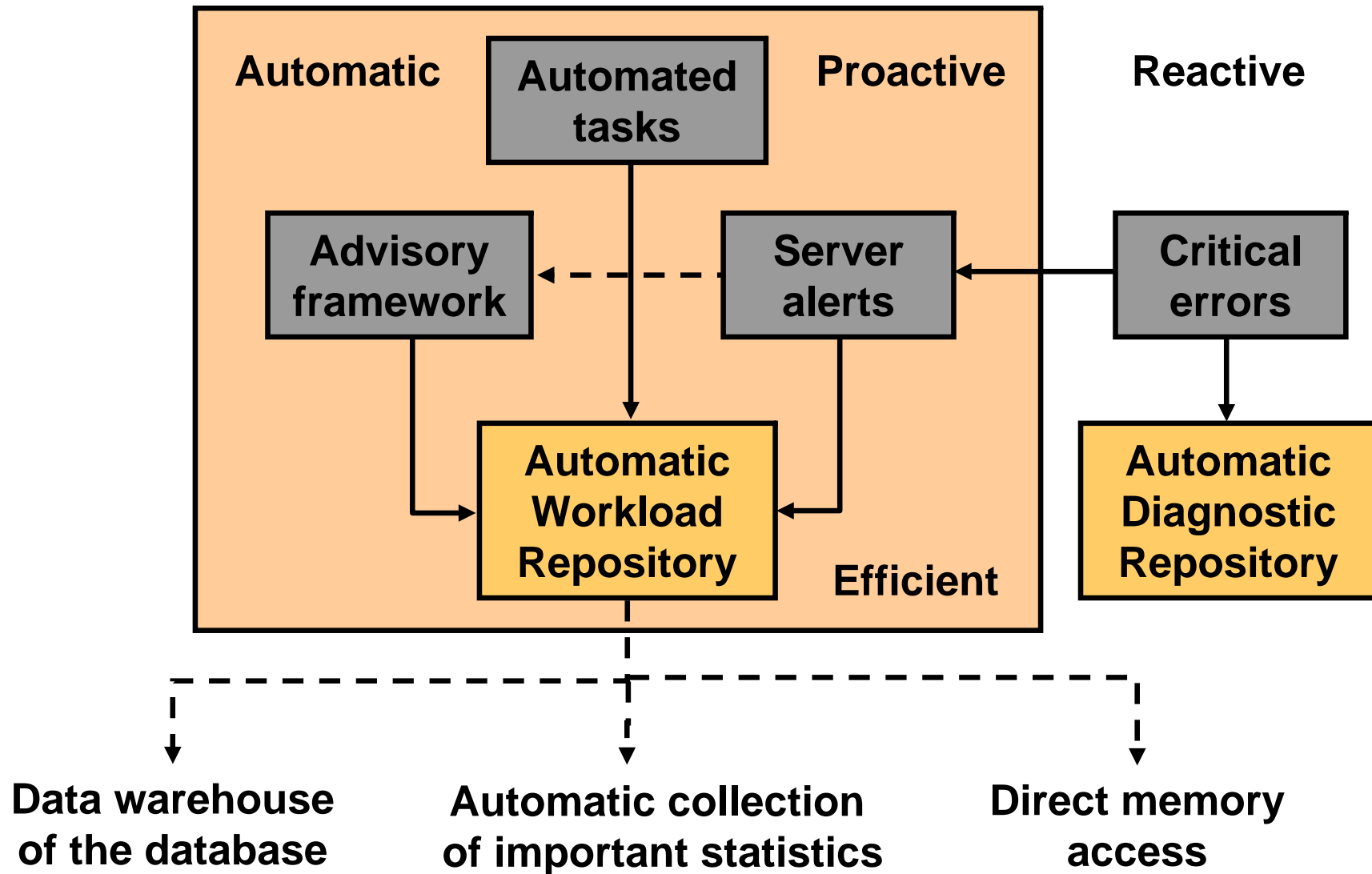
Database Maintenance

Objectives

After completing this lesson, you should be able to:

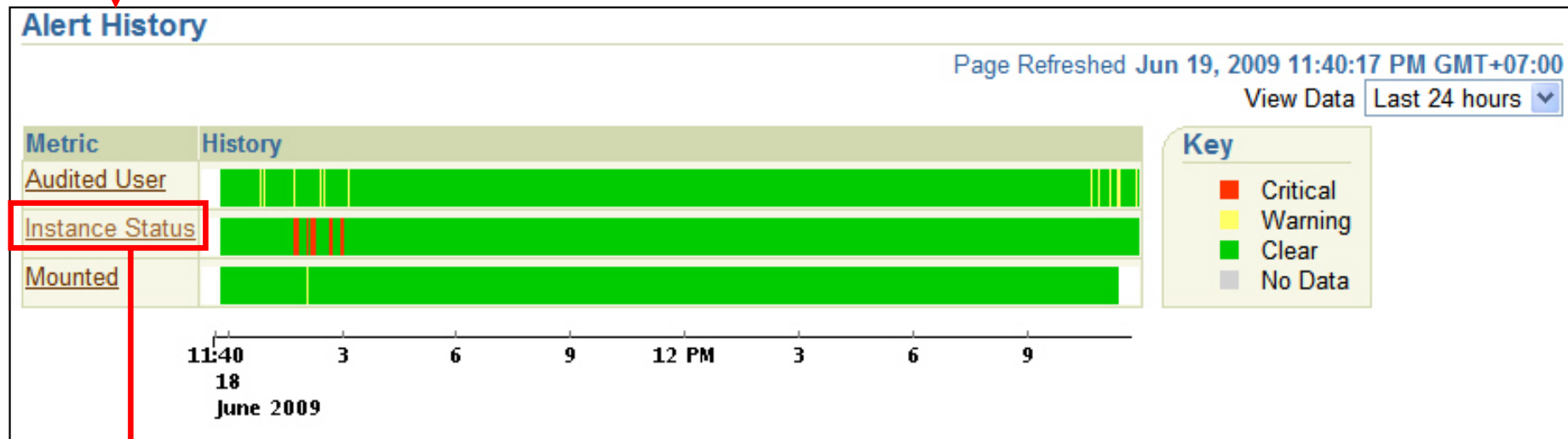
- Manage optimizer statistics
- Manage the Automatic Workload Repository (AWR)
- Use the Automatic Database Diagnostic Monitor (ADDM)
- Describe and use the advisory framework
- Set alert thresholds
- Use server-generated alerts
- Use automated tasks

Database Maintenance



Viewing the Alert History

Related Links		
Access	Add Exadata Cell Targets	Advisor Central
Alert History	Alert Log Contents	All Metrics
Baseline Metric Thresholds	Blackouts	EM SQL History
Jobs	Metric and Policy Settings	Metric Collection Errors
Monitoring Configuration	Monitor in Memory Access Mode	Policy Groups
Scheduler Central	SQL Worksheet	Target Properties
User-Defined Metrics		



Severity	Timestamp ▾	Message	Last Comment	Details
✓	Jun 19, 2009 2:02:12 AM	The instance is down, and health check reported: .		-
✗	Jun 19, 2009 1:32:12 AM	The instance is down, and health check reported: Instance Shutdown.		-
✓	Jun 18, 2009 5:31:15 AM	The instance is down, and health check reported: .		-

Terminology

- Automatic Workload Repository (AWR): Infrastructure for data gathering, analysis, and solutions recommendations
- AWR Baseline: A set of AWR snapshots for performance comparison
- Metric: Rate of change in a cumulative statistic
- Statistics: Data collections providing database and object detail
 - Optimizer statistics: Used by query optimizer
 - Database statistics: Used for performance
- Threshold: A boundary value against which metric values are compared



Oracle Optimizer: Overview

The Oracle optimizer determines the most efficient execution plan and is the most important step in the processing of any SQL statement.

The optimizer:

- Evaluates expressions and conditions
- Uses object and system statistics
- Decides how to access the data
- Decides how to join tables
- Determines the most efficient path

Optimizer Statistics

Optimizer statistics are:

- A snapshot at a point in time
- Persistent across instance restarts
- Collected automatically

```
SQL> SELECT COUNT(*) FROM hr.employees;
```

```
COUNT(*)
```

```
-----  
214
```

```
SQL> SELECT num_rows FROM dba_tables
```

```
2 WHERE owner='HR' AND table_name = 'EMPLOYEES';
```

```
NUM_ROWS
```

```
-----  
107
```

Using the Manage Optimizer Statistics Page

Database Instance: [orcl.oracle.com](#)

Home	Performance	Availability	Server	Schema	Data Movement	Software and Support
----------------------	-----------------------------	------------------------------	---------------	------------------------	-------------------------------	--------------------------------------

Query Optimizer

[Manage Optimizer Statistics](#)

[SQL Plan Control](#)

Manage Optimizer Statistics

Database **orcl.oracle.com**

Optimizer Statistics are used by the query optimizer to choose the best execution plan for each SQL statement. Up-to-date optimizer statistics can greatly improve the performance of SQL statements.

Operations

- [Gather Optimizer Statistics](#)
- [Restore Optimizer Statistics](#)
- [Lock Optimizer Statistics](#)
- [Unlock Optimizer Statistics](#)
- [Delete Optimizer Statistics](#)

Related Links

- [Object Statistics](#)
- [Global Statistics Gathering Options](#)
- [Object Level Statistics Gathering Preferences](#)
- [Job Scheduler](#)
- [Automated Maintenance Tasks](#)

Gathering Optimizer Statistics Manually

Manage Optimizer Statistics

Database **orcl.oracle.com**

Optimizer Statistics are used by the query statistics can greatly improve the performance.

Operations

- Gather Optimizer Statistics**
- [Restore Optimizer Statistics](#)
- [Lock Optimizer Statistics](#)
- [Unlock Optimizer Statistics](#)
- [Delete Optimizer Statistics](#)

Information

For 11, Oracle recommends you enable automated maintenance task (Optimizer Statistics Gathering) to generate optimizer statistics regularly within maintenance windows. This wizard should only be used for cases where the task is inappropriate or disabled. For example, you may want to gather optimizer statistics immediately, or the task failed to execute within a maintenance window, or you want to customize options to gather optimizer statistics.

Gather Optimizer Statistics: Scope

Database **orcl.oracle.com** Logged In As **SYS** [Cancel](#) [Step 1 of 5](#) [Next](#)

Task Status **Enabled** Scope **Database**

Select the type of object for which you want to gather optimizer statistics.

Object Type

- ☒ Database
- ☐ Schema
- ☐ Tables
- ☐ Indexes
- ☐ Fixed Objects
In-memory structures/variables of the RDBMS that are exposed in the form of dynamic performance tables.
- ☐ Dictionary Objects
Objects in 'SYS', 'SYSTEM' and all non-user defined schemas.

TIP The Objects step will be skipped when Database, Fixed Objects or Dictionary Objects is selected.

Preferences for Gathering Statistics



Optimizer
statistics
gathering
task

SCOPE

STATEMENT LEVEL

TABLE LEVEL

SCHEMA LEVEL

DATABASE LEVEL

GLOBAL LEVEL

PREFERENCES

CASCADE

DEGREE

ESTIMATE_PERCENT

NO_INVALIDATE

METHOD_OPT

GRANULARITY

INCREMENTAL

PUBLISH

STALE_PERCENT



DBA

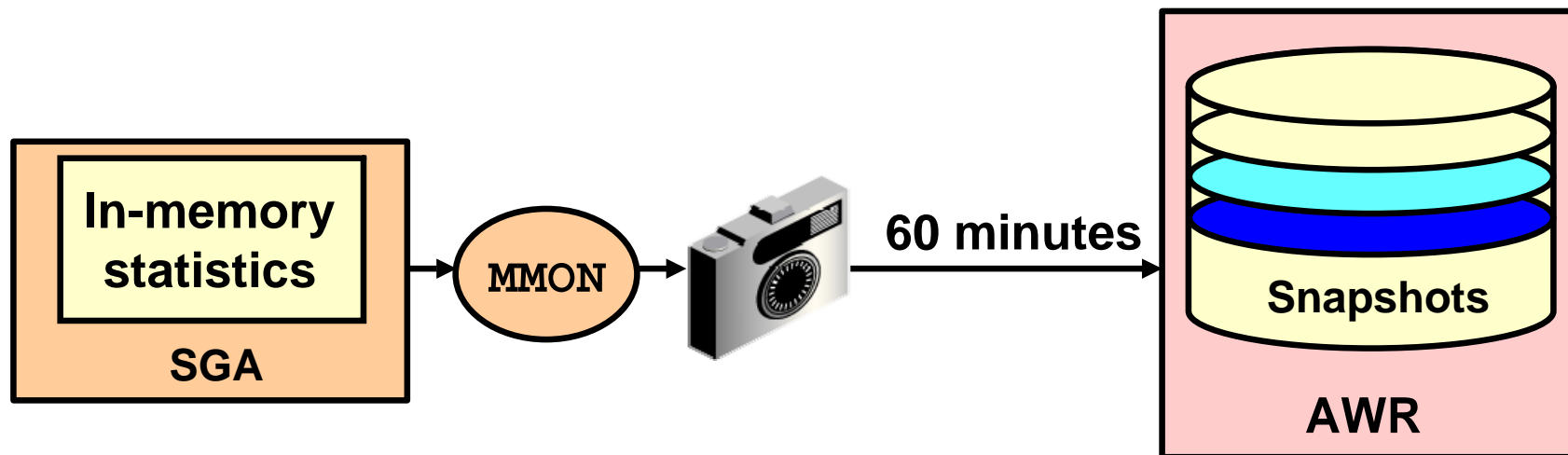
DBMS_STATS

set | get | delete | export | import

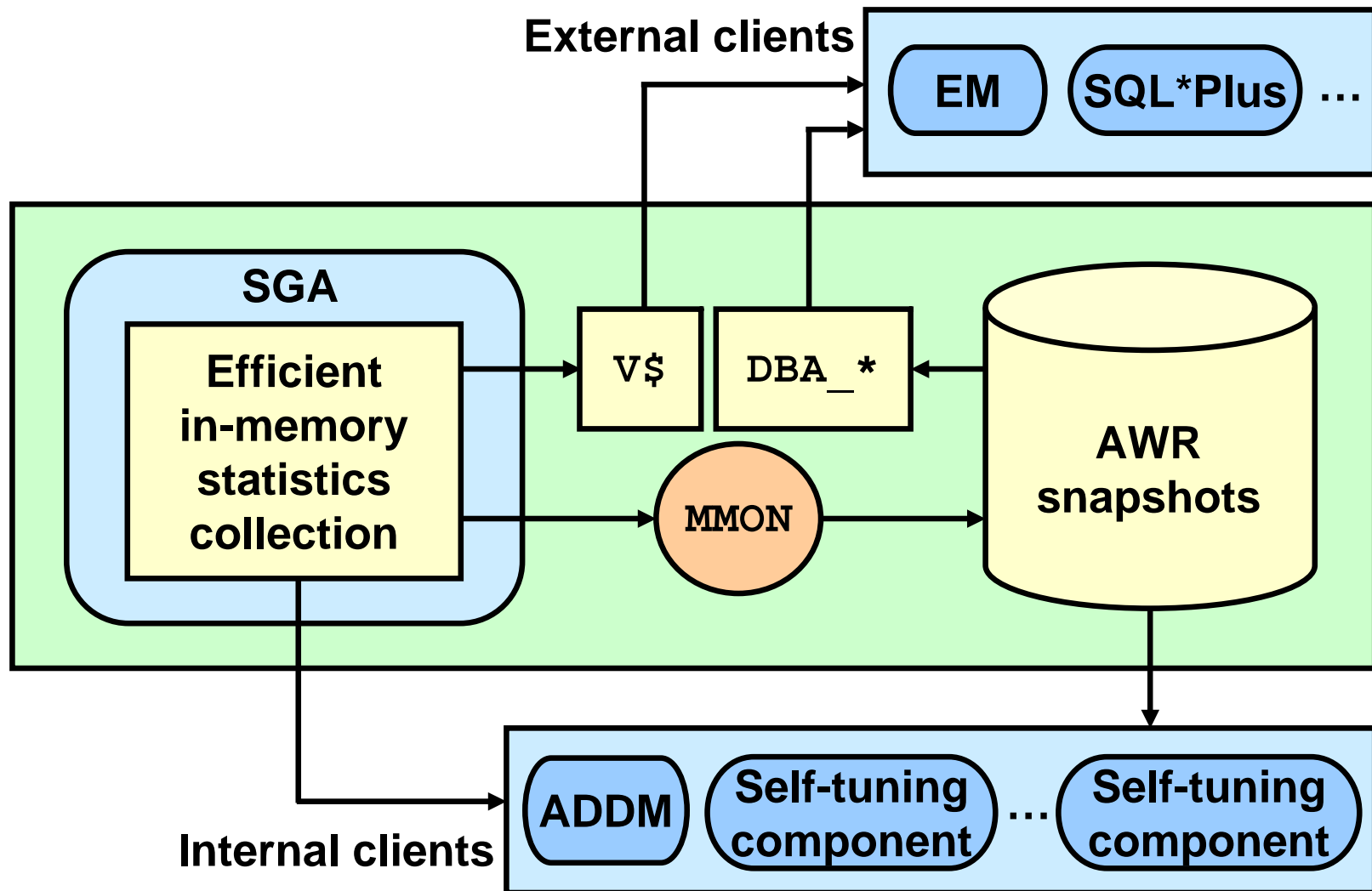
```
exec dbms_stats.set_table_prefs('SH','SALES','STALE_PERCENT','13');
```

Automatic Workload Repository (AWR)

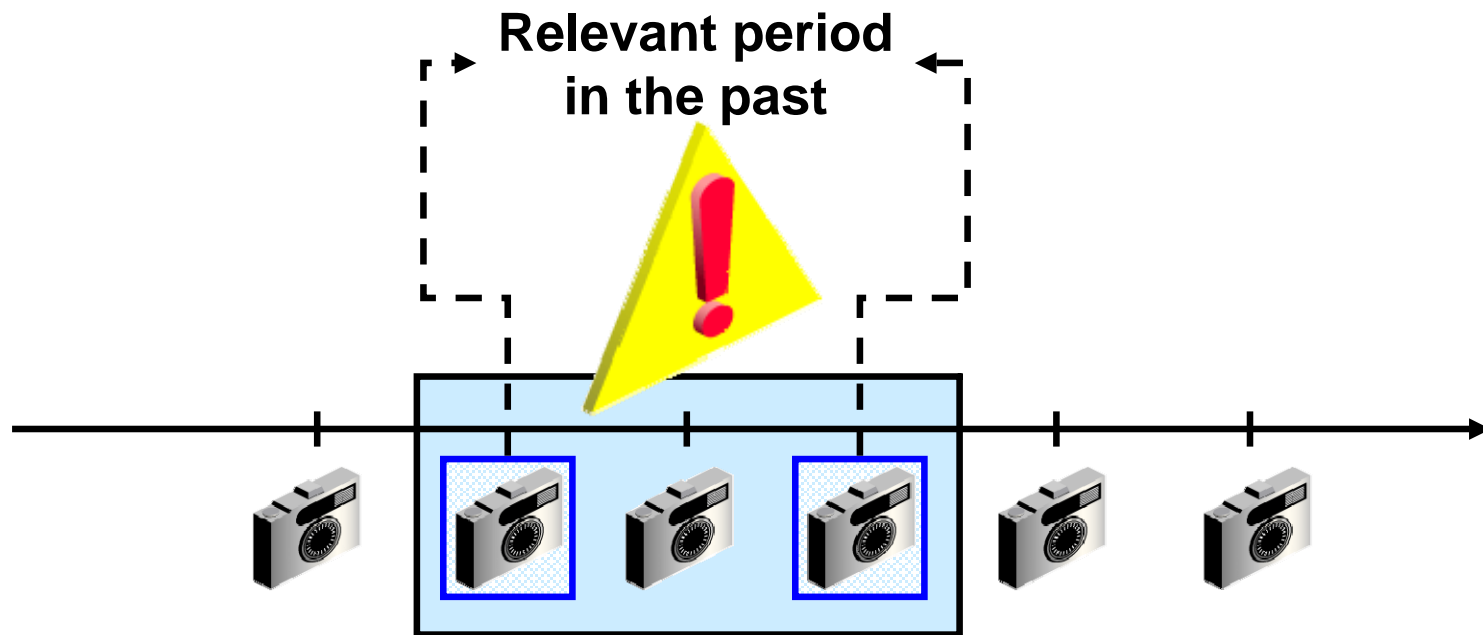
- Built-in repository of performance information
- Snapshots of database metrics taken every 60 minutes and retained for eight days
- Foundation for all self-management functions



AWR Infrastructure



AWR Baselines



```
DBMS_WORKLOAD_REPOSITORY.CREATE_BASELINE ( -  
    start_snap_id IN NUMBER,  
    end_snap_id   IN NUMBER,  
    baseline_name IN VARCHAR2);
```

Enterprise Manager and the AWR

The screenshot displays the Oracle Enterprise Manager interface. The top navigation bar includes links for [Home](#), [Performance](#), [Availability](#), **Server**, [Schema](#), and [Data Movement](#). The left-hand navigation pane is divided into two sections: **Storage** and **Statistics Management**. Under **Storage**, there are links for [Control Files](#), [Tablespaces](#), [Temporary Tablespace Groups](#), [Datafiles](#), [Rollback Segments](#), [Redo Log Groups](#), [Archive Logs](#), [Migrate to ASM](#), and [Make Tablespace Locally Managed](#). Under **Statistics Management**, there is a red-bordered box around the [Automatic Workload Repository](#) link, and below it is the [AWR Baselines](#) link. A red arrow originates from the [Automatic Workload Repository](#) link and points to the main content area.

The main content area is titled **Automatic Workload Repository**. It includes a status bar indicating the page was refreshed on **Aug 21, 2008 9:47:11 PM MDT** with a **Refresh** button. Below this, a descriptive text states: "The Automatic Workload Repository is used for storing database statistics that are used for performance tuning."

The **General** section contains the following configuration details:

- Snapshot Retention (days)**: 8
- Snapshot Interval (minutes)**: 60
- Collection Level**: TYPICAL
- Next Snapshot Capture Time**: Aug 21, 2008 10:00:49 PM

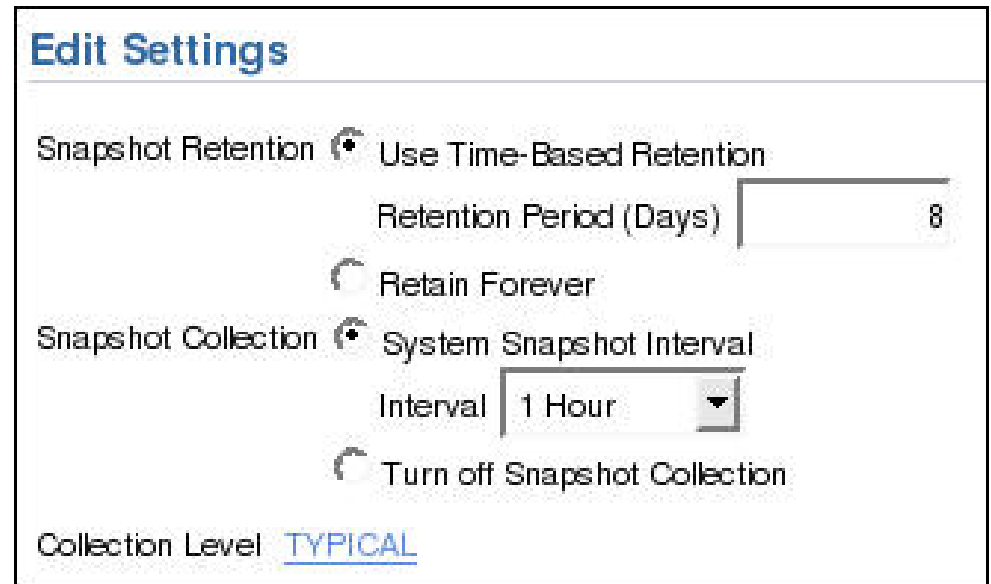
An **Edit** button is located to the right of the General section.

The **Manage Snapshots and Baselines** section includes a **Run AWR Report** button and the following summary information:

- Snapshots**: [195](#)
- Baselines**: [1](#)
- Latest Snapshot Time**: Aug 21, 2008 9:00:49 PM
- Earliest Snapshot Time**: Aug 13, 2008 7:00:26 PM

Managing the AWR

- Retention period
 - Default: Eight days
 - Consider storage needs
- Collection interval
 - Default: 60 minutes
 - Consider storage needs and performance impact
- Collection level
 - Basic (disables most ADDM functionality)
 - Typical (recommended)
 - All (adds additional SQL tuning information to snapshots)



The screenshot shows the 'Edit Settings' dialog for AWR configuration. It has two main sections: 'Snapshot Retention' and 'Snapshot Collection'. In the 'Snapshot Retention' section, 'Use Time-Based Retention' is selected with a radio button, and the 'Retention Period (Days)' is set to 8. The 'Retain Forever' option is also visible but unselected. In the 'Snapshot Collection' section, 'System Snapshot Interval' is selected with a radio button, and the 'Interval' is set to '1 Hour' from a dropdown menu. The 'Turn off Snapshot Collection' option is also visible but unselected. At the bottom, the 'Collection Level' is set to 'TYPICAL' with a blue underline.

Edit Settings

Snapshot Retention ☒ Use Time-Based Retention
Retention Period (Days)

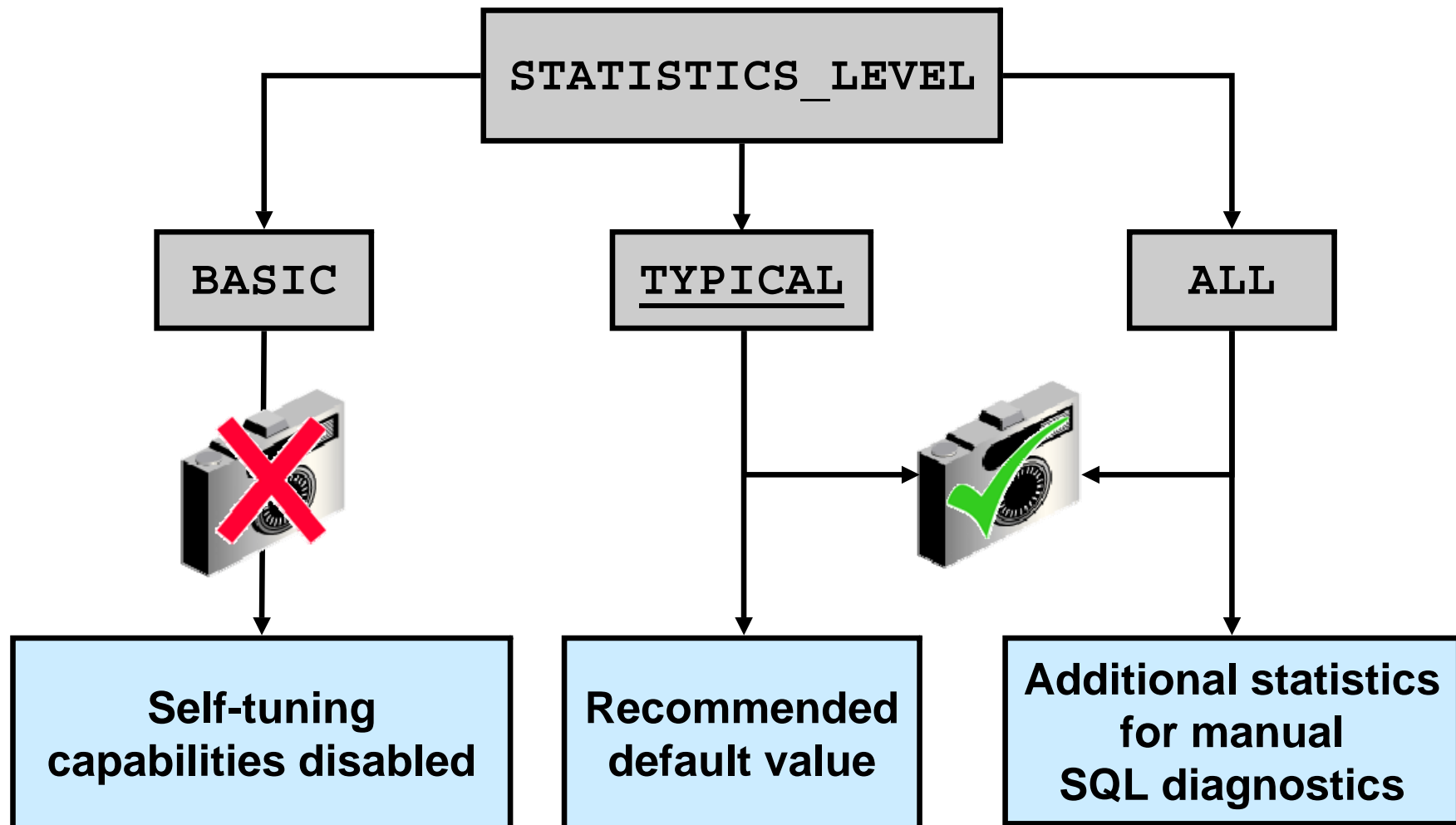
☐ Retain Forever

Snapshot Collection ☒ System Snapshot Interval
Interval

☐ Turn off Snapshot Collection

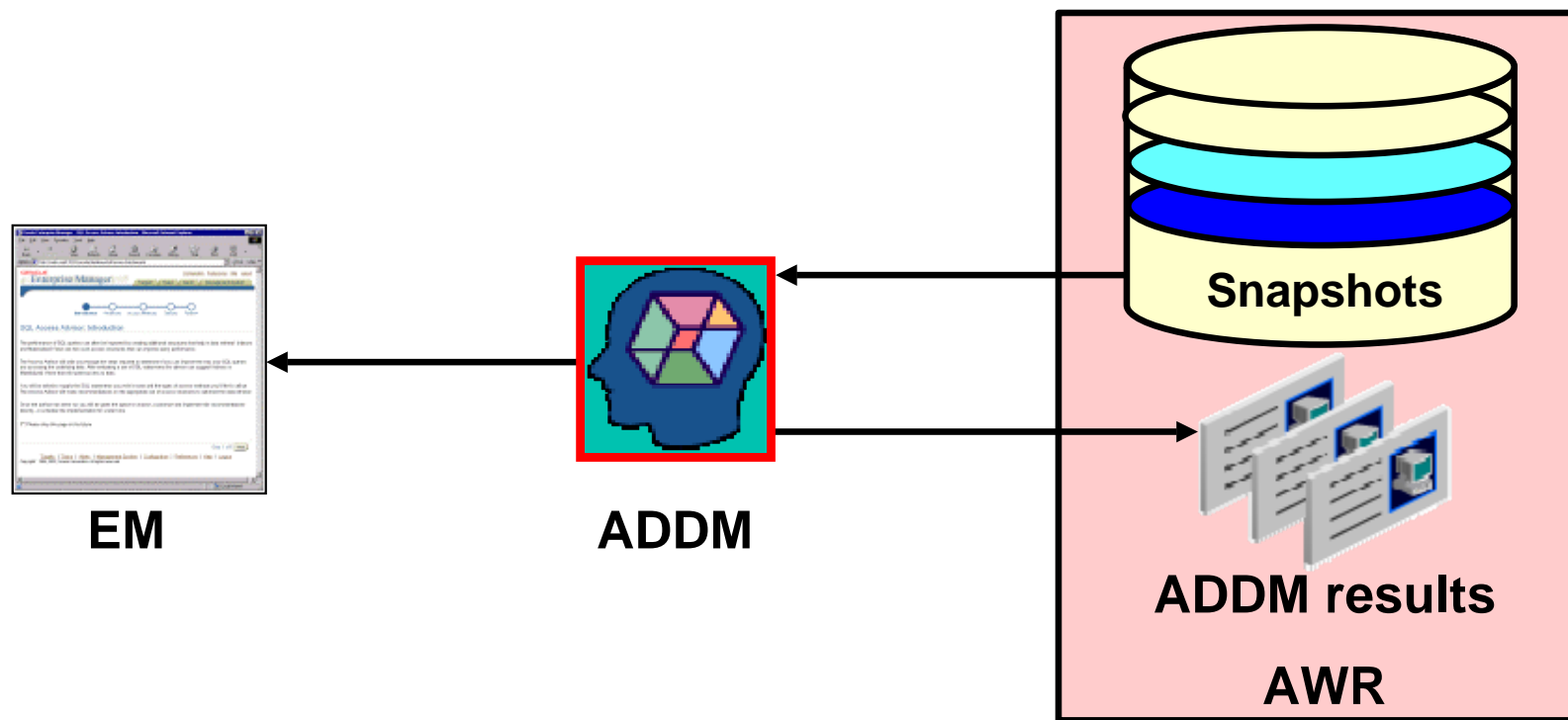
Collection Level TYPICAL

Statistic Levels

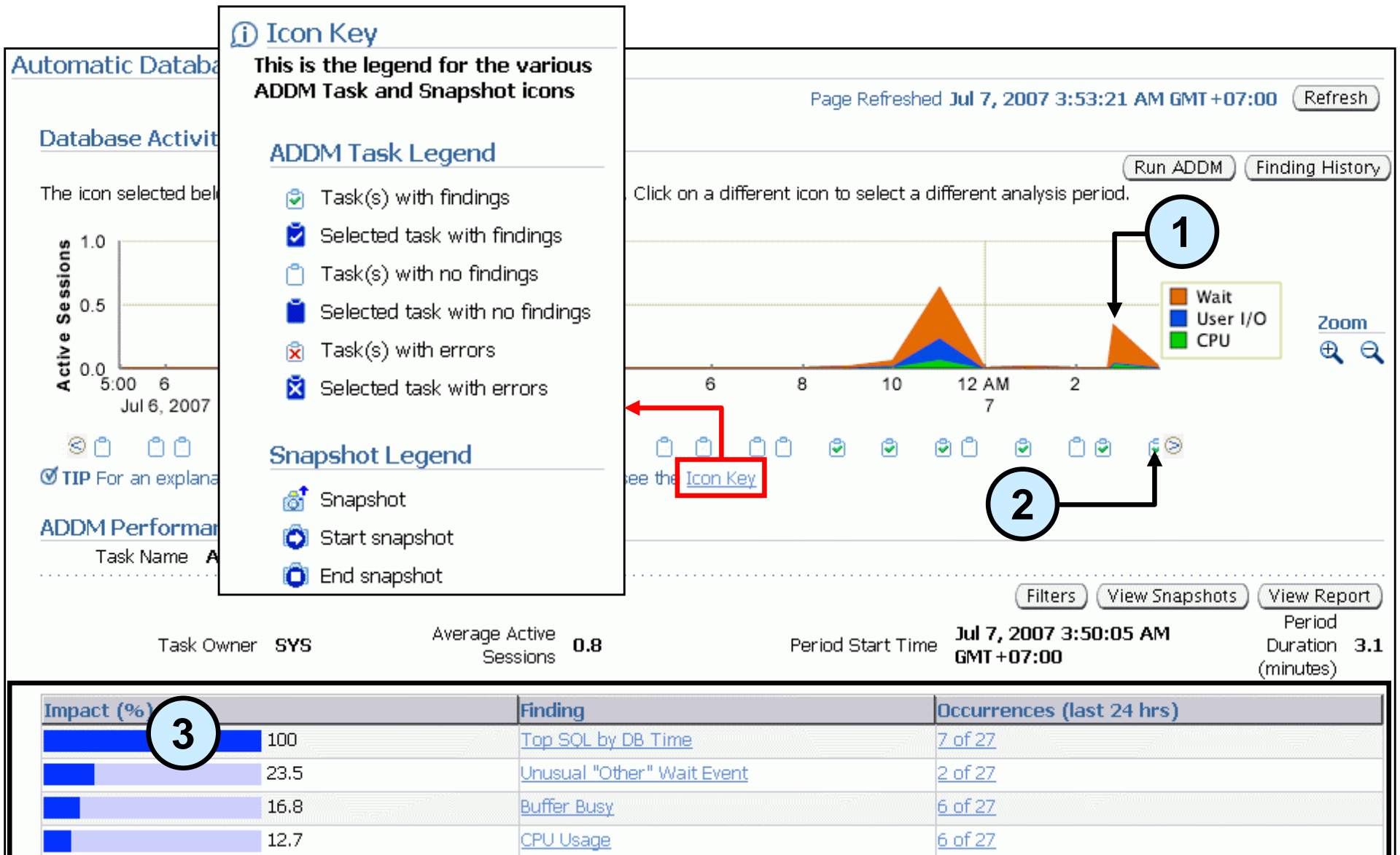


Automatic Database Diagnostic Monitor (ADDM)

- Runs after each AWR snapshot
- Monitors the instance; detects bottlenecks
- Stores results in the AWR



ADDM Findings




ADDM Recommendations

Performance Finding Details: Buffer Busy

Finding **Read and write contention on database blocks was consuming significant database time.** [Finding History](#)

Impact (Active Sessions) **.14**

Impact (%)  **16.8**

Period Start Time **Jul 7, 2007 3:50:05 AM GMT +07:00**

Period Duration (minutes) **3.1**

Filtered **No** [Filters](#)



Recommendations

[Show All Details](#) | [Hide All Details](#)

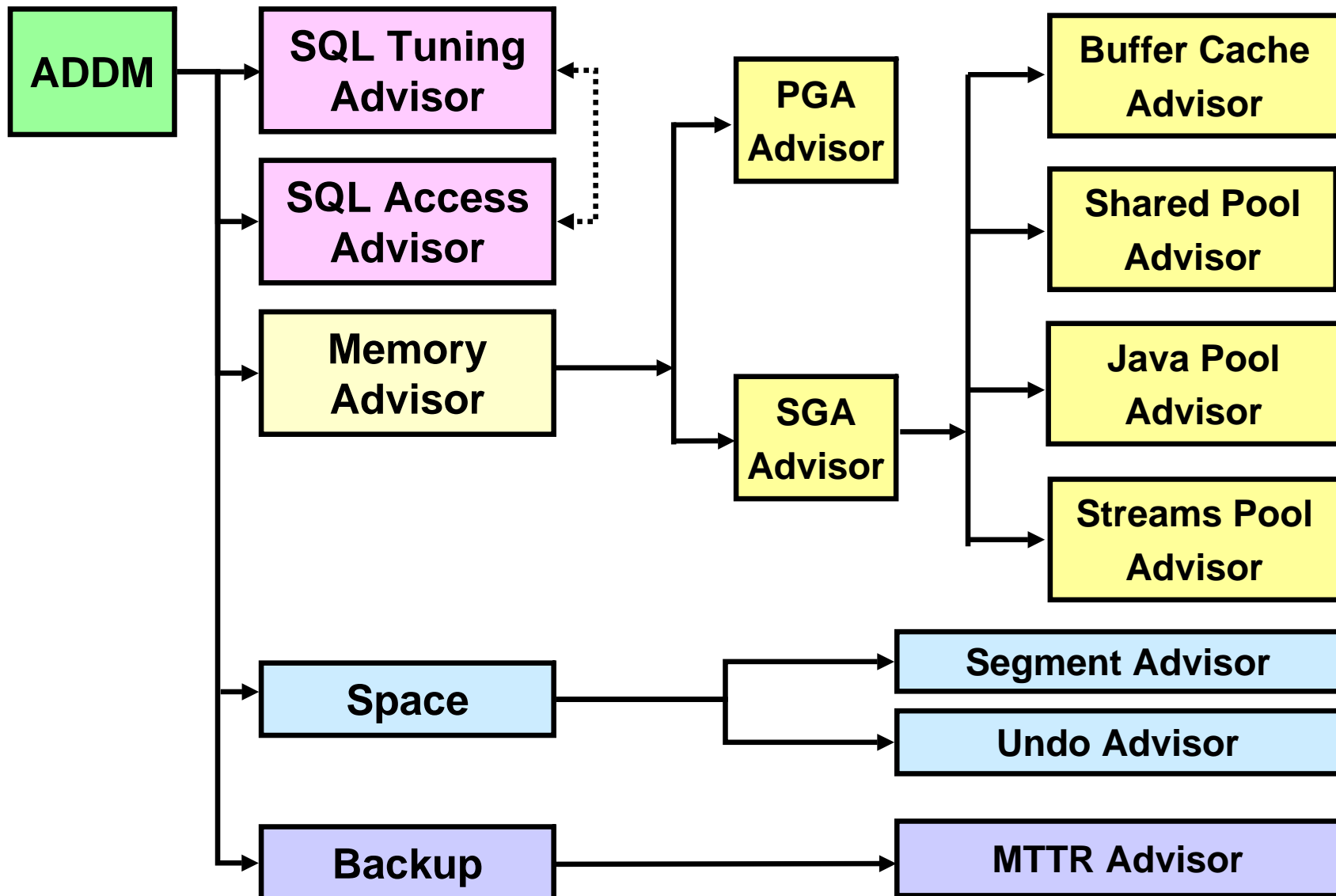
Details	Category	Benefit (%) ▾
Hide	Schema	<div><div></div></div> 16.8
Action	<div>Consider using ORACLE's recommended solution of automatic segment space management in a locally managed tablespace for the tablespace "TBSSPC" containing the TABLE "SPC.SPCT" with object ID 82664. Alternatively, you can move this object to a different tablespace that is locally managed with automatic segment space management.</div> <div>Database Object SPC.SPCT</div>	
<hr/>		
Rationale	There was significant read and write contention on TABLE "SPC.SPCT" with object ID 82664. <div>Database Object SPC.SPCT</div>	
Show	Schema	<div><div></div></div> 16.8
Show	Schema	<div><div></div></div> 16.8

Findings Path

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

Findings	Impact (%)	Additional Information
▼ Read and write contention on database blocks was consuming significant database time.	 16.8	
Wait class "Concurrency" was consuming significant database time.	 17.4	

Advisory Framework



Enterprise Manager and Advisors

Advisor Central

Advisors [Checkers](#)

Page Refreshed Jun 7, 2007 2:26:15 PM CDT [Refresh](#)

Advisors
[ADDM](#) [Automatic Undo Management](#) [Data Recovery Advisor](#)
[Memory Advisors](#) [MTTR Advisor](#) [Segment Advisor](#)
[SQL Advisors](#) [SQL Performance Analyzer](#)

Advisor Tasks [Change Default Parameters](#)

Search
Select an advisory type and optionally enter a task name to filter the data that is displayed in your results set.
Advisory Type Task Name Advisor Runs Status

All Types Last Run All [Go](#)

By default, the search returns all uppercase matches beginning with the string you entered. To run an exact or case-sensitive match, double quote the search string. You can use the wildcard symbol (%) in a double quoted string.

Results

[View Result](#) [Delete](#) [Actions](#) [Re-schedule](#) [Go](#)

Select	Advisory Type	Name
<input type="radio"/>	ADDM	ADDM:115240

[Advisors](#) **Checkers**

Page Refreshed June 7, 2007 2:33:54 PM CDT [Refresh](#)

Checkers
[DB Structure Integrity Check](#) [Data Block Integrity Check](#) [Redo Integrity Check](#)
[Transaction Integrity Check](#) [Undo Segment Integrity Check](#) [Dictionary Integrity Check](#)

DBMS_ADVISOR Package

Procedure	Description
CREATE_TASK	Creates a new task in the repository
DELETE_TASK	Deletes a task from the repository
EXECUTE_TASK	Initiates execution of the task
INTERRUPT_TASK	Suspends a task that is currently executing
GET_TASK_REPORT	Creates and returns a text report for the specified task
RESUME_TASK	Causes a suspended task to resume
UPDATE_TASK_ATTRIBUTES	Updates task attributes
SET_TASK_PARAMETER	Modifies a task parameter
MARK_RECOMMENDATION	Marks one or more recommendations as accepted, rejected, or ignored
GET_TASK_SCRIPT	Creates a script of all the recommendations that are accepted

Quiz

The optimizer statistic `num_rows` will always reflect the true row count for a table.

1. True
2. False

Automated Maintenance Tasks

Autotask maintenance process:

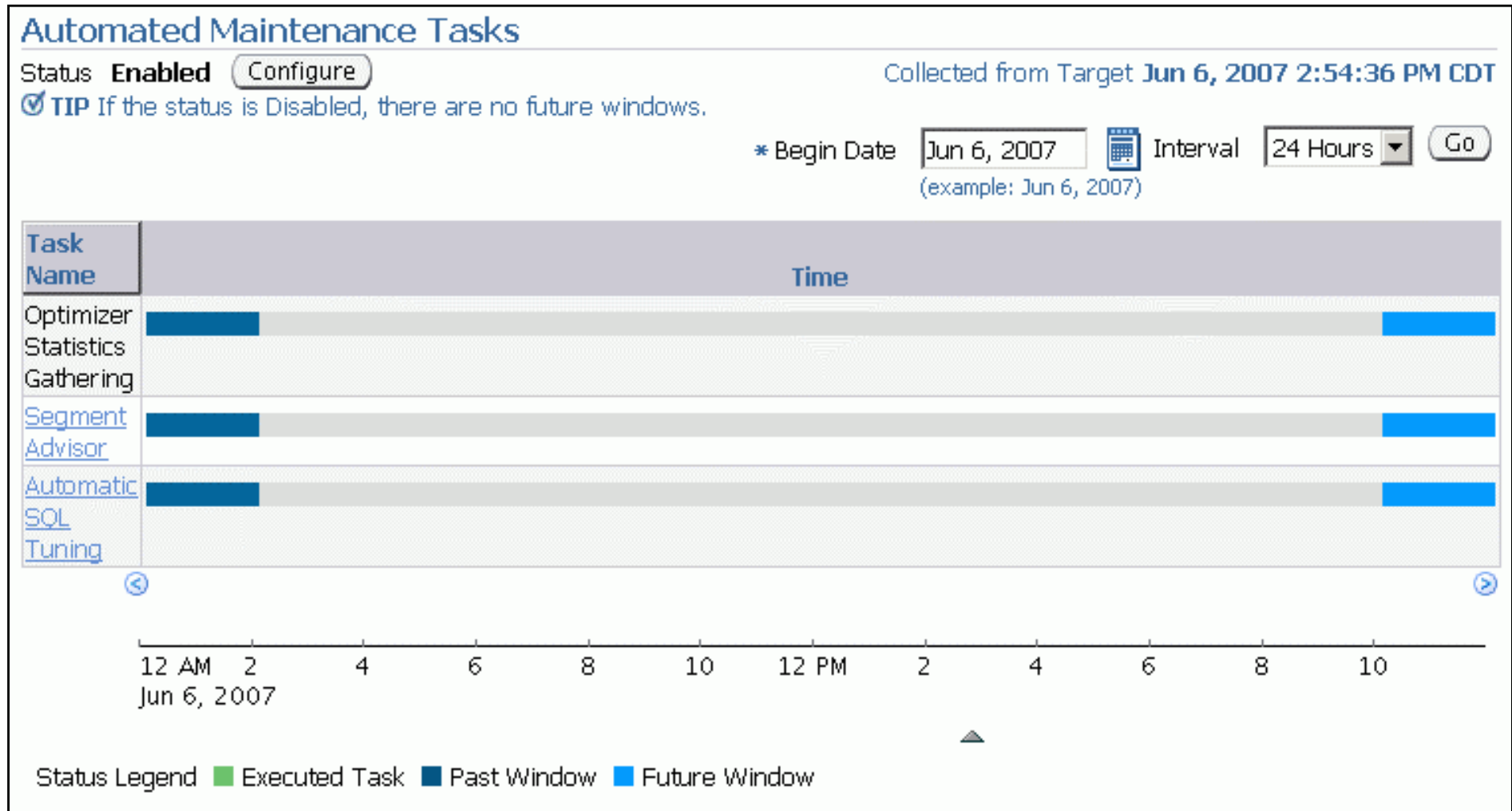
1. Maintenance Window opens.
2. Autotask background process schedules jobs.
3. Scheduler initiates jobs.
4. Resource Manager limits impact of Autotask jobs.

Default Autotask maintenance jobs:

- Gathering optimizer statistics
- Automatic Segment Advisor
- Automatic SQL Advisor



Automated Maintenance Tasks



Automated Maintenance Tasks Configuration

Automated Maintenance Tasks Configuration

Global Status ☒ Enabled ☐ Disabled

Task Settings

Optimizer Statistics Gathering ☒ Enabled ☐ Disabled [Configure](#)

Segment Advisor ☒ Enabled ☐ Disabled

Automatic SQL Tuning ☒ Enabled ☐ Disabled [Configure](#)

Maintenance Window Group Assignment

[Edit Window Group](#)

Window	Optimizer Statistics Gathering	Segment Advisor	Automatic SQL Tuning
	Select All Select None	Select All Select None	Select All Select None
WEDNESDAY WINDOW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
THURSDAY WINDOW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FRIDAY WINDOW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SATURDAY WINDOW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SUNDAY WINDOW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
MONDAY WINDOW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
TUESDAY WINDOW	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

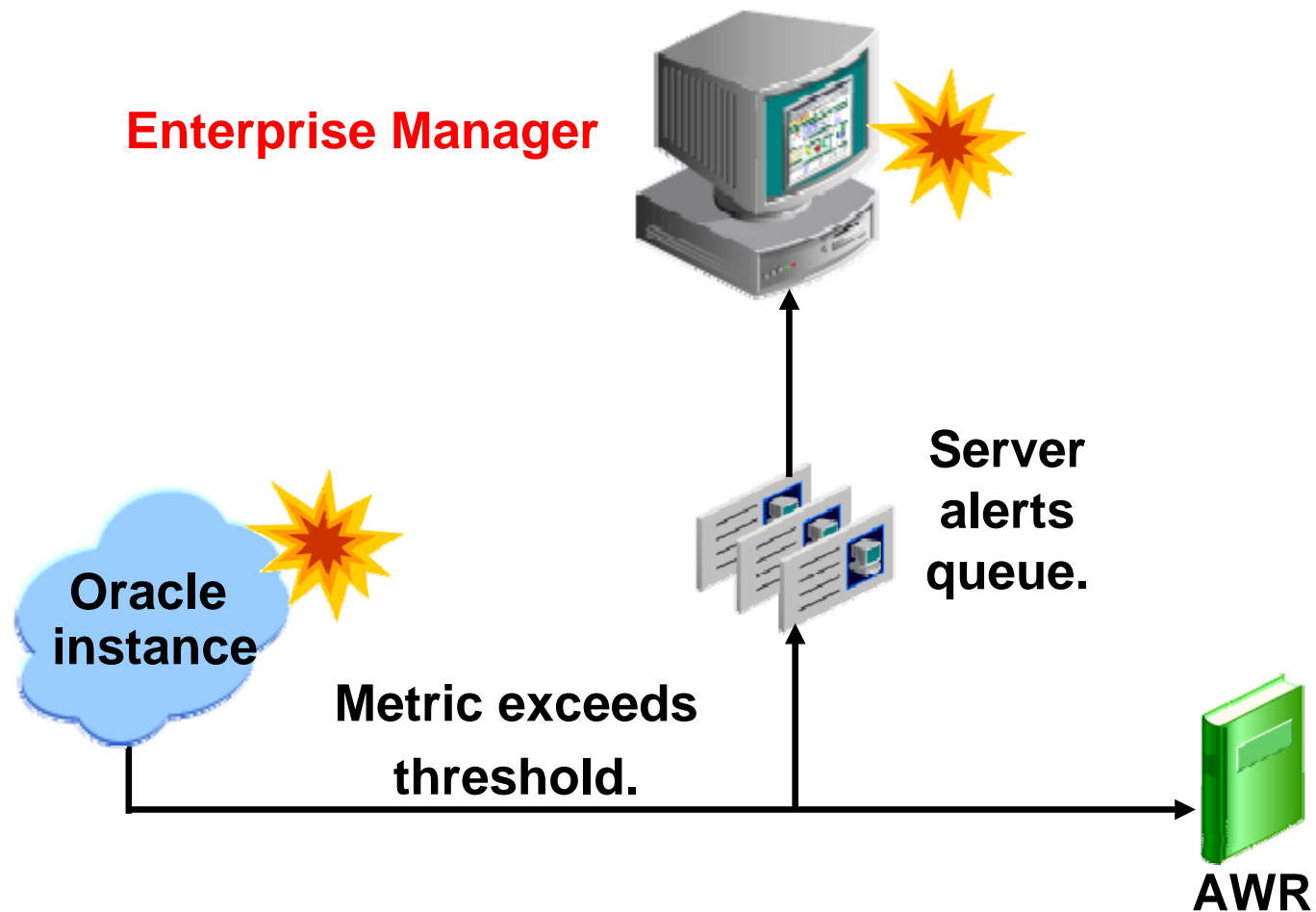
[Show SQL](#)

[Revert](#)

[Apply](#)

ORACLE

Server-Generated Alerts



Setting Thresholds

Metric and Policy Settings

Cancel
OK

Metric Thresholds
Policies

View
Metrics with thresholds

All metrics
Metrics with thresholds

Metric	Comparison Operator	Warning Threshold	Critical Threshold	Corrective Actions	Collection Schedule	Edit
Access Violation	Matches		.*	None	Every 5 Minutes	
Access Violation Status	>		0	None	Every 5 Minutes	
Archive Area Used (%)	>	80		None	Every 15 Minutes	
Archiver Hung	Matches		.*	None	Every 5 Minutes	
Archiver Hung Status	>		0	None	Every 5 Minutes	
Audited User	=	SYS		None	Every 15 Minutes	
Average Users Waiting Count						
Administrative	>	10		None		
Application	>	10		None		
Cluster	>	30		None		
Commit	>	30		None		
Concurrency	>	10		None		
Configuration	>	10		None		
Network	>	10		None		

Creating and Testing an Alert

1. Specify a threshold.
2. Create a test case.
3. Check for an alert.

Edit Advanced Settings: Tablespace Space Used (%) Cancel Continue

Monitored Objects
The table lists all Tablespace Name objects monitored for this metric. You can specify different threshold settings for each Tablespace Name object.

Add Reorder

Select	Tablespace Name	Comparison Operator	Warning Threshold	Critical Threshold	Corrective Action
<input checked="" type="radio"/>	All others	>=	70	75	None

Show SQL Return

```
CREATE TABLE "HR"."FILLER" TABLESPACE "INVENTORY"
STORAGE ( INITIAL 8M) AS SELECT * FROM HR.EMPLOYEES
```

Alerts

Category: All Go Critical × 3 Warning ! 1

Severity	Category	Name	Impact	Message	Alert Triggered
×	Tablespaces Full	Tablespace Space Used (%)		Tablespace INVENTORY is 80 percent full	Jun 7, 2007 3:24:05 PM

Alerts Notification

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout

Database

Preferences






Edit Notification Rule: Database Availability and Critical States

Cancel OK

General Availability Metrics Policies Jobs Methods

Remove Add Previous 10 21-24 of 24 Next

Select All Select None

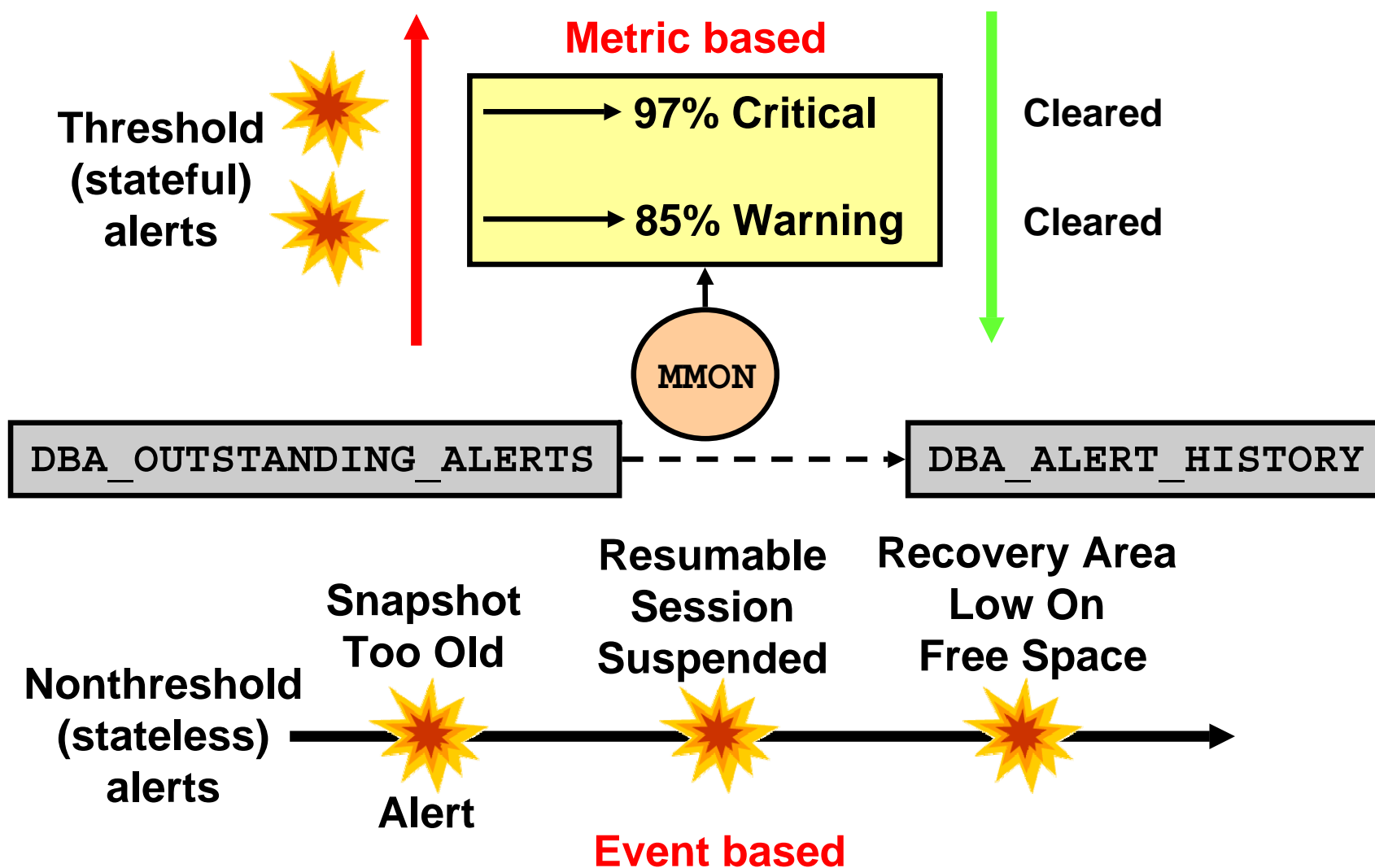
Select	Metric 	Objects	Severity States	Corrective Action States		Edit
				On Critical	On Warning	
<input type="checkbox"/>	Session Limit Usage (%)	n/a	Critical			
<input type="checkbox"/>	Session Terminated Status	n/a	Critical			
<input type="checkbox"/>	Tablespace Space Used (%)	All Objects (Tablespace Name)	Critical			
<input type="checkbox"/>	Wait Time (%)	n/a	Critical			

Reacting to Alerts

- If necessary, you should gather more input (for example, by running ADDM or another advisor).
- Investigate critical errors.
- Take corrective measures.
- Acknowledge alerts that are not automatically cleared.



Alert Types and Clearing Alerts



Quiz

Stateless alerts such as `SNAPSHOT TOO OLD` can be found in the dictionary view `DBA_OUTSTANDING_ALERTS`.

1. True
2. False

Summary

In this lesson, you should have learned how to:

- Manage optimizer statistics
- Manage the Automatic Workload Repository (AWR)
- Use the Automatic Database Diagnostic Monitor (ADDM)
- Describe and use the advisory framework
- Set alert thresholds
- Use server-generated alerts
- Use automated tasks

Practice 12 Overview: Proactive Maintenance

This practice covers proactively managing your database with ADDM, including:

- Setting up an issue for analysis
- Reviewing your database performance
- Implementing a solution