

# 12

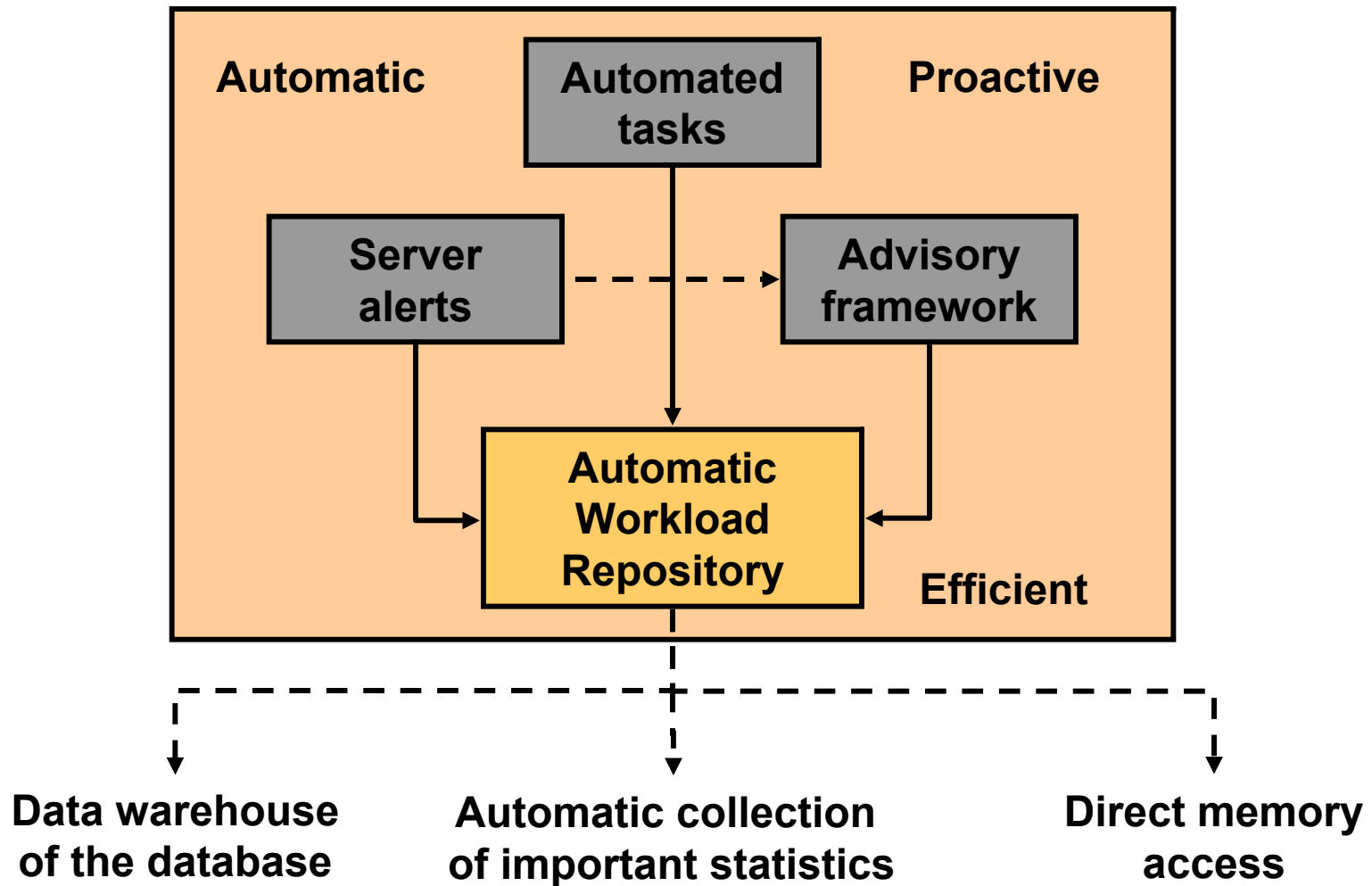
## **Proactive Maintenance**

# Objectives

**After completing this lesson, you should be able to do the following:**

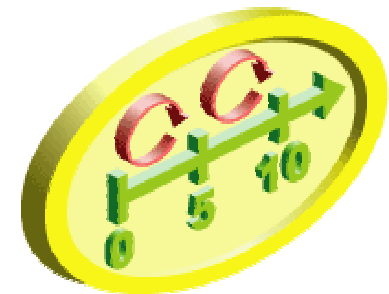
- **Use statistics**
- **Manage the Automatic Workload Repository (AWR)**
- **Use the Automatic Database Diagnostic Monitor (ADDM)**
- **Describe the advisory framework**
- **Set alert thresholds**
- **Use server-generated alerts**
- **Use automated tasks**

# Proactive Maintenance



# Introducing Terminology

- **Automatic Workload Repository (AWR):** Infrastructure for data gathering, analysis, and solutions recommendations
- **Baseline:** Data gathered of a “normal running database” for performance comparison
- **Metric:** Rate of change in a cumulative statistic
- **Statistics:** Data collections used for optimizing internal operations, such as execution of a SQL statement
- **Threshold:** A boundary value against which metric values are compared



# Optimizer Statistics

> **Statistics**  
AWR  
ADDM  
Advisors  
Alerts  
AutoTasks

Optimizer statistics are:

- Not real 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](#) > Manage Optimizer Statistics

Logged in As DBA1

## 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.

### Oracle-Defined GATHER\_STATS\_JOB Job

The GATHER\_STATS\_JOB updates optimizer statistics for objects with stale or missing statistics. It is executed within the maintenance window on a regular basis.

#### Configuration

Configure

Job Status	<b>Enabled</b>
Next Run	<b>Jun 6, 2005 10:00:00 PM PDT</b>
Window Group for Next Run	<a href="#">MAINTENANCE WINDOW GROUP</a>
Previous Runs	<b>9</b>

**TIP** SYS user or user with ALTER privileges on the Oracle-defined job can configure and view the Oracle-defined Job

#### Last Run

Time	<b>Jun 4, 2005 6:01:14 AM PDT</b>
Status	<b>SUCCEEDED</b>
Duration (mins)	<b>1.18</b>
Objects Analyzed	<a href="#">97</a>

### Operations

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

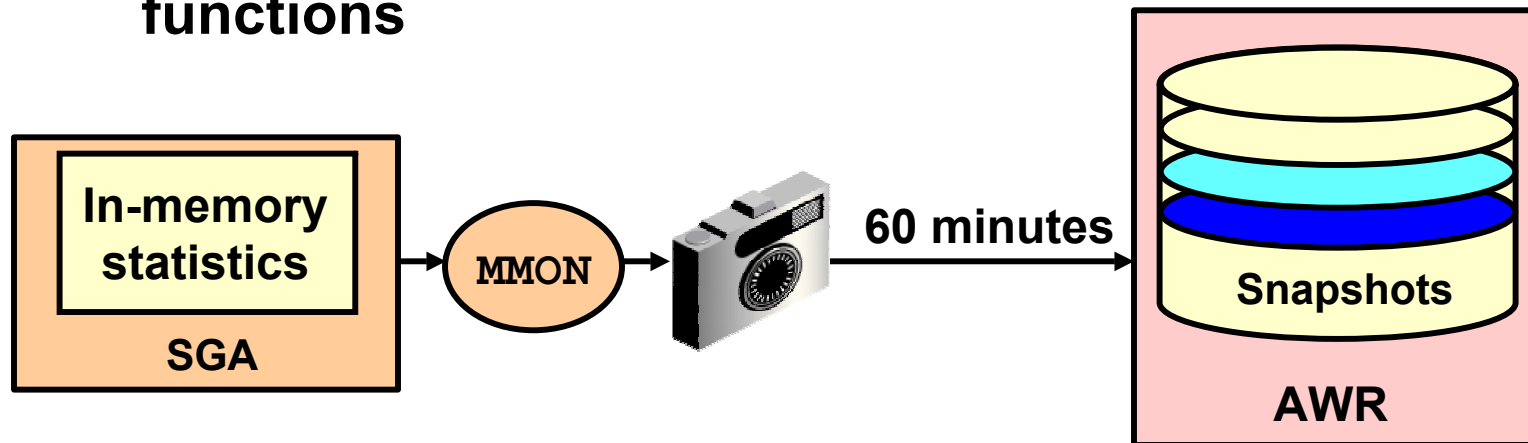
### Related Links

[Object Status](#)  
[Statistics Options](#)  
[Job Scheduler](#)

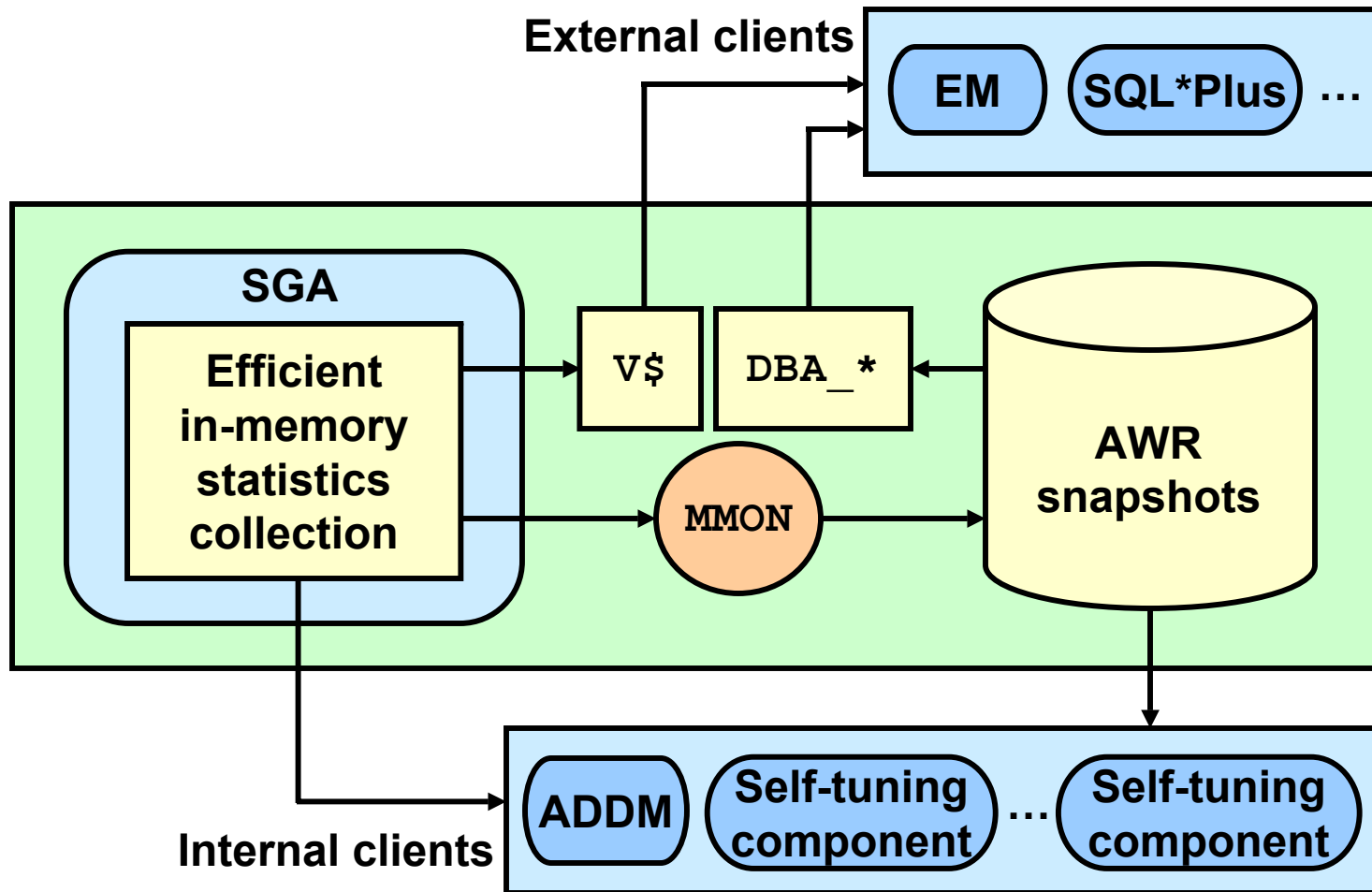
# Automatic Workload Repository (AWR)

Statistics  
> AWR  
ADDM  
Advisors  
Alerts  
AutoTasks

- Built-in repository of performance information
- Snapshots of database metrics taken every 60 minutes and retained for 7 days
- Foundation for all self-management functions

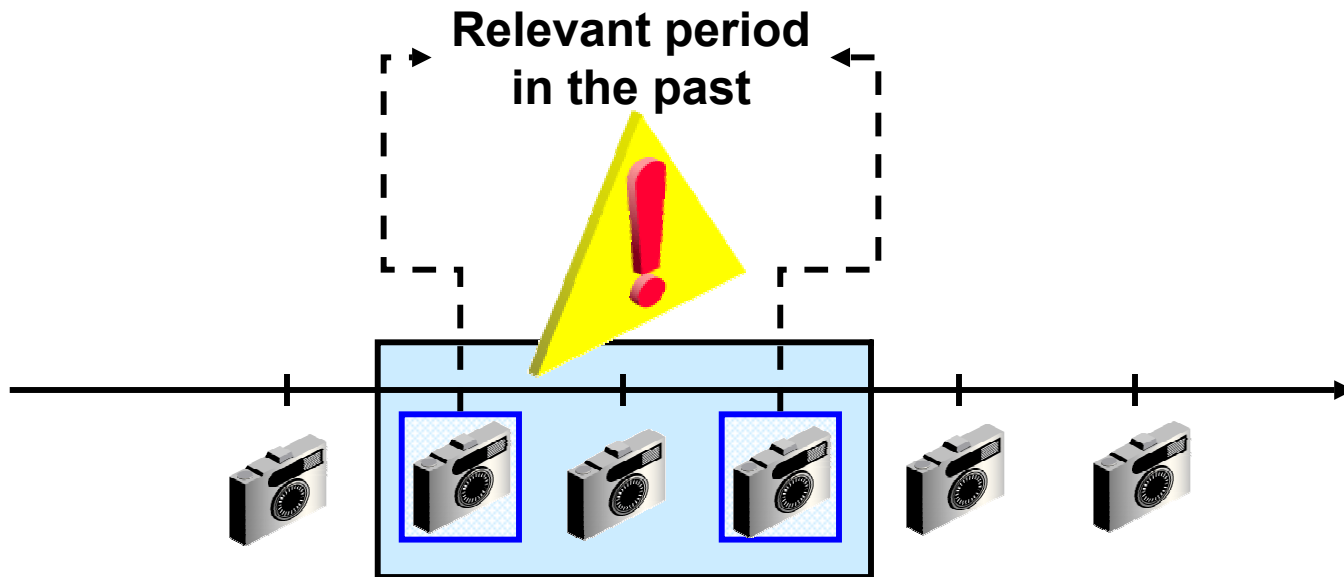


# AWR Infrastructure



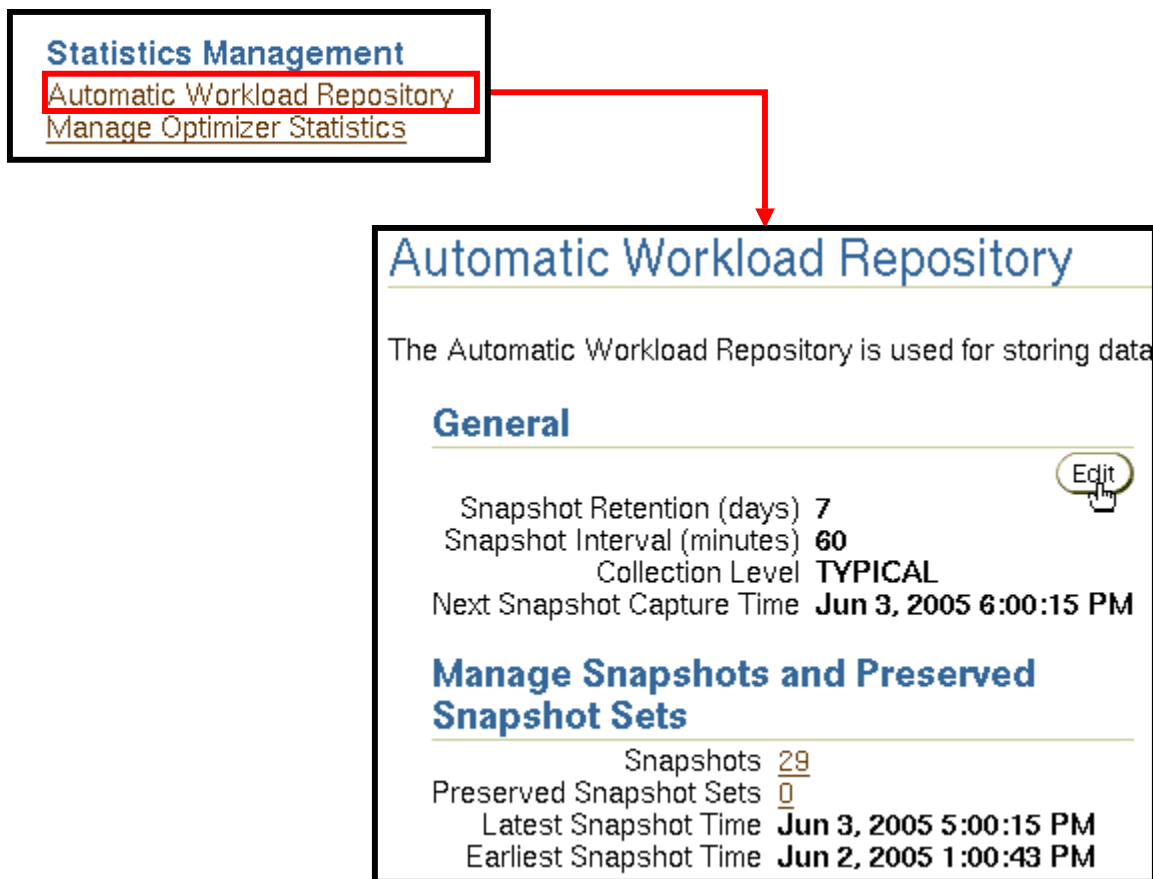


# AWR Snapshot Sets



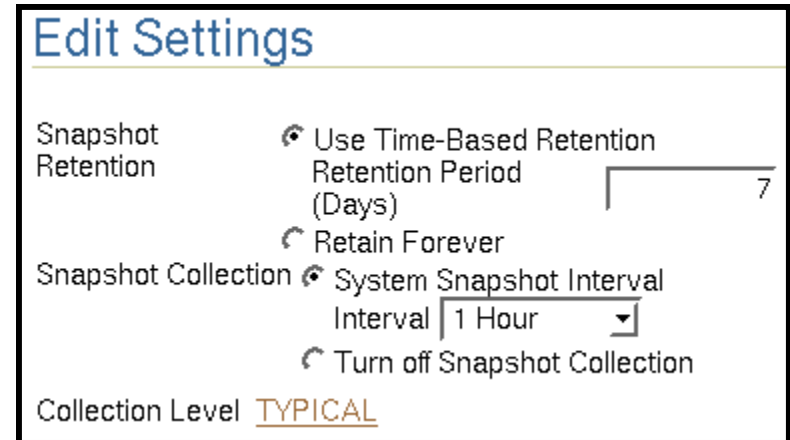
```
DBMS_WORKLOAD_REPOSITORY.CREATE_BASELINE ( -  
    start_snap_id IN NUMBER ,  
    end_snap_id   IN NUMBER ,  
    baseline_name IN VARCHAR2);
```

# Enterprise Manager and AWR



# Managing the AWR

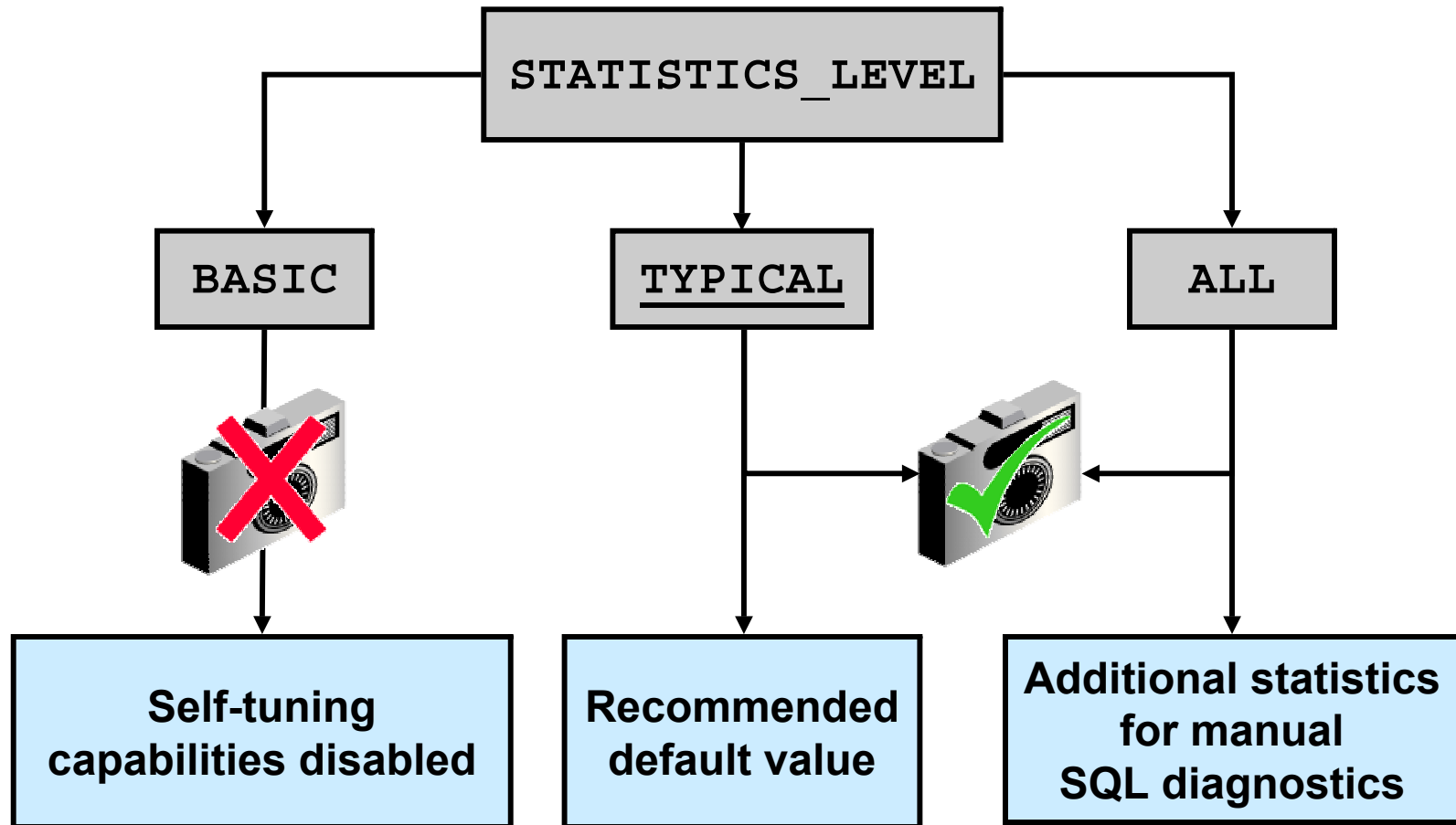
- **Retention period**
  - The default is 7 days
  - Consider storage needs
- **Collection interval**
  - The default is 60 minutes
  - Consider storage needs and performance impact
- **Collection level**
  - Basic (disables most of ADDM functionality)
  - Typical (recommended)
  - All (adds additional SQL tuning information to snapshots)



The screenshot shows the 'Edit Settings' dialog for AWR configuration. It has a title bar 'Edit Settings' and a yellow border. The settings are as follows:

Setting	Value
Snapshot Retention	<input checked="" type="radio"/> Use Time-Based Retention Retention Period (Days) <input type="text" value="7"/>
	<input type="radio"/> Retain Forever
Snapshot Collection	<input checked="" type="radio"/> System Snapshot Interval Interval <input type="text" value="1 Hour"/>
	<input type="radio"/> Turn off Snapshot Collection
Collection Level	<u>TYPICAL</u>

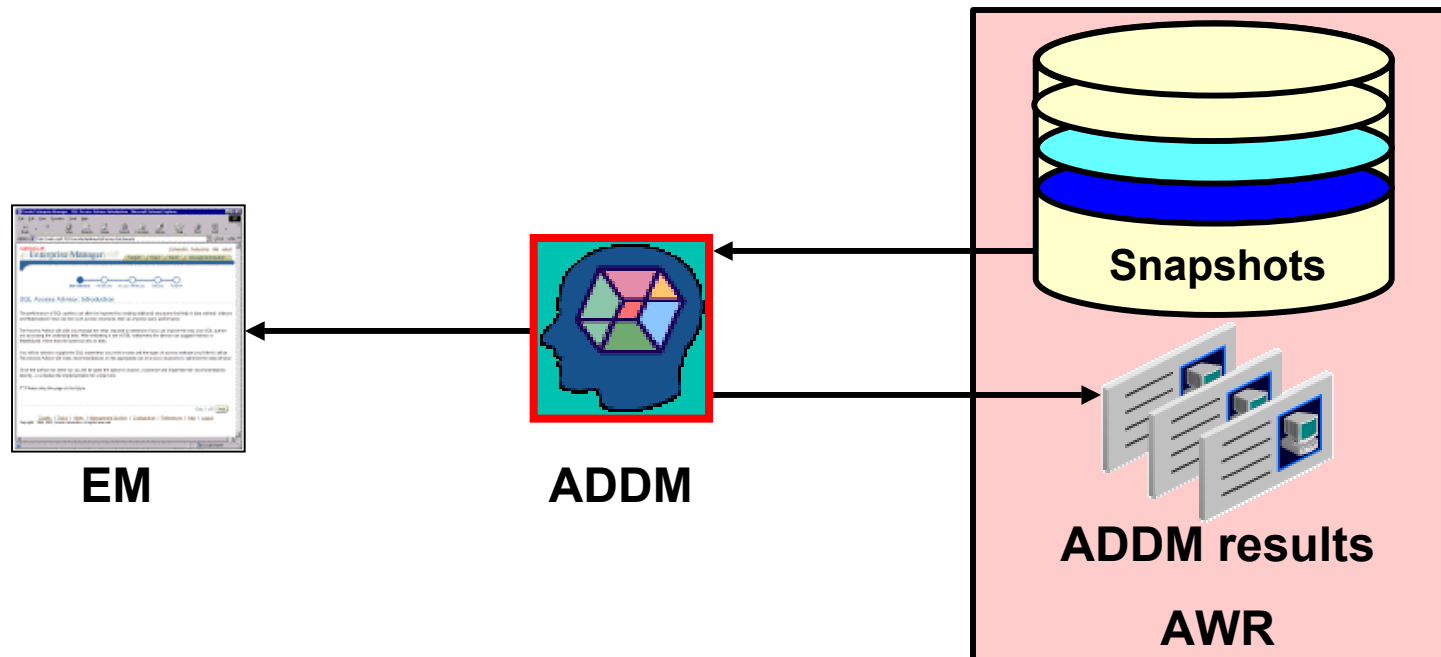
# Statistic Levels



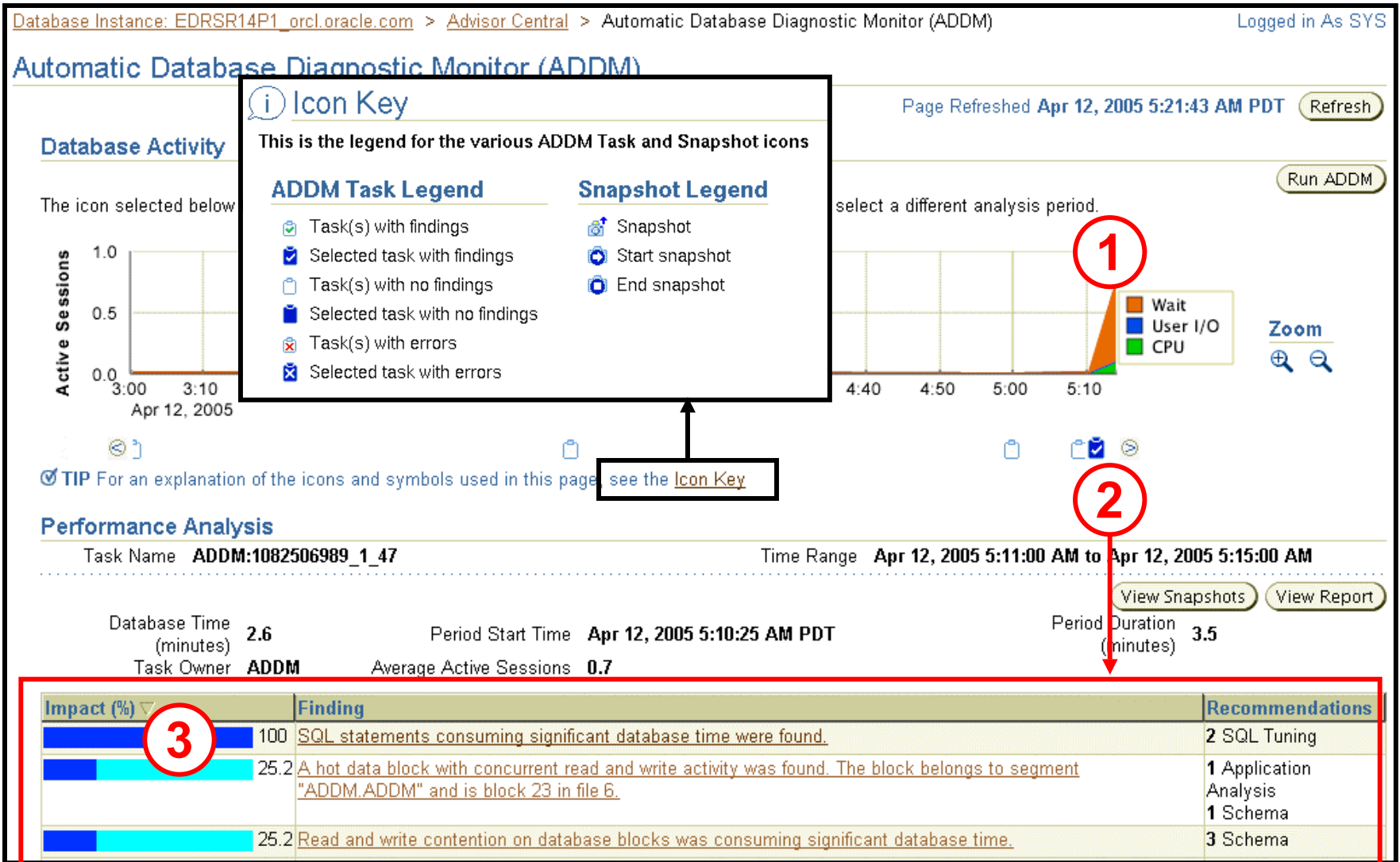
# Automatic Database Diagnostic Monitor (ADDM)

Statistics  
AWR  
> **ADDM**  
Advisors  
Alerts  
AutoTasks

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



# ADDM Findings



# ADDM Recommendations

Database Instance: [EDRSR14P1\\_orcl.oracle.com](#) > [Advisor Central](#) > [Automatic Database Diagnostic Monitor \(ADDM\)](#) >

Logged in As SYS

Performance Finding Details


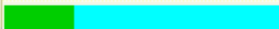
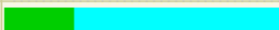
## Performance Finding Details

Database Time (minutes)	2.6	Period Start Time	Apr 12, 2005 5:10:25 AM PDT	Period Duration (minutes)	3.5
Task Owner	ADDM	Task Name	ADDM:1082506989_1_47	Average Active Sessions	0.7

Finding **Read and write contention on database blocks was consuming significant database time.**  
 Impact (minutes) **0.6**  
 Impact (%)  25.2



## Recommendations

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

Details	Category	Benefit (%) ▾
<a href="#">Hide</a>	Schema	 25.2
Action	<b>Consider using ORACLE's recommended solution of automatic segment space management in a locally managed tablespace for the tablespace "TBSADDM" containing the TABLE "ADDM.ADDM" with object id 54441. Alternatively, you can move this object to a different tablespace that is locally managed with automatic segment space management.</b>	
	Database Object <a href="#">ADDM.ADDM</a>	
Rationale	<b>There was significant read and write contention on TABLE "ADDM.ADDM" with object id 54441.</b>	
	Database Object <a href="#">ADDM.ADDM</a>	
<a href="#">Show</a>	Schema	 25.2
<a href="#">Show</a>	Schema	 25.2

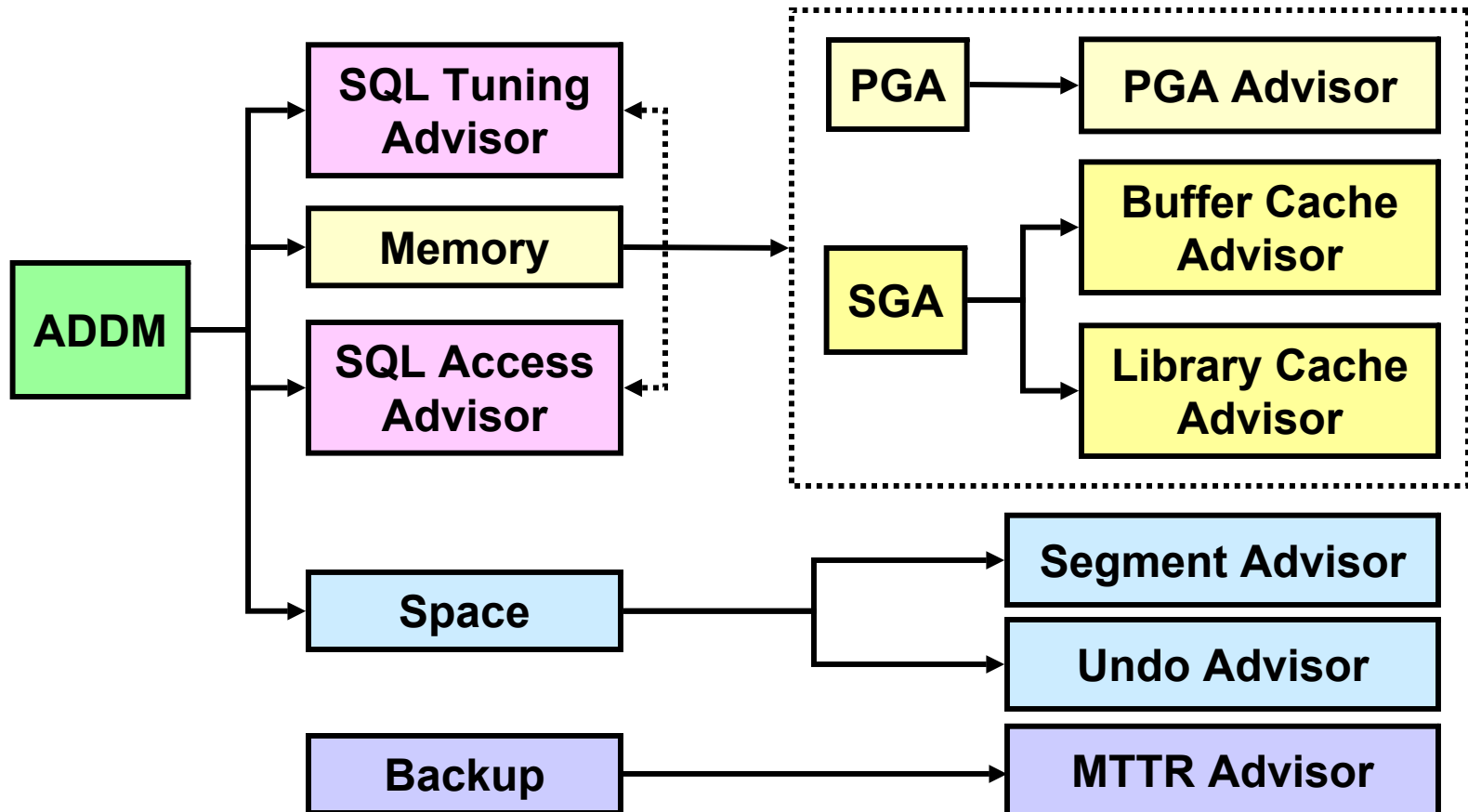
## Findings Path

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

Findings	Impact (%)	Additional Information
<a href="#">Hide</a> Read and write contention on database blocks was consuming significant database time.	 25.2	
Wait class "Concurrency" was consuming significant database time.	 61.1	

# Advisory Framework

Statistics  
AWR  
ADDM  
> **Advisors**  
Alerts  
AutoTasks





# Enterprise Manager and Advisors

**ORACLE** Enterprise Manager 10g Database Control

Setup Preferences Help Logout Database

Database Instance: EDRSR14P1\_orcl.oracle.com > Advisor Central

Logged in As SYS

Advisor Central

Page Refreshed Apr 13, 2005 8:42:15 AM PDT Refresh

**Advisors**

[ADDM](#)  
[Segment Advisor](#)  
[Undo Management](#)

[Memory Advisor](#)  
[SQL Access Advisor](#)

[MTTR Advisor](#)  
[SQL Tuning Advisor](#)

**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

**Results**

View Result Delete Actions Re-schedule Go

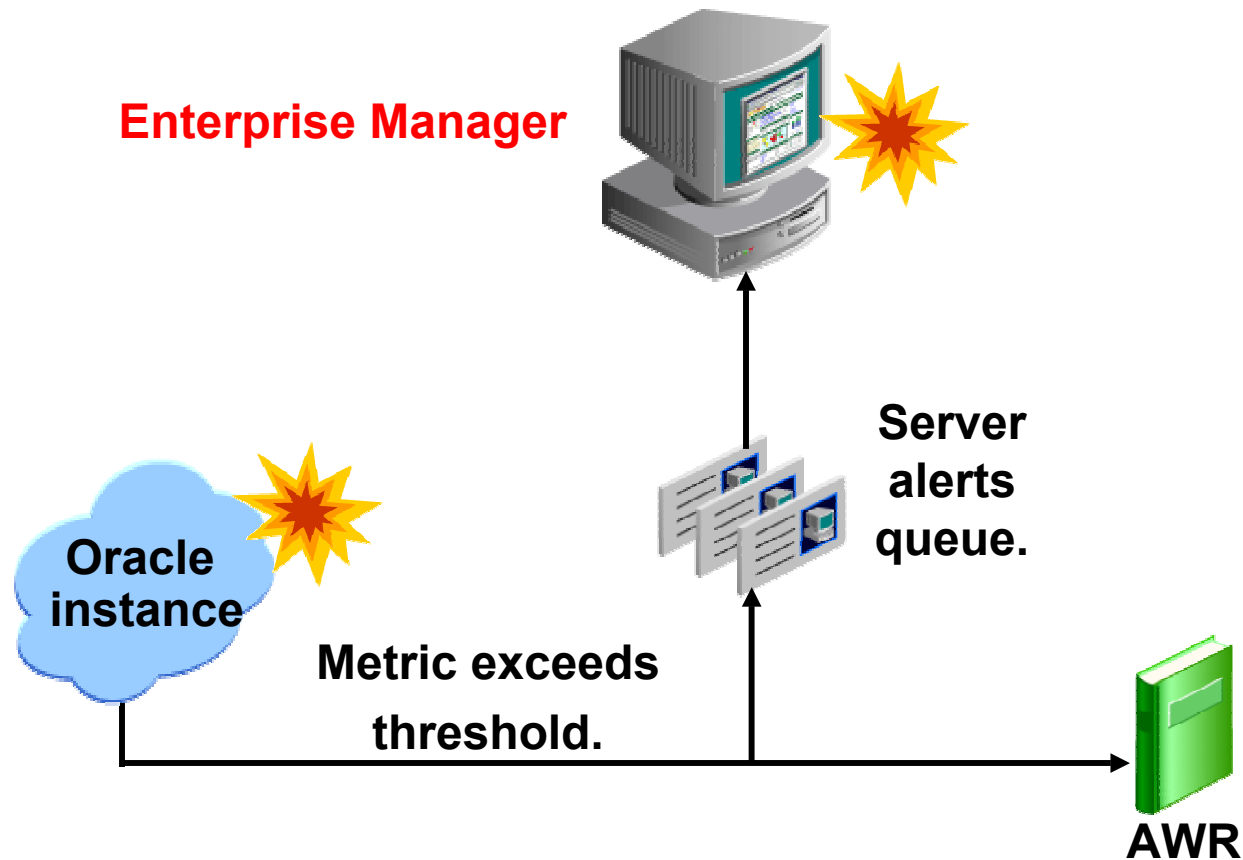
Select	Advisory Type	Name	Description	User	Status	Start Time	Duration (seconds)	Expires In (days)
<input checked="" type="radio"/>	ADDM	<a href="#">ADDM:1082506989_1_75</a>	ADDM auto run: snapshots [74, 75], instance 1, database id 1082506989	SYS	COMPLETED	Apr 13, 2005 8:00:13 AM	0	30
<input type="radio"/>	Segment Advisor	<a href="#">SYS_AUTO_SPCADV_8021342005</a>	Auto Space Advisor	SYS	COMPLETED	Apr 12, 2005 7:00:17 PM	4	29

# The DBMS\_ADVISOR Package

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

# Server-Generated Alerts

Statistics  
AWR  
ADDM  
Advisors  
> Alerts  
AutoTasks



# Default Server-Generated Alerts



**Database Control:  
SYSTEM metrics**

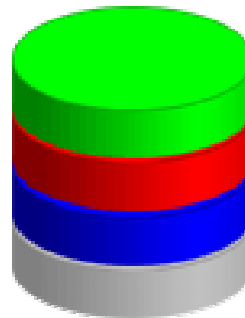


**Tablespace  
Space Usage**

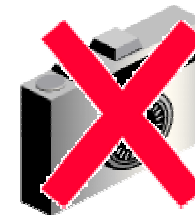
→ **97% Critical**  
→ **85% Warning**



**Resumable  
Session  
Suspended**



**Recovery Area  
Low On  
Free Space**



**Snapshot  
Too Old**

# Setting Thresholds

Database Instance: orcl > Manage Metrics > Edit Thresholds

## Edit Thresholds

You can set a warning and critical threshold for each of the metrics below. When a threshold is reached, an alert will be generated and the response action, if specified, executed. The response action can be any command or script, with a fully qualified path, that is accessible to the Management Agent.

Cancel

OK

**TIP** Some metrics do not allow a default set of thresholds for all their monitored objects. Click "Specify Multiple Thresholds" to set thresholds for specific objects.

Related Link [Response to Target Down](#)

Specify Multiple Thresholds

Select	Metric	Comparison Operator	Warning Threshold	Critical Threshold	Response Action
<input checked="" type="radio"/>	Archive Area Used (%)	>	80		
<input type="radio"/>	Archiver Hung Alert Log Error	Contains		ORA-	
<input type="radio"/>	Archiver Hung Alert Log Error Status	>	0		
<input type="radio"/>	Audited User	=	SYS		
<input type="radio"/>	Average File Read Time (centi-seconds)	>			
<input type="radio"/>	Average File Write Time (centi-seconds)	>			
<input type="radio"/>	Average Users Waiting Count				
<input type="radio"/>	Administrative	>	10		
<input type="radio"/>	Application	>	10		
<input type="radio"/>	Cluster	>	30		
<input type="radio"/>	Commit	>	30		

# Creating and Testing an Alert

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

Show SQL

2

```
CREATE TABLE "HR"."FILLER" ( "EMPLOYEE_ID" NUMBER(6), "FIRST_NAME"
VARCHAR2(20), "LAST_NAME" VARCHAR2(25), "EMAIL" VARCHAR2(25),
"PHONE_NUMBER" VARCHAR2(20), "HIRE_DATE" DATE, "JOB_ID" VARCHAR2(10),
"SALARY" NUMBER(8, 2), "COMMISSION_PCT" NUMBER(2, 2), "MANAGER_ID"
NUMBER(6), "DEPARTMENT_ID" NUMBER(4)) TABLESPACE "INVENTORY" PCTFREE 10
INITRANS 1 MAXTRANS 255 STORAGE ( INITIAL 64K BUFFER_POOL DEFAULT)
NOLOGGING
```

## Tablespace Full Metric Thresholds

Monitor the fullness of the tablespace using either of

### Space Used (%)

A warning or critical alert will be generated if the percentage of space used exceeds the corresponding threshold.

☐ Use Database Default Thresholds [Modify](#)

Warning (%) 85

Critical (%) 97

☒ Specify Thresholds

Warning (%) 70

Critical (%) 75

☐ Disable Thresholds

1

## Alerts

3

Category All [Go](#) Critical ✖ 1 Warning ⚠ 1

Severity	Category	Name	Message	Alert Triggered
<span style="color: red;">✖</span>	Tablespaces Full	Tablespace Space Used (%)	Tablespace INVENTORY is 98 percent full	Jun 3, 2005 10:44:04 AM
<span style="color: orange;">⚠</span>	User Audit	Audited User	User SYS logged on from EDRSR30P1.	Jun 3, 2005 8:25:04 AM

# Alerts Notification

**ORACLE** Enterprise Manager 10g Database Control

Setup Preferences Help Logout

Database

Preferences

Properties Targets Availability **Metrics** Objects Methods More

**Edit Notification Rule Database Availability and Critical States: Metrics**

Select the metrics and their severities for which you would like to receive notifications.

Cancel Back Step 4 of 7 Next

**Severity States**

Select the severity states for which you would like to receive notification.

☒ Critical  
☐ Warning  
☐ Clear

**Metrics**

Severity states apply to all selected metrics.

**Available Metrics**

Archiver Hung Alert Log Error  
Audited User  
Average File Read Time (centi-seconds)  
Average File Write Time (centi-seconds)  
Average Users Waiting Count  
BG Checkpoints (per second)  
Branch Node Splits (per second)  
Branch Node Splits (per transaction)  
Broken Job Count  
Buffer Cache Hit (%)

Move  
Move All  
Remove  
Remove All

**Selected Metrics**

Archiver Hung Alert Log Error Status  
Process Limit Usage (%)  
Archive Area Used (%)  
Session Limit Usage (%)  
Segments Approaching Maximum Extents Count  
Wait Time (%)  
Session Terminated Alert Log Error Status  
Tablespace Space Used (%)  
Generic Alert Log Error Status  
Data Block Corruption Alert Log Error Status

☒ **TIP** You will skip the Objects step if none of the selected metrics could have objects.

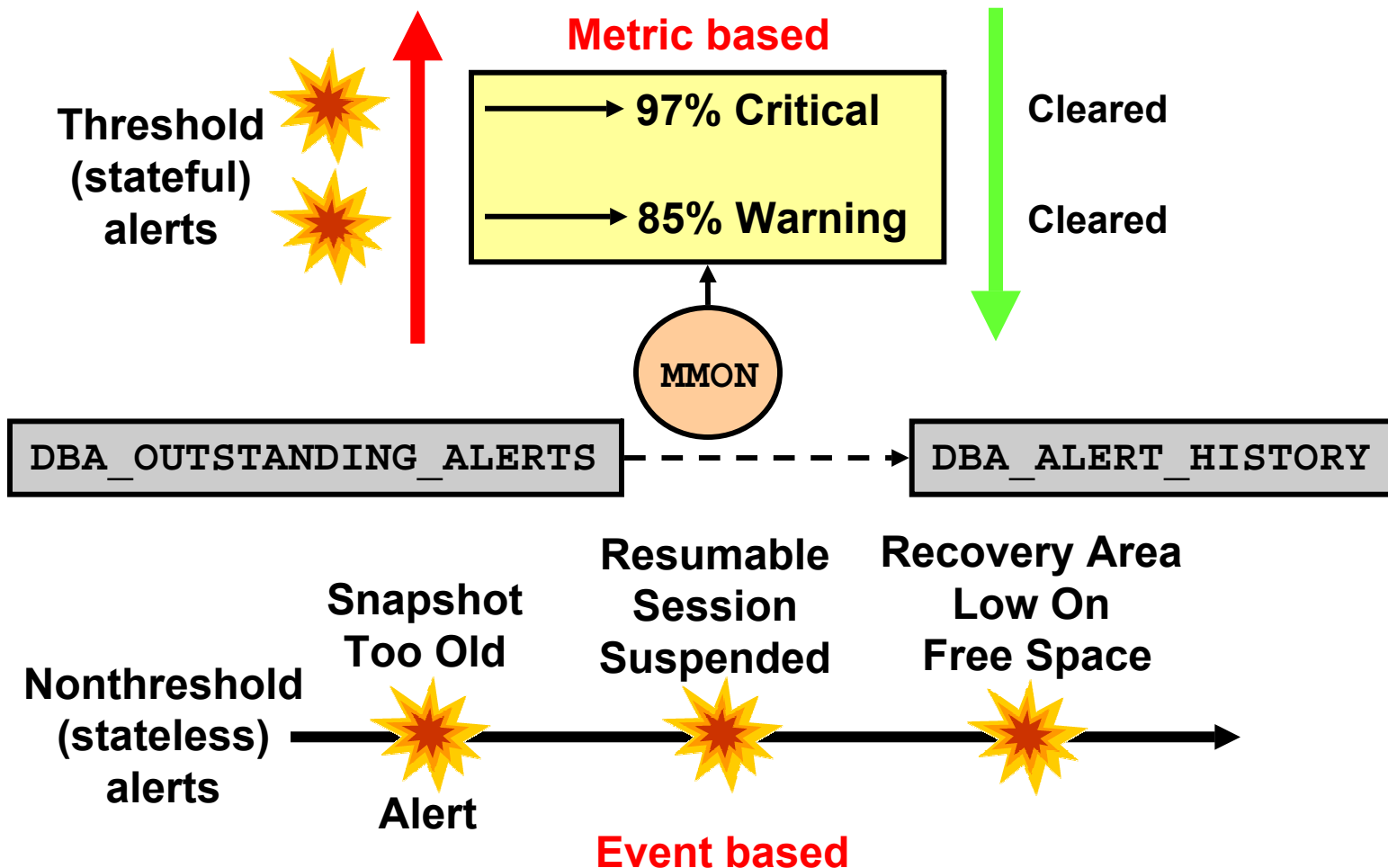
# Reacting to Alerts

- **If needed, gather more input, for example, by running ADDM or another advisor.**
- **Take corrective measures.**
- **Acknowledge alerts, which are not automatically cleared.**





# Alert Types and Clearing Alerts



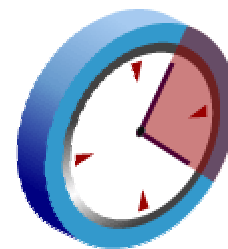
# Automated Maintenance Tasks

Statistics  
AWR  
ADDM  
Advisors  
Alerts  
> **AutoTasks**

- **Scheduler initiates jobs**
- **Jobs run in the default maintenance window**
- **Limit maintenance impact on normal operation by using Resource Manager**

## **Examples of maintenance:**

- **Gathering optimizer statistics**
- **Gathering segment information**
- **Backing up database**



# Summary

**In this lesson, you should have learned how to:**

- **Use statistics**
- **Manage the Automatic Workload Repository**
- **Use the Automatic Database Diagnostic Monitor**
- **Describe the advisory framework**
- **Set alert thresholds**
- **Use server-generated alerts**
- **Use automated tasks**

# **Practice Overview: Proactive Maintenance**

**This practice covers the following topics:**

- **Proactively managing your database by using ADDM**
  - **Setting up an issue for analysis**
  - **Reviewing your database performance**
  - **Implementing a solution**