Oracle Database: Performance Management and Tuning

Duration: 5 Days

What you will learn

The course starts with an unknown database that requires tuning. The lessons will proceed through the steps a DBA will perform to acquire the information needed to identify problem areas, to diagnose common problems, and remedy those problems. The methodology used in the practices is primarily reactive. After configuring monitoring tools, and reviewing the available reports, the student will be presented with the Oracle architecture based on the SQL statement processing of SELECT and DML.

The SQL tuning section assumes that the DBA has little or no ability to change the code. The DBA will influence the SQL performance with available tools. The DBA will be introduced to various methods of identifying the SQL statements that require tuning, and the diagnostic tools needed to find ways to change the performance. This will include the use of statistics, and profiles to influence the optimizer, adding and rebuilding indexes, and using the SQL Advisors. A major task of DBA's is to maintain SQL performance across changes. This course introduces the DB Replay, and SQL Performance Analyzer tools to help the DBA test and minimize the impact of change.

Instance tuning uses the same general method of observing a problem, diagnosing the problem, and implementing a solution. The instance tuning lessons cover the details of major tunable components and describe how you can influence the instance behavior. For each lesson, we will examine the relevant components of the architecture.

The course only discusses the architecture to the level required to understand the symptoms and solutions. More detailed explanations are left to other courses, reference material, and the Oracle documentation.

The last lesson of this course is a recap of the best practices discovered in the previous lessons, and miscellaneous recommendations. The goal is to finish the course with a best practices list for students to take away.

Learn To:

Use the Oracle tuning methodology

Use Oracle-supplied tools for monitoring and diagnosing SQL and instance tuning issues

Use database advisors to practively correct performance problems

Identify problem SQL statements

Tune SQL performance problems

Monitor instance performance by using Enterprise Manager

Tune instance components by primarily using instance parameters

Related Training

Required Prerequisites

A working knowledge of SQL and PL/SQL packages

Basic knowledge of Linux operating system

Basic understanding of Oracle Database architecture

Familiarity with basic database monitoring procedures

Oracle Database 18c: Administration Workshop

Suggested Prerequisites
Familiarity with Oracle Database configuration concepts

Familiarity with Oracle Database installation

Oracle Database 12c R2: Install and Upgrade Workshop

Course Objectives

Use the Oracle Database tuning methodology appropriate to the available tools

Utilize database advisors to proactively tune an Oracle Database Instance

Use the tools based on the Automatic Workload Repository to tune the database

Diagnose and tune common SQL related performance problems

Diagnose and tune common Instance related performance problems

Use Enterprise Manager performance-related pages to monitor an Oracle Database

Course Topics

Introduction
Types of Tuning
Tuning Methodology
Effective Tuning Goals
General Tuning Session

Basic Tuning Diagnostics
 Performance Tuning Features and Tools

Top Timed Events
DB Time
CPU and Wait Time Tuning Dimensions
Time Model
Statistic Levels
Wait Events
Alert Log and Trace Files

Using Automatic Workload Repository
Automatic Workload Repository Data
AWR Administration
AWR in a Multitenant Architecture Database
Snapshots
Reports
Compare Periods
PDB-Level Snapshot Views

Defining the Scope of Performance Issues
Determining Tuning Priorities
Top SQL Repors
Common Tuning Problems
Tuning During the Life Cycle
ADDM Tuning Session
Performance Versus Business Requirements
Performance Tuning Resources

Using Metrics and Alerts
Typical Delta Tools
Oracle Database Metrics
Statistic Histograms
Server-Generated Alerts
Alert Usage Model
Setting Thresholds

Using Baselines
Comparative Performance Analysis with AWR Baselines
Types of Baselines
Creating AWR Baselines
Managing Baselines by Using the DBMS_WORKLOAD_REPOSITORY PL/SQL Package
Performance Monitoring and Baselines
Defining Alert Thresholds Using a Static Baseline
Configuring a Basic Set of Thresholds

Using AWR-Based Tools
Automatic Maintenance Tasks
ADDM Performance Monitoring
AWR and ADDM Behavior in a Multitenant Architecture Database
Using Compare Periods ADDM
Active Session History
Emergency Monitoring
Real-time ADDM

Real-Time Database Operation Monitoring
Scope of a Composite Database Operation
Database Operation Concepts
Identifying a Database Operation
Enabling Monitoring of Database Operations
Monitoring Load Database Operations
Reporting Database Operations by Using Functions
Database Operation Tuning

Monitoring Applications
Creating Services
Using Services with Client Applications
Using Services with the Resource Manager
Using Enterprise Manager to Manage Consumer Group Mappings
Using Services with Metric Thresholds
Service Aggregation and Tracing
Client Identifier Aggregation and Tracing
trcsess Utility

Identifying Problem SQL Statements
SQL Statement Processing Phases
Role of the Oracle Optimizer
Identifying Bad SQL
Uses of Execution Plans
Reading an Execution Plan
SQL Trace Facility
Generate an Optimizer Trace

Influencing the Optimizer
Functions of the Query Optimizer
Selectivity,Cardinality and Cost
Optimizer Statistics
Extended Statistics
Adaptive Execution Plans
Using Hints
Access Paths
Join Operations and Sort Operations

Reducing the Cost of SQL Operations
Index Maintenance
SQL Access Advisor
Table Reorganization Methods
Space Management
Extent Management
Migration and Chaining
Shrinking Segments
Data Compression

Using SQL Performance Analyzer
Capturing the SQL Workload
Creating a SQL Performance Analyzer Task
Comparison Report

Tuning Regressing Statements
SQL Tuning Recommendations
Preventing Regressions
Tuning Regressed SQL Statements

SQL Performance Management
Maintaining Optimizer Statistics
Setting Statistic Preferences
Using the Optimizer Statistics Advisor
Deferred Statistics Publishing
Automatic SQL Tuning
SQL Tuning Advisor
Using the SQL Access Advisor
SQL Plan Management

Using Database Replay
Capture Considerations
Replay Considerations
Replay Analysis
Database Replay Packages
Calibrating Replay Clients

Tuning the Shared Pool
Shared Pool Architecture
The Library Cache
Latch and Mutex
Diagnostic Tools for Tuning the Shared Pool
Sizing the Shared Pool
Avoiding Fragmentation
Data Dictionary Cache
SQL Query Result Cache

Tuning the Buffer Cache
Database Buffers
Symptoms of a Buffer Cache Issue
Solutions for Buffer Cache Issues
Memoptimized Rowstore
Automatically Tuned Multiblock Reads
Database Smart Flash Cache
Force Full Database Caching
Flushing the Buffer Cache

Tuning PGA and Temporary Space
SQL memory usage
SQL Memory Manager
Configuring Automatic PGA Memory
Managing PGA for PDBs
PGA Target Advice Statistics and Histograms
Temporary Tablespace Management
Temporary Tablespace Group
Shrinking a Temporary Tablespace

Automatic Memory

Dynamic SGA

Memory Advisories

Automatic Shared Memory Management

Memory Broker Architecture

Memory Management for CDBs

Managing SGA for PDBs

SGA Advisor

Automatic Memory Management

Performance Tuning Summary with Waits

Automatic Checkpoint Tuning

Sizing the Redo Log Buffer

Sizing Redo Log Files

Increasing the Performance of Archiving

General Tablespace and Undo Tablespace Best Practices

SQL Execution Related Waits

Internal Fragmentation Considerations

I/O Modes