

RAC Global Resource Management Concepts

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Room 1

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Introduction

This presentation will focus on the concepts underlying global resource coordination for an Oracle RAC Database. It will discuss Global Enqueues, Instance Locks, Result Cache coordination and Buffer Cache fusion and explain the framework used by Oracle to coordinate access to shared resources from multiple database instances.

The Need for Global Concurrency

Accessing various resources from multiple instances, creates requirements to coordinate access so that the activity in one instance does not corrupt resources. A controlled access is required, that can survive the failure of one or more instances. This requirement is met by the Global Resource Directory.

How Global Resources are Managed

The management of global resources requires a global view and local views in each database instance. It also requires resiliency in the face of possible instance failure. To solve this problem, RAC implements Master Resources, which control access globally to a particular global object, and shadow resources which define a local interest in a resource within an instance. The shadow resources also facilitate recovery of Global Resources in the event of an instance failure.

Global Resource Remastering

When an instance fails, the surviving instances must determine which resources must be recovered in the Global Resource directory and which instance will become the new Master instance for any resource that was mastered by the failed instance. The recovery and rebuilding of resources is fundamental to maintaining global resource coordination after instance failure.

Global Enqueue and Instance Lock Management

Management of Enqueues to control Exclusive or shared access to a resource uses Global Enqueues when the owner of the resource is a specific process in an instance. If the owner of the resource is the instance itself, then Instance Locks are used and a special background process is used to be the owner of the enqueue.

Global Buffer Cache Management

Buffer Cache management controls shared access to database block images and must cope with many possible sequences of access to a block for query, for update, for single block access and for multi-block reads. It must also manage in the case of read consistency. We will examine examples of “Read-Read”, “Read-Write”, “Write-Read” and “Write-Write” situations as well as Grants for disk I/O and Past image management for recovery scenarios.

Result Cache Management

Each RAC Database instance maintains a Result Cache. But Data Manipulation Language (DML) executed in one instance must invalidate one or more results in all instances that depend on the objects for which DML was committed. The fusion of results cache invalidations will be examined.

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