# Oracle Database 19c: Clusterware Administration Workshop

Oracle Database

| DURATION | MODULES | COURSE CODE |
| --- | --- | --- |
| **4 Days** | **11 Lectures** | **—** |

## Course Overview

This course teaches you how to administer and manage Oracle Database 19c: Clusterware Administration Workshop. Gain hands-on experience with configuration, maintenance, and troubleshooting in Oracle Database environments.

## What You Will Learn

### Introduction to Clusterware

- Objectives
- Cluster
- Clusterware
- Oracle Clusterware
- Clusterware Architecture and Cluster Services
- Goals for Oracle Clusterware
- Oracle Clusterware Fencing
- Cluster Time Synchronization
- Network Resource Management
- Oracle Clusterware Operating System Requirements
- Oracle Clusterware Networking
- IP Addresses for Public Networks
- Private Network IPv6 Support
- Grid Naming Service (GNS)
- Grid Naming Service Configuration Options
- Shared GNS Across Multiple Clusters
- Highly Available Grid Naming Service
- Configuring Highly Available GNS
- Single-Client Access Name
- Quiz
- Summary

## Oracle Clusterware Architecture

- Objectives
- Oracle Clusterware Technology Stack
- Cluster Ready Services Technology Stack
- OHAS Technology Stack
- Clusterware Component Processes and Services
- Oracle Clusterware Repository (OCR)
- CSS Voting Disk Function
- Voting Disk Considerations
- Oracle Local Registry and High Availability
- Oracle Clusterware Initialization
- Clusterware Startup Details
- Clusterware Startup: OHASD orarootagent
- Clusterware Startup Details: CRSD orarootagent
- Clusterware Startup Details: OHASD oraagent
- Controlling Oracle Clusterware
- Verifying the Status of Oracle Clusterware
- Viewing the High Availability Services Stack
- GPnP Architecture: Overview
- How GPnP Works: Cluster Node Startup
- Client Database Connections
- Quiz
- Summary
- Practice 2: Overview

## Cluster Configuration Options

- Cluster Configuration Options
- Oracle Standalone Clusters
- Oracle Cluster Domain
- Oracle Cluster Domain: Overview
- Oracle Member Clusters
- Oracle Member Cluster for Oracle Databases
- Oracle Member Cluster for Applications
- Member Cluster Manifest File for Member Clusters
- Oracle Extended Clusters
- Option 1: Configure an Oracle Extended Cluster
- Assign Failure Groups to Sites
- Option 2: Configure Oracle Extended Clusters
- Assign Failure Groups to Sites Using ASMCA
- Quiz
- Summary

## Grid Infrastructure: Preinstallation Tasks

- Objectives

- Shared Storage Planning for Grid Infrastructure and RAC
- Using a Shared File System with Grid Infrastructure
- Logical Volume Managers and Grid Infrastructure
- Managing Voting Disks in ASM
- Sizing Storage for Oracle Standalone Cluster
- GIMR Configuration Details
- Quiz
- Oracle Grid Infrastructure Installation
- General Server Minimum Requirements
- Checking System Requirements
- Enabling the Name Service Cache Daemon (nscd)
- Setting the Disk I/O Scheduler on Linux
- Cluster Name and SCAN Requirements
- Checking Network Requirements
- IP Address Requirements with GNS
- IP Address Requirements for Static Configuration
- Broadcast and Multicast Requirements
- Private Interconnect Network Requirements
- Interconnect NIC Guidelines
- Private Interconnect Redundant Network Requirements
- Interconnect Link Aggregation: Single Switch
- Interconnect Link Aggregation: Multiswitch
- Additional Interconnect Guidelines
- Cluster Time Synchronization
- Software Requirements (Kernel)
- Software Requirements: Packages
- Oracle Linux with the Unbreakable Enterprise Kernel
- Zero-Downtime Kernel Updates with Ksplice
- Oracle Preinstallation RPM
- Installing the cvuqdisk RPM for Linux
- Creating Groups and Users
- Creating Groups, Users, and Paths
- Shell Settings for the Grid Infrastructure User
- Determining Root Script Execution Plan
- Quiz
- Summary
- Practice 4: Overview

## Grid Infrastructure Installation

- Objectives
- Installing Grid Infrastructure
- Choosing a Cluster Configuration
- Grid Plug and Play Support
- Configuring Shared GNS
- Cluster Node Information

- Specify Network Interface Usage
- Storage Option Information
- Create ASM Disk Group
- Create ASM Disk Group: Specify Failure Groups
- Specify ASM Password
- Failure Isolation Support with IPMI
- Specify Management Options
- Privileged Operating System Groups
- Specify Installation Location
- Create Inventory
- Root Script Execution Configuration
- Perform Prerequisite Checks
- Install Product
- Verifying the Grid Infrastructure Installation
- Understanding Offline Processes
- Check ASM Function for Oracle Clusterware Files
- Create a Fast Recovery Area Disk Group
- Modifying Oracle Clusterware Binaries After Installation
- Unconfiguring Oracle Clusterware Without Removing Binaries
- Quiz
- Summary
- Practice 5: Overview

## Managing Cluster Nodes

- Objectives
- Adding a Cluster Node
- Prerequisite Steps for Adding a Node
- Adding a Node Using gridSetup.sh
- Using gridSetup.sh to Add a Node
- Adding a Node to a Cluster on Windows Systems
- Using Fleet Patching and Provisioning to Add a Node
- Deleting a Node from the Cluster
- Deleting a Node from a Windows-Based Cluster
- Additional Methods to Delete a Node from a Ccluster
- Summary
- Practice 6: Overview

## Traditional Clusterware Management

- Objectives
- Managing Oracle Clusterware
- Role-Separated Management
- Configuring Horizontal Role Separation
- Controlling Oracle Clusterware
- Verifying the Status of Oracle Clusterware
- Determining the Location of Oracle Clusterware Configuration Files

- Checking the Integrity of Oracle Clusterware Configuration Files
- Locating the OCR Automatic Backups
- Changing the Automatic OCR Backup Location
- Adding, Replacing, and Repairing OCR Locations
- Removing an Oracle Cluster Registry Location
- Migrating OCR Locations to ASM
- Migrating OCR from ASM to Other Shared Storage
- Performing Manual OCR Backups
- Restoring the OCR on Linux or UNIX Systems
- Backing Up and Recovering the Voting Disk
- Adding, Deleting, or Migrating Voting Disks
- Restoring Voting Disks
- Oracle Local Registry
- Oracle Interface Configuration Tool: oifcfg
- Determining the Current Network Settings
- Configuring Redundant Interconnect Usage Using OIFCFG
- Changing the Virtual IP Addresses Using SRVCTL
- Changing the Interconnect Adapter Using OIFCFG
- Managing SCAN VIP and SCAN Listener Resources
- SCAN Listeners and Valid Node Checking
- What-If Command Evaluation
- Performing What-If Command Evaluation on Application Resources
- with CRSCTL
- Performing What-If Command Evaluation on Oracle Clusterware Resources
- with CRSCTL
- Formatting the Output for What-If Command Evaluation on Oracle
- Clusterware Resources
- Performing What-If Command Evaluation with SRVCTL
- Evaluating Failure Consequences with SRVCTL
- Reasoned Command Evaluation (Why-If)
- Why-If: Managing Servers, Server Pools, and Policies
- Quiz
- Summary
- Practice 7: Overview

## Policy-Based Cluster and Capacity Management

- Objectives
- Policy-Based Cluster Management Enhancements: Overview
- Server Pools
- Server Pools and Policy-Based Management
- Server Pool Attributes
- Server Pool Attribute Considerations
- GENERIC and FREE Server Pools
- Assignment of Servers to Server Pools
- Creating Server Pools with crsctl and srvctl

- Managing Server Pools with srvctl and crsctl
- Moving Servers Between Server Pools
- Managing Server Pools Using Default Attributes
- Server State Attributes
- Server Categorization: Overview
- Server Categorization
- Administering Server Categorization: Server Attributes
- Administering Server Categorization: Server Categories
- Administering Server Categorization: Server Pools
- Policy Set: Overview
- Policy-Based Cluster Management and QoS Management
- Viewing the Policy Set
- Configuring a User-Defined Policy Set: Method 1
- Configuring a User-Defined Policy Set: Method 2
- Modifying a User-Defined Policy Set
- Activating a User-Defined Policy
- Load-Aware Resource Placement
- Server Weight-Based Node Eviction
- Assigning Weight to Servers and Resources
- Quiz
- Summary
- Practice 8 Overview: Using Policy-Based Cluster Management

## Upgrading and Patching Grid Infrastructure

- Objectives
- Clusterware Upgrading and Patching: Overview
- Oracle Grid Infrastructure Upgrade
- Options for Oracle Grid Infrastructure Upgrades
- Pre-Upgrade Tasks
- Moving Oracle Clusterware Files to Oracle ASM
- Using CVU to Validate Readiness for Clusterware Upgrades
- Understanding Rolling Upgrades Using Batches
- Dry-run Upgrade
- Performing a Rolling Upgrade from an Earlier Release
- Completing a Clusterware Upgrade When Nodes Become Unreachable
- Deinstalling the Old Oracle Clusterware Installation
- Patching: Overview
- Types of Patches
- RU and RUR Download Assistant
- Apply Patches during an Oracle Grid Infrastructure Installation or Upgrade
- Grid Infrastructure Patching with OPatch
- Rolling Patches
- Checking Software Versions
- OPatch: Overview
- OPatch: General Usage

- Before Patching with OPatch
- Installing a Patch Manually Using OPatch
- OPatch Automation
- Installing a Patch Automatically Using OPatchAuto
- OPatch Log and Trace Files
- Queryable Patch Inventory
- Quiz
- Summary

## Monitoring and Troubleshooting Oracle Clusterware

- Objectives
- “Golden Rule” in Debugging Oracle Clusterware
- Oracle Autonomous Health Framework
- Cluster Verify Utility (CVU)
- Clusterware resource (ora.cvu)
- CVU Heath Check Report: Example
- Cluster Verify Components
- Cluster Verify Output: Example
- Cluster Health Monitor (CHM)
- oclumon Utility
- clumon dumpnodeview Command
- oclumon dumpnodeview Command
- oclumon manage Command
- Oclumon dumpnodeview
- Oclumon Version / debug
- Cluster Health Advisor (CHA)
- Cluster Health Advisor: Overview
- Oracle Cluster Health Advisor Architecture
- Using the CHA Command Line Interface chactl
- Managing the CHA Models: Defining “normal”
- CHA Key Performance and Workload Indicators
- Using chactl query to View Problems and Diagnosis
- Managing the CHA Repository
- Trace File Analyzer (TFA) Collector
- TFA Collector Utility
- TFA Collector Analysis
- TFA Collector Repository
- Managing ADR Logs by Using tfactl managelogs
- Oracle Autonomous Health Framework Components
- Lesson Agenda
- Cluster Resource Activity Log (CALOG)
- Querying and Managing the CALOG
- Lesson Agenda
- ADR Directory Structure
- Files in the Trace Directory

- Clusterware Trace Files
- The Oracle Clusterware Alert Log
- Incident Trace Files
- Other Diagnostic Data
- Lesson Agenda
- Node Eviction: Overview
- Rebootless Node Eviction: Example
- Processes Roles For Node Reboots
- Reboot Advisory in clusterware alert.log
- Other Log & Trace Files to Review
- Possible Troubleshooting Scenario: Example
- Quiz
- Summary
- Practice 10: Overview

## Making Applications Highly Available with Oracle Clusterware

- Objectives
- Oracle Clusterware High Availability (HA)
- Oracle Clusterware HA Components
- Clusterware Resource Modeling
- Agents
- Action Scripts
- Resource Types
- Adding Resource Types
- Adding a Resource Type with EM
- Using Clusterware to Enable High Availability
- Resource Attributes
- Resource States
- Resource Dependencies
- Start Dependencies
- Stop Dependencies
- Creating a Clusterware Managed Application VIP
- Creating an Application VIP Using EM
- Deciding on a Deployment Scheme
- Registering a Resource
- Registering a Resource: Example
- Adding Resources with EM
- Managing Resources with crsctl
- Managing Clusterware Resources with EM
- Clusterware Resource Groups
- Resource Group: Overview
- Automatic Resource Groups
- Resource Group Privileges
- Resource Group Dependencies
- Resource Group Dependency Types and Modifiers
- Failure and Recovery of Critical Resources

- Failure and Recovery of Non-Critical Resources
- Resource Group Types
- Using Resource Groups
- HA Events: ONS and FAN
- Managing Oracle Notification Server with srvctl
- Quiz
- Summary
- Practice 11: Overview