Oracle RAC (Real Application Cluster)

Oracle CRSCTL, SRVCTL and Dependencies

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Oracle CRSCTL, SRVCTL, and Their Interdependencies

Purpose: This document introduces Oracle RAC's CRSCTL and SRVCTL utilities, explaining their roles, components they manage, commonly used commands, and dependencies between them. It is designed to help new Oracle DBAs understand RAC administration in a clear and beginner-friendly way.

Introduction to CRSCTL and SRVCTL

Oracle Real Application Clusters (RAC) is a system where multiple computers (nodes) work together to run a single Oracle database, ensuring high availability and performance. To manage this complex setup, Oracle provides two key command-line tools: **CRSCTL** and **SRVCTL**. These tools help DBAs control and monitor the RAC environment.

What is CRSCTL?

- **Definition**: CRSCTL (Cluster Ready Services Control) is a tool used to manage the underlying infrastructure of an Oracle RAC cluster, known as Oracle Clusterware. It handles the core components that keep the cluster running smoothly across all nodes.
- **Purpose**: Think of CRSCTL as the "manager" of the cluster's foundation, ensuring all nodes communicate, storage is accessible, and the cluster stays healthy. It's like the control center for the RAC environment.
- **Run By**: Typically the Grid Infrastructure owner (e.g., grid user) or root for some commands.
- **Location**: Found in $GRID_HOME/bin (e.g., /u01/app/grid/19.0/bin/crsctl).

What is SRVCTL?

- **Definition**: SRVCTL (Server Control) is a tool used to manage database-related components in RAC, such as the database itself, its instances, services, and listeners.
- **Purpose**: SRVCTL is like the "manager" of the Oracle database and its services running on the cluster. It ensures the database and its components are started, stopped, or configured correctly across nodes.
- **Run By**: Typically the Oracle database owner (e.g., oracle user).
- **Location**: Found in $ORACLE_HOME/bin (e.g., /u01/app/oracle/product/19.0/dbhome_1/bin/srvctl).

Key Difference

- CRSCTL manages the **cluster infrastructure** (the foundation), while SRVCTL manages the **database and its services** (the application layer). SRVCTL depends on CRSCTL-managed components being up and running.

Components Handled by CRSCTL and SRVCTL

Each tool manages specific components in the RAC environment, stored in the Oracle Cluster Registry (OCR), which acts like a configuration database for the cluster.

Components Handled by CRSCTL

CRSCTL manages the core Oracle Clusterware components that keep the RAC cluster operational:

1. **Oracle High Availability Services (OHASD)**: The main process that starts and stops the cluster software on each node.
2. **Cluster Synchronization Services (CSS)**: Ensures nodes communicate and agree on cluster membership, using voting disks to prevent conflicts (e.g., split-brain scenarios).
3. **Oracle Cluster Registry (OCR)**: Stores cluster configuration, like node details and resource dependencies.
4. **Voting Disks**: Files on shared storage that nodes use to "vote" on cluster decisions, ensuring only active nodes operate.
5. **ASM (Automatic Storage Management)**: Manages shared storage for database files, OCR, and voting disks.
6. **Network and VIPs**: Manages network resources and Virtual IPs for node connectivity.
7. **Nodes**: Controls node membership and status in the cluster.

Components Handled by SRVCTL

SRVCTL manages database-related components that rely on the Clusterware infrastructure:

1. **Database**: The entire RAC database (e.g., prod), spanning multiple nodes.
2. **Instances**: Individual database processes on each node (e.g., prod1, prod2).
3. **Services**: Logical groupings of database connections for specific workloads (e.g., sales_svc for sales applications).
4. **Listeners**: Network processes that handle client connections to the database.
5. **ASM Instances**: Database-specific ASM operations, though shared with CRSCTL.
6. **Node Applications**: Includes listeners and VIPs specific to database operations.

Commonly Used CRSCTL and SRVCTL Commands

Frequently used commands

CRSCTL Commands

Run these as the grid user or root from $GRID_HOME/bin.

Command	Description	Example
crsctl check crs	Checks if Clusterware components (OHASD, CSS, EVM) are running.	crsctl check crs Output: "CRS-4537: Cluster Ready Services is online"
crsctl start crs	Starts Clusterware on the local node.	crsctl start crs
crsctl stop crs	Stops Clusterware on the local node.	crsctl stop crs -f (force stop)
crsctl check cluster -all	Checks the status of all nodes in the cluster.	crsctl check cluster -all Output: Lists status of nodes (e.g., rac1: CRS-4537)
crsctl query css votedisk	Shows voting disk locations and status.	crsctl query css votedisk Output: Lists disks (e.g., +DATA1)
ocrcheck	Verifies OCR integrity.	ocrcheck Output: "Cluster registry integrity check succeeded"
ocrconfig -manualbackup	Creates a manual OCR backup.	ocrconfig -manualbackup
crsctl status resource -t	Shows status of all Clusterware resources (e.g., ASM, listeners).	crsctl status resource -t

SRVCTL Commands

Run these as the oracle user from $ORACLE_HOME/bin.

Command	Description	Example
srvctl status database -d dbname	Checks if the database and its instances are running.	srvctl status database -d prod Output: "Instance prod1 is running on node rac1"
srvctl start database -d dbname	Starts the database and its instances.	srvctl start database -d prod
srvctl stop database -d dbname	Stops the database and its instances.	srvctl stop database -d prod -o immediate
srvctl config database -d dbname	Shows database configuration details.	srvctl config database -d prod Output: Lists instances, SPFILE, etc.
srvctl start instance -d dbname -i instname	Starts a specific instance.	srvctl start instance -d prod -i prod1
srvctl status service -d dbname -s servicename	Checks the status of a database service.	srvctl status service -d prod -s sales_svc
srvctl start service -d dbname -s servicename	Starts a database service.	srvctl start service -d prod -s sales_svc
srvctl status listener -l listenername	Checks listener status.	srvctl status listener -l LISTENER

Dependencies Between CRSCTL and SRVCTL Services

In Oracle RAC, SRVCTL-managed resources (databases, instances, services) depend on CRSCTL-managed resources (Clusterware, ASM, OCR, voting disks) to function. Think of CRSCTL as the foundation of a house and SRVCTL as the rooms inside—the rooms can't work without a stable foundation.

Key Dependencies

1. **Clusterware (CRSCTL) as the Foundation**:
    - **Dependency**: SRVCTL-managed databases and services require Clusterware (OHASD, CSS) to be running, controlled by CRSCTL (crsctl start crs).
    - **Why**: Clusterware manages node communication and quorum via voting disks. If Clusterware is down, SRVCTL commands (e.g., srvctl start database) fail.
    - **Example**: Before starting a database, check Clusterware:
      ```
      crsctl check crs
      ```

2. **ASM Dependency**:
    - **Dependency**: Databases and instances (SRVCTL) rely on ASM for storage, managed by both CRSCTL (ora.asm) and SRVCTL (srvctl start asm).
    - **Why**: ASM hosts database files, OCR, and voting disks. If ASM is offline, databases cannot start.
    - **Example**: Check ASM before database startup:
      ```
      crsctl status resource ora.asm
      srvctl start asm -n rac1
      ```

3. **Node and Network Dependencies**:
    - **Dependency**: SRVCTL-managed listeners and services need CRSCTL-managed network resources (e.g., Virtual IPs) and active nodes.
    - **Why**: Listeners require network connectivity to accept client connections.
    - **Example**: Verify node status before starting a listener:
      ```
      crsctl check cluster -all
      srvctl start listener -l LISTENER
      ```

4. **OCR Dependency**:
    - **Dependency**: SRVCTL uses OCR (managed by CRSCTL) to store database and service configurations.
    - **Why**: If OCR is corrupted, SRVCTL commands may fail due to missing metadata.
    - **Example**: Check OCR before SRVCTL operations:
      ```
      Ocrcheck
      ```

5. **Service and Instance Dependencies**:
    - **Dependency**: Services (SRVCTL) depend on instances, which depend on the database and ASM (CRSCTL/SRVCTL).
    - **Why**: A service cannot run if its instance or database is down.
    - **Example**: Start instance before service:
      ```
      srvctl start instance -d prod -i prod1
      srvctl start service -d prod -s sales_svc
      ```

Dependency Flow

- **Startup Order**: CRSCTL starts Clusterware → ASM → Nodes → SRVCTL starts Database → Instances → Services → Listeners.
- **Failure Impact**: If a CRSCTL-managed resource (e.g., voting disk) fails, Clusterware may evict a node, stopping SRVCTL-managed instances/services on that node.
- **Visual Example**:
    - CRSCTL: Ensures Clusterware, ASM, and OCR are running.
    - SRVCTL: Uses these to start the prod database and sales_svc service.

Example Workflow

- **Task**: Start the prod database and its sales_svc service after a node reboot.
- **Steps**:

1. **Check Clusterware (CRSCTL)**:
   ```
   crsctl check crs
   ```
    - If down, start it: crsctl start crs.
2. **Check ASM (CRSCTL/SRVCTL)**:
   ```
   crsctl status resource ora.asm
   srvctl status asm -n rac1
   ```
    - If down, start it: srvctl start asm -n rac1.
3. **Start Database (SRVCTL)**:
   ```
   srvctl start database -d prod
   ```
4. **Start Service (SRVCTL)**:
   ```
   srvctl start service -d prod -s sales_svc
   ```
5. **Verify**:
   ```
   srvctl status database -d prod
   srvctl status service -d prod -s sales_svc
   ```

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