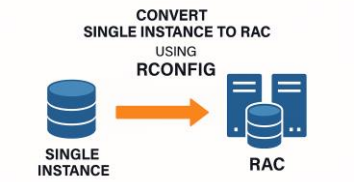
Transforming an Oracle Single Instance to RAC with RCONFIG



In this article, I share a practical step-by-step guide on how to convert an Oracle database, configured as **Single Instance** to **RAC (Real Application Clusters),** using the **RCONFIG tool**. The demonstration is done in an environment with Oracle Grid Infrastructure and Oracle Software configured on two nodes, ideal for those looking for scalability and high availability.

Let's go!!

1. Through the rac-status.sh script we can verify that there is no DB instance configured on our nodes, only the **GRID Infrastructure**.

```
[grid@rac01 ~]$ ./rac-status.sh

        Cluster rac (upgrade state is NORMAL)

     Listener     |      Port      |      rac01      |      rac02      |     Type     |
  ----------------------------------------------------------------------------------------
   ASMNET1LSNR_ASM| TCP:1525       |      Online     |      Online     |   Listener   |
   LISTENER       | TCP:1521       |      Online     |      Online     |   Listener   |
   LISTENER_SCAN1 | TCP:1521       |        -        |      Online     |     SCAN     |
   LISTENER_SCAN2 | TCP:1521       |      Online     |        -        |     SCAN     |
   LISTENER_SCAN3 | TCP:1521       |      Online     |        -        |     SCAN     |
  ----------------------------------------------------------------------------------------
```

2. We will now configure a **Single Instance** within this environment, so that we can simulate this conversion, through **DBCA** in **silent mode**.

```
dbca -silent -createDatabase \
 -templateName General_Purpose.dbc \
 - gdbname orcl \
 -SID ORCL \
 -responseFile NO_VALUE \
 -characterSet AL32UTF8 \
 -sysPassword dbaocmpwd \
 -systemPassword dbaocmpwd \
 -createAsContainerDatabase true \
 -numberOfPDBs 1 \
 -pdbName pdb \
 -pdbAdminPassword dbaocmpwd \
 -databaseType MULTIPURPOSE \
 -enableArchive TRUE \
 -archiveLogMode AUTO \
 -archiveLogDest '+FROM' \
 -storageType ASM \
 -datafileDestination '+DATA' \
 -redoLogFileSize 200 \
 -emConfiguration NONE \
 -ignorePreReqs
```

```
[oracle@rac01 ~]$ dbca -silent -createDatabase \
>    -templateName General_Purpose.dbc \
>    -gdbname orcl \
>    -sid orcl \
>    -responseFile NO_VALUE \
>    -characterSet AL32UTF8 \
>    -sysPassword dbaocmpwd \
>    -systemPassword dbaocmpwd \
>    -createAsContainerDatabase true \
>    -numberOfPDBs 1 \
>    -pdbName pdb \
>    -pdbAdminPassword dbaocmpwd \
>    -databaseType MULTIPURPOSE \
>    -enableArchive TRUE \
>    -archiveLogMode AUTO \
>    -archiveLogDest '+FRA' \
>    -storageType ASM \
>    -datafileDestination '+DATA' \
>    -redoLogFileSize 200 \
>    -emConfiguration NONE \
>    -ignorePreReqs
[WARNING] [DBT-06208] The 'SYS' password entered does not conform to the Oracle recommen
ded standards.
   CAUSE:
a. Oracle recommends that the password entered should be at least 8 characters in length
, contain at least 1 uppercase character, 1 lower case character and 1 digit [0-9].
b.The password entered is a keyword that Oracle does not recommend to be used as passwor
d
   ACTION: Specify a strong password. If required refer Oracle documentation for guideli
nes.
[WARNING] [DBT-06208] The 'SYSTEM' password entered does not conform to the Oracle recom
mended standards.
   CAUSE:
a. Oracle recommends that the password entered should be at least 8 characters in length
, contain at least 1 uppercase character, 1 lower case character and 1 digit [0-9].
b.The password entered is a keyword that Oracle does not recommend to be used as passwor
d
   ACTION: Specify a strong password. If required refer Oracle documentation for guideli
nes.
[WARNING] [DBT-06208] The 'PDBADMIN' password entered does not conform to the Oracle rec
ommended standards.
   CAUSE:
a. Oracle recommends that the password entered should be at least 8 characters in length
, contain at least 1 uppercase character, 1 lower case character and 1 digit [0-9].
b.The password entered is a keyword that Oracle does not recommend to be used as passwor
d
   ACTION: Specify a strong password. If required refer Oracle documentation for guideli
nes.
Prepare for db operation
7% complete
Registering database with Oracle Restart
11% complete
Copying database files
33% complete
Creating and starting Oracle instance
35% complete
38% complete
42% complete
45% complete
48% complete
Completing Database Creation
53% complete
55% complete
56% complete
Creating Pluggable Databases
60% complete
78% complete
Executing Post Configuration Actions
100% complete
Database creation complete. For details check the logfiles at:
 /u01/app/oracle/cfgtoollogs/dbca/orcl.
Database Information:
Global Database Name:orcl
System Identifier(SID):orcl
Look at the log file "/u01/app/oracle/cfgtoollogs/dbca/orcl/orcl.log" for further detail
s.
[oracle@rac01 ~]$
```

3. After the end of the creation of the **Database**, we verify through the **PMON** process and **SRVCTL** that it is of the **Single Instance type** and is running only on one node, in **RAC01**.

```
[oracle@rac01 ~]$ ps -ef | grep pmon
grid      9782     1  0 May10 ?        00:00:13 asm_pmon_+ASM1
oracle   18017     1  0 16:37 ?        00:00:00 ora_pmon_orcl
oracle   30968 15225  0 16:46 pts/0    00:00:00 grep --color=auto pmon
```

```
[oracle@rac01 ~]$ srvctl config database -d orcl
Database unique name: orcl
Database name: orcl
Oracle home: /u01/app/oracle/product/19.3.0/db_1
Oracle user: oracle
Spfile: +DATA/ORCL/PARAMETERFILE/spfile.277.120093316
Password file:
Domain:
Start options: open
Stop options: immediate
Database role: PRIMARY
Management policy: AUTOMATIC
Server pools:
Disk Groups: FRA,DATA
Mount point paths:
Services:
Type: SINGLE
OSDBA group: dba
OSOPER group: oper
Database instance: orcl
Configured nodes: rac01
CSS critical: no
CPU count: 0
Memory target: 0
Maximum memory: 0
Default network number for database services:
Database is administrator managed
```

4. Running the **rac-status.sh** script again, it now presents the **ORCL instance**, of type **SINGLE.**

```
[grid@rac01 ~]$ ./rac-status.sh

       Cluster rac (upgrade state is NORMAL)

    Listener    |      Port      |      rac01      |      rac02      |     Type     |
 ---------------------------------------------------------------------------------
  ASMNET1LSNR_ASM| TCP:1525       |      Online     |      Online     |   Listener   |
  LISTENER       | TCP:1521       |      Online     |      Online     |   Listener   |
  LISTENER_SCAN1 | TCP:1521       |        -        |      Online     |     SCAN     |
  LISTENER_SCAN2 | TCP:1521       |      Online     |        -        |     SCAN     |
  LISTENER_SCAN3 | TCP:1521       |      Online     |        -        |     SCAN     |
 ---------------------------------------------------------------------------------

       DB        |     Version    |      rac01      |      rac02      |    DB Type   |
 ---------------------------------------------------------------------------------
 orcl            | 19.3.0     (1) |      Open       |        -        |  SINGLE (P)  |
 ---------------------------------------------------------------------------------
 ORACLE_HOME references listed in the Version column

       1 : /u01/app/oracle/product/19.3.0/db_1       oracle oinstall

   : Has been restarted less than 24 hours ago
```

5. In **SQLPLUS** we will connect to the **PDB** and create a test table called teste_clientes so we can validate the data after the conversion.

```
[oracle@rac01 ~]$ rlwrap sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Mon May 12 16:49:34 2025
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.3.0.0.0

SQL> show pdbs

    CON_ID CON_NAME                       OPEN MODE  RESTRICTED
---------- ------------------------------ ---------- ----------
         2 PDB$SEED                       READ ONLY  NO
         3 PDB                            READ WRITE NO
SQL>
```

```
SQL> alter session set container=PDB;

Session altered.

SQL> show con_name

CON_NAME
------------------------------
PDB
SQL>
SQL>
SQL>     telefone        VARCHAR2(20),
    data_cadastro   DATE DEFAULT SYSDATE
CREATE TABLE teste_clientes (
    id_cliente      NUMBER GENERATED BY DEFAULT ON NULL AS IDENTITY PRIMARY KEY,
    nome            VARCHAR2(100),
    email           VARCHAR2(100),
    telefone        VARCHAR2(20),
    data_cadastro   DATE DEFAULT SYSDATE
  7  );

Table created.

INSERT INTO teste_clientes (nome, email, telefone)
VALUES ('Joao Silva', 'joao.silva@email.com', '11999998888');

1 row created.

SQL>
INSERT INTO teste_clientes (nome, email, telefone)
VALUES ('Maria Oliveira', 'maria.oliveira@email.com', '21988887777');

1 row created.

SQL>
SQL> COMMIT;

Commit complete.
```

```
SQL> select * from teste_clientes;

  ID Nome do Cliente                Email                          Telefone        Data de Cadastro
---- ------------------------------ ------------------------------ --------------- --------------------
   3 Joao Silva                     joao.silva@email.com           11999998888     12-MAY-25
   4 Maria Oliveira                 maria.oliveira@email.com       21988887777     12-MAY-25
```

6. Now let's convert the **Single Database** to **RAC**, using **RCONFIG,** which comes with the **Oracle Software** installation. First, we will go to the location of the **XML** files that we will use for the conversion with **RCONFIG** into:

/u01/app/oracle/product/19.3.0/db_1/assistants/rconfig/sampleXMLs

```
[oracle@rac01 ~]$ cd /u01/app/oracle/product/19.3.0/db_1/assistants/rconfig/sampleXMLs/
[oracle@rac01 sampleXMLs]$
[oracle@rac01 sampleXMLs]$ ll
total 8
-rw-r----- 1 oracle oinstall 2497 Jul 16  2018 ConvertToRAC_AdminManaged.xml
-rw-r----- 1 oracle oinstall 2604 Mar  9  2018 ConvertToRAC_PolicyManaged.xml
```

7. We will use **the ConvertToRAC_AdminManaged.xml**, where we will make a copy of it, calling this copy **ConverToRAC_ORCL.xml**.

```
[oracle@rac01 sampleXMLs]$ cp ConvertToRAC_AdminManaged.xml ConvertToRAC_ORCl.xml
[oracle@rac01 sampleXMLs]$ ll
total 12
-rw-r----- 1 oracle oinstall 2497 Jul 16  2018 ConvertToRAC_AdminManaged.xml
-rw-r----- 1 oracle oinstall 2497 May 12 18:40 ConvertToRAC_ORCl.xml
-rw-r----- 1 oracle oinstall 2604 Mar  9  2018 ConvertToRAC_PolicyManaged.xml
```

8. The necessary change is made, informing the **SourceDBHome**, **TargetDBHome**, **SID**, **the nodes**, **TargetDatabaseArea** and **TargetFlashRecoveryArea** as shown in the image below.

```
<?xml version="1.0" encoding="UTF-8"?>
<n:RConfig xmlns:n="http://www.oracle.com/rconfig"
           xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
           xsi:schemaLocation="http://www.oracle.com/rconfig rconfig.xsd">
    <n:ConvertToRAC>
<!-- Verify does a precheck to ensure all pre-requisites are met, before the conversion is attempted. Allowable values are: YES|NO|ONLY -->
        <n:Convert verify="YES">
<!--Specify current OracleHome of non-rac database for SourceDBHome -->
            <n:SourceDBHome>/u01/app/oracle/product/19.3.0/db_1</n:SourceDBHome>
<!--Specify OracleHome where the rac database should be configured. It can be same as SourceDBHome -->
            <n:TargetDBHome>/u01/app/oracle/product/19.3.0/db_1</n:TargetDBHome>
<!--Specify SID of non-rac database -->
            <n:SourceDBInfo SID="orcl"/>
<!--Specify the list of nodes that should have rac instances running for the Admin Managed Cluster Database. LocalNode should be the first node in this nodelist. -->
            <n:NodeList>
              <n:Node name="rac01"/>
              <n:Node name="rac02"/>
            </n:NodeList>
<!--Specify RacOneNode along with servicename to convert database to RACOne Node -->
            <!--n:RacOneNode  servicename="salesrac1service"/-->
<!--Instance Prefix tag is optional starting with 11.2. If left empty, it is derived from db_unique_name.-->
            <n:InstancePrefix>orcl</n:InstancePrefix>
<!-- Listener details are no longer needed starting 11.2. Database is registered with default listener and SCAN listener running from Oracle Grid Infrastructure home. -->
<!--Specify the type of storage to be used by rac database. Allowable values are CFS|ASM. The non-rac database should have same storage type. ASM credentials are no needed for conversi
on. -->
            <n:SharedStorage type="ASM">
<!--Specify Database Area Location to be configured for rac database.If this field is left empty, current storage will be used for rac database. For CFS, this field will have directory
 path. -->
              <n:TargetDatabaseArea>+DATA</n:TargetDatabaseArea>
<!--Specify Fast Recovery Area to be configured for rac database. If this field is left empty, current recovery area of non-rac database will be configured for rac database. If current
 database is not using recovery Area, the resulting rac database will not have a recovery area. -->
              <n:TargetFlashRecoveryArea>+FRA</n:TargetFlashRecoveryArea>
            </n:SharedStorage>
        </n:Convert>
    </n:ConvertToRAC>
</n:RConfig>
~
~
```

9. Access the **$ORACLE_HOME/bin** folder and run **rconfig** pointing to the path of the **ConverToRAC_ORCL.xml** file.

./rconfig /u01/app/oracle/product/19.3.0/db_1/assistants/rconfig/sampleXMLs

```
[oracle@rac01 sampleXMLs]$ cd $ORACLE_HOME/bin
[oracle@rac01 bin]$
[oracle@rac01 bin]$ ./rconfig /u01/app/oracle/product/19.3.0/db_1/assistants/rconfig/
doc/        sampleXMLs/
[oracle@rac01 bin]$ ./rconfig /u01/app/oracle/product/19.3.0/db_1/assistants/rconfig/sampleXMLs/ConvertToRAC_ORCl.xml
```

```
[oracle@rac01 bin]$ ./rconfig /u01/app/oracle/product/19.3.0/db_1/assistants/rconfig/sampleXMLs/ConvertToRAC_ORCl.xml
Specify sys user password for the database

Converting Database "orcl" to Cluster Database. Target Oracle Home: /u01/app/oracle/product/19.3.0/db_1. Database Role: PRIMARY.
Setting Data Files and Control Files
Adding Trace files
Adding Database Instances
Create temporary password file
Adding Redo Logs
Enabling threads for all Database Instances
Setting TEMP tablespace
Adding UNDO tablespaces
Setting Fast Recovery Area
Updating Oratab
Creating Password file(s)
Configuring related CRS resources
Starting Cluster Database
<?xml version="1.0" ?>
<RConfig version="1.1" >
<ConvertToRAC>
    <Convert>
      <Response>
        <Result code="0" >
          Operation Succeeded
        </Result>
      </Response>
      <ReturnValue type="object">
<Oracle_Home>
         /u01/app/oracle/product/19.3.0/db_1
       </Oracle_Home>
       <Database type="ADMIN_MANAGED"  >
         <InstanceList>
           <Instance SID="orcl1" Node="rac01"  >
           </Instance>
           <Instance SID="orcl2" Node="rac02"  >
           </Instance>
         </InstanceList>
       </Database>     </ReturnValue>
    </Convert>
  </ConvertToRAC></RConfig>
```

10. It is now verified that our **ORCL Database** is of the **RAC** type, running on **rac01** and **rac02 nodes** and **administrator managed.**

```
[oracle@rac01 bin]$ srvctl config database -d orcl
Database unique name: orcl
Database name: orcl
Oracle home: /u01/app/oracle/product/19.3.0/db_1
Oracle user: oracle
Spfile: +DATA/ORCL/PARAMETERFILE/spfile.277.1200933163
Password file: +DATA/orapworcl
Domain:
Start options: open
Stop options: immediate
Database role: PRIMARY
Management policy: AUTOMATIC
Server pools:
Disk Groups: DATA,FRA
Mount point paths:
Services:
Type: RAC
Start concurrency:
Stop concurrency:
OSDBA group: dba
OSOPER group: oper
Database instances: orcl1,orcl2
Configured nodes: rac01,rac02
CSS critical: no
CPU count: 0
Memory target: 0
Maximum memory: 0
Default network number for database services:
Database is administrator managed
```

```
[oracle@rac01 bin]$ ps -ef | grep pmon
oracle    4011     1  0 19:05 ?        00:00:00 ora_pmon_orcl1
grid      9782     1  0 May10 ?        00:00:13 asm_pmon_+ASM1
oracle   15270  2670  0 19:14 pts/0    00:00:00 grep --color=auto pmon
```

```
[oracle@rac02 db_1]$ ps -ef | grep pmon
oracle   11480     1  0 19:06 ?        00:00:00 ora_pmon_orcl2
oracle   17682 28480  0 19:15 pts/0    00:00:00 grep --color=auto pmon
grid     25472     1  0 May10 ?        00:00:13 asm_pmon_+ASM2
```

11. It is verified that the data remains as it was before the conversion within the **PDB**.

```
[oracle@rac02 ~]$ rlwrap sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Mon May 12 19:16:04 2025
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.3.0.0.0

SQL>
SQL> show pdbs;

    CON_ID CON_NAME                       OPEN MODE  RESTRICTED
---------- ------------------------------ ---------- ----------
         2 PDB$SEED                       READ ONLY  NO
         3 PDB                            READ WRITE NO
SQL>
SQL> alter session set container=PDB;

Session altered.
```

```
SQL> select * from teste_clientes;

  ID Nome do Cliente               Email                          Telefone        Data de Cadastro
---- ------------------------------ ------------------------------ --------------- --------------------
   3 Joao Silva                     joao.silva@email.com           11999998888     12-MAY-25
   4 Maria Oliveira                 maria.oliveira@email.com       21988887777     12-MAY-25
```

12. And through our script we can also confirm that the **ORCL Database** is of type **RAC**, running on both **nodes**.

```
[grid@rac01 ~]$ ./rac-status.sh

       Cluster rac (upgrade state is NORMAL)

     Listener     |      Port      |      rac01      |      rac02      |     Type     |
  ----------------------------------------------------------------------------------------
   ASMNET1LSNR_ASM| TCP:1525       |      Online     |      Online     |   Listener   |
   LISTENER       | TCP:1521       |      Online     |      Online     |   Listener   |
   LISTENER_SCAN1 | TCP:1521       |        -        |      Online     |     SCAN     |
   LISTENER_SCAN2 | TCP:1521       |      Online     |        -        |     SCAN     |
   LISTENER_SCAN3 | TCP:1521       |      Online     |        -        |     SCAN     |
  ----------------------------------------------------------------------------------------

       DB         |     Version    |      rac01      |      rac02      |    DB Type   |
  ----------------------------------------------------------------------------------------
  orcl            | 19.3.0     (1) |      Open       |      Open       |    RAC (P)   |
  ----------------------------------------------------------------------------------------
  ORACLE_HOME references listed in the Version column

       1 : /u01/app/oracle/product/19.3.0/db_1        oracle oinstall

     : Has been restarted less than 24 hours ago
```

Here is the link to download the script used in this article
https://github.com/freddenis/oracle-scripts/blob/master/rac-status.sh

With this practical example, we show how it is possible to perform the conversion of an Oracle **Single Instance** database to **RAC** using **RCONFIG** efficiently and safely. This type of conversion is especially useful in organizational growth scenarios, where the demand for high availability, scalability, and performance becomes essential. Feel free to use the script shared on GitHub and adapt the process to your environment.

Wagner Roberto Gaioto Mariano