

Hey DBMS_COMPARISON! Are my Tables in sync?

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2 HALLO, GRÜEZI, HI!



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5 AGENDA

1. Introduction

2. DBMS_COMPARISON

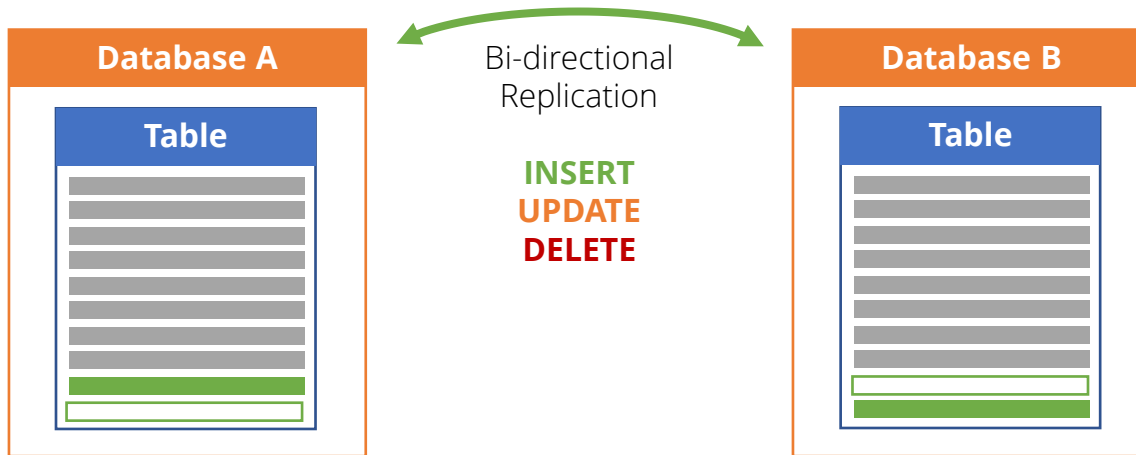
3. Execution

4. Enterprise Manager Integration

INTRODUCTION

7 MOTIVATION

- Data is replicated between different databases using **Logical Replication**
 - For example, Data Guard Logical Standby, GoldenGate, third-party products
 - **Uni- or bi-directional replication**
- If an error or collision occurs, the data **might get out-of-sync** (data deviation)



8 SOLUTION?

- Evaluate your Logical Replication configuration
 - Check error and collision handling
 - Improve monitoring
 - Compare the data between source and target regularly
- Identify data deviations and correct only the affected data
 - Avoid complete data refreshes to minimize the downtime

DBMS_COMPARISON

10 DBMS_COMPARISON

- **PL/SQL package**, introduced with Oracle 11g Release 1
- **Scans the contents of two tables** for differences (this is called a comparison)
 - Either in the same database or in two different databases
 - A database link is used to connect between source and target database
- The scan can **include the affected rows** or a general state of the synchronization
 - Getting the affected rows require more time
- **Differences can be converged** to get a synchronized state
 - Deactivate your Logical Replication before doing this
 - Only rows with differences are synchronized using INSERT, UPDATE, DELETE statements



A table which is part of a replication is also known as a **shared database object**.

11 SUPPORTED OBJECT TYPES

- Tables
- Single-Table Views
- Materialized Views
- Synonyms for above object types



A comparison of different object type is possible, e.g., table with materialized view.

12 (UN)SUPPORTED DATA TYPES

- Not all column data types are supported for a comparison

Supported

- BINARY_DOUBLE
- BINARY_FLOAT
- CHAR
- DATE
- FLOAT
- INTERVAL DAY TO SECOND
- INTERVAL YEAR TO MONTH
- NCHAR
- NUMBER
- NVARCHAR2
- RAW
- TIMESTAMP
- TIMESTAMP WITH LOCAL TIME ZONE
- TIMESTAMP WITH TIME ZONE
- VARCHAR2

Unsupported

- BFILE
- BLOB
- CLOB
- LONG
- LONG RAW
- NCLOB
- Oracle-supplied types (including any types, XML types, spatial types, and media types)
- ROWID
- UROWID
- User-defined types (including object types, REFs, varrays, and nested tables)



Exclude columns with unsupported data types to allow a partial comparison.

13 GENERAL REQUIREMENTS

- Character set must be the same between source and target

```
SQL> SELECT property_name, property_value  
       FROM database_properties  
       WHERE property_name LIKE '%CHARACTERSET%';
```

- Table shape (columns, data type) must be equal
 - Parameter column_list must be used if the shape is different
- For the data type TIMESTAMP WITH LOCAL TIME ZONE (TSLTZ), the time zone version must be equal



The remote database can be also 10g Release 1 and higher.

14 INDEX REQUIREMENTS 1/2

- To compare rows between source and target table, **each row must be uniquely identified**
- For all scan modes, the database objects must have one of the following types of indexes
 - Single column index on NUMBER, TIMESTAMP, INTERVAL or DATE data type
 - Composite index with only columns of the same data type family
- One of the following index types can be used to achieve this
 - Primary key index
 - Unique index with one or more NOT NULL columns



The columns of the index must be part of the comparison.

15 INDEX REQUIREMENTS 2/2

- Use parameters INDEX_SCHEMA_NAME and INDEX_NAME to select a specific index
 - Uniqueness is not checked
- If no index can be found or is not suitable, ORA-23676 is raised

ORA-23676: no eligible index on local table "SOURCE_USER"."EMPLOYEES"

16 SCAN MODES

- Tables can be scanned completely or partially
- Four different scan modes can be used
 - Parameter `scan_mode` in `DBMS_COMPARISON.CREATE_COMPARISON`

FULL (CMP_SCAN_MODE_FULL) (default)

- Full database objects comparison

RANDOM (CMP_SCAN_MODE_RANDOM)

- A random portion of data is compared

CYCLIC (CMP_SCAN_MODE_CYCLIC)

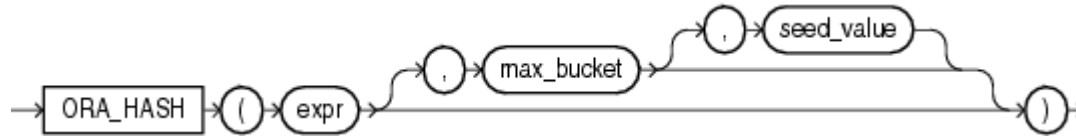
- A different portion (starting after the last run) of the object is compared

CUSTOM (CMP_SCAN_MODE_CUSTOM)

- The user can define the range of data to compare

17 ORA_HASH

- DBMS_COMPARISON uses the **ORA_HASH function** to generate a hash for each row
 - **32-bit hash algorithm** with $2^{32} - 1$ different buckets



- This function is the reason for the data type restrictions
- All compared columns are checked with **nested ORA_HASH calls**

```
ora_hash(NVL(to_char(s."EMPLOYEE_ID"), 'ORA$STREAMS$NV'), 4294967295,  
ora_hash(NVL((s."LAST_NAME"), 'ORA$STREAMS$NV'), 4294967295, 0))
```

- **Hash collisions can happen**, but with the additional check of the primary key, they are very unlikely

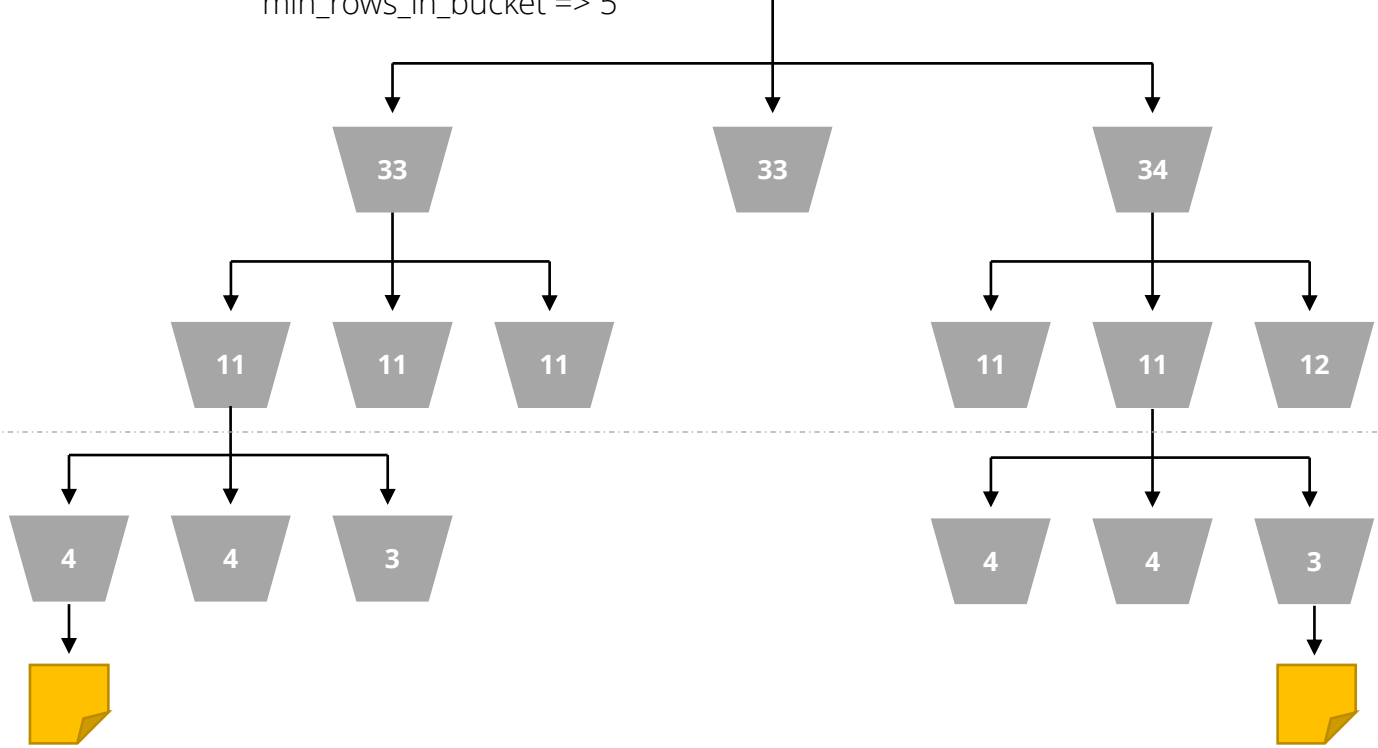


The result of an ORA_HASH call is used as seed value for the previous call.

18 SCANS & BUCKETS 1/2

Parameters
num_buckets => 3
min_rows_in_bucket => 5

EMPLOYEES 100 Rows



Minimum number of rows per bucket reached

19 SCANS & BUCKETS 2/2

- Query **DBA_COMPARISON_SCAN_SUMMARY** to get an overview of the scans

```
SQL> SELECT scan_id, parent_scan_id, status, current_dif_count, count_rows
       FROM dba_comparison_scan_summary
       WHERE comparison_name = 'MY_COMPARISON'
       ORDER BY last_update_time;
```

SCAN_ID	PARENT_SCAN_ID	STATUS	CURRENT_DIF_COUNT	COUNT_ROWS
61		BUCKET DIF	3	100
62	61	BUCKET DIF	1	33
64	62	BUCKET DIF	1	11
65	64	ROW DIF	1	4
63	61	BUCKET DIF	2	34
66	63	BUCKET DIF	2	11
67	66	ROW DIF	2	3

Root scan



Only scans with differences are visible.

20 FLASHBACK QUERY

- To compare historical data, **Flashback Query** can be used
- Create a view with the desired point-in-time in the past (AS OF TIMESTAMP) or a SCN (AS OF SCN)

```
SQL> CREATE VIEW EMPLOYEES_60 AS  
      SELECT * FROM EMPLOYEES AS OF TIMESTAMP 'SYSTIMESTAMP-60/1440';
```

- If a SCN is used between two different databases, ensure that the SCNs are representing the same point-in-time
 - Use function SCN_TO_TIMESTAMP to validate



Increase value of parameter `undo_retention` (default: 900 seconds) to avoid ORA-01555 errors.

EXECUTION

22 CREATE COMPARISON

- Define a comparison template

```
SQL> BEGIN
  DBMS_COMPARISON.CREATE_COMPARISON (
    comparison_name => 'MY_COMPARISON',
    schema_name => 'SOURCE_USER',
    object_name => 'EMPLOYEES',
    dblink_name => NULL,
    remote_schema_name => 'TARGET_USER',
    remote_object_name => 'EMPLOYEES',
    column_list => ,employee_id, last_name',
    scan_mode => DBMS_COMPARISON.CMP_SCAN_MODE_FULL,
    max_num_buckets => 3,
    min_rows_in_bucket => 100
  );
END;
/
```

NULL for a local comparison

23 COMPARE 1/2

- Compare the data of the source and target object

```
SQL> DECLARE
  v_scan_info    DBMS_COMPARISON.COMPARISON_TYPE;
  v_result       BOOLEAN;
BEGIN
  v_result := DBMS_COMPARISON.COMPARE (
    comparison_name => 'MY_COMPARISON',
    scan_info => v_scan_info,
    min_value => NULL, max_value => NULL,
    perform_row_dif => TRUE
  );

  IF v_result THEN
    DBMS_OUTPUT.PUT_LINE('Both tables are in sync');
  ELSE
    DBMS_OUTPUT.PUT_LINE('Differences found in scan with ID ' || v_scan_info.SCAN_ID);
  END IF;
END;
/
```

Define range
for custom scan
mode

If set to TRUE, each
row is compared
individually

24 COMPARE 2/2

- Query the comparison results to get the differences

```
SQL> SELECT scan_id, parent_scan_id, status, current_dif_count, count_rows
        FROM dba_comparison_scan_summary
        WHERE comparison_name = 'MY_COMPARISON'
        ORDER BY last_update_time;
```

SCAN_ID	PARENT_SCAN_ID	STATUS	CURRENT_DIF_COUNT	COUNT_ROWS
12		BUCKET DIF	2	107
13	12	ROW DIF	1	36
14	12	ROW DIF	1	35

```
SQL> SELECT scan_id, index_value, local_rowid, remote_rowid, status
        FROM dba_comparison_row_dif
        WHERE comparison_name = 'MY_COMPARISON';
```

SCAN_ID	INDEX_VALU	LOCAL_ROWID	REMOTE_ROWID	STA
13	100	AAATFUAAALAAAjXLAAA	AAATFVAALAAAjXTAAA	DIF
14	156	AAATFUAAALAAAjXLAA4	AAATFVAALAAAjXTAA4	DIF

25 CONVERGE

- If wished, synchronize data between source and target object

```
SQL> DECLARE
  v_scan_info      DBMS_COMPARISON.COMPARISON_TYPE;
BEGIN
  DBMS_COMPARISON.CONVERGE (
    comparison_name => 'MY_COMPARISON',
    scan_id => 12,
    scan_info => v_scan_info,
    converge_options => DBMS_COMPARISON.CMP_CONVERGE_LOCAL_WINS,
    perform_commit => TRUE
  );

  DBMS_OUTPUT.PUT_LINE('Rows merged (local)..: ' || v_scan_info.LOC_ROWS_MERGED);
  DBMS_OUTPUT.PUT_LINE('Rows merged (remote)..: ' || v_scan_info.RMT_ROWS_MERGED);
  DBMS_OUTPUT.PUT_LINE('Rows deleted (local)..: ' || v_scan_info.LOC_ROWS_DELETED);
  DBMS_OUTPUT.PUT_LINE('Rows deleted (remote): ' || v_scan_info.RMT_ROWS_DELETED);
END;
/
```

Decide which
object wins.

If set to TRUE, a
commit is performed

26 RECHECK 1/2

- Use the RECHECK function to recheck differences in a specific scan
 - Or continue a partial scan

```
SQL> DECLARE
  v_result          BOOLEAN;
BEGIN
  v_result := DBMS_COMPARISON.RECHECK (
    comparison_name => 'MY_COMPARISON',
    scan_id => 12,
    perform_row_dif => TRUE
  );

  IF v_result THEN
    DBMS_OUTPUT.PUT_LINE('Both tables are in sync');
  ELSE
    DBMS_OUTPUT.PUT_LINE('Differences found');
  END IF;
END;
/
```

If set to TRUE, each row is compared individually

27 RECHECK 2/2

- Query the comparison results again – all differences are fixed

```
SQL> SELECT scan_id, parent_scan_id, status, current_dif_count, count_rows
       FROM dba_comparison_scan_summary
       WHERE comparison_name = 'MY_COMPARISON'
       ORDER BY last_update_time;
```

SCAN_ID	PARENT_SCAN_ID	STATUS	CURRENT_DIF_COUNT	COUNT_ROWS
13	12	SUC	0	36
14	12	SUC	0	35
12		SUC	0	107

```
SQL> SELECT scan_id, index_value, local_rowid, remote_rowid, status
       FROM dba_comparison_row_dif
       WHERE comparison_name = 'MY_COMPARISON';
```

SCAN_ID	INDEX_VALU	LOCAL_ROWID	REMOTE_ROWID	STA
13	100	AAATfUAALAAAjxLAAA	AAATfVAALAAAjxTAAA	SUC
14	156	AAATfUAALAAAjxLAA4	AAATfVAALAAAjxTAA4	SUC

28 CLEANUP

- To keep the comparison template for future scans, purge the results

```
SQL> BEGIN
  DBMS_COMPARISON.PURGE_COMPARISON (
    comparison_name => 'MY_COMPARISON',
    scan_id => NULL
  );
END;
/
```

Optional a specific scan can be purged.

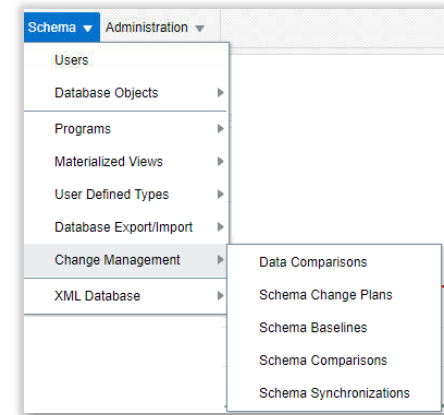
- If a comparison template is not required anymore, it can be dropped

```
SQL> BEGIN
  DBMS_COMPARISON.DROP_COMPARISON (
    comparison_name => 'MY_COMPARISON'
  );
END;
/
```

ENTERPRISE MANAGER INTEGRATION

30 GENERAL

- Enterprise Manager Cloud Control supports **data and schema comparisons**
- The data comparison feature is based on DBMS_COMPARISON
- To use all the available features the **Oracle Database Lifecycle Management Pack (DBLM)** is required
- Views are always created internally to support additional features like Flashback Query or comparison of LOB columns
- Navigate to the database target and open the navigation: **Schema > Change Management > Data Comparisons**



There is no support to converge the data after the comparison.

31 REQUIREMENTS

- Depending on the used functionalities, special privileges are required
- To allow the comparison of LOB columns, DBMS_CRYPTO is internally used

```
SQL> GRANT EXECUTE ON DBMS_CRYPTO TO <User>;
```

- Grant FLASHBACK ANY TABLE to the user that is used for the comparison to support Flashback Query

```
SQL> GRANT FLASHBACK ANY TABLE TO <User>;
```



Revoke especially the ANY privileges after the comparison is complete.

32 CREATE COMPARISON

The image shows two overlapping screenshots from Oracle Enterprise Manager Cloud Control 13c. The background screenshot displays the 'Data Comparisons' page with a 'Create...' button highlighted by a purple box. A purple arrow points from this button to the foreground screenshot, which is the 'Create Data Comparison' dialog box. In the dialog box, the 'Name' field contains 'MY_COMPARISON'. The 'Reference Database' and 'Candidate Database' fields both contain 'CDB1_qn_fra_PDB1'. The 'OK' button at the bottom left of the dialog is also highlighted with a purple box.

ORACLE Enterprise Manager Cloud Control 13c

Data Comparisons

A data comparison operation compares data in a set of database objects in a candidate database with those in a reference database. You can create a comparison specifying which objects are to be compared and submit a job to compare them immediately or at a later time. Use the link in the Job Status column to check the status of the data comparison job. On job completion, select the data comparison and view results. The results will be purged when you delete the comparison.

Page Refreshed Feb 14, 2023 2:39:08 PM CET

Actions **Create...** Edit Specification... Submit Comparison Job... View Results Delete...

Name

No data to display.

ORACLE Enterprise Manager Cloud Control 13c

Create Data Comparison

* Name MY_COMPARISON

Description

To compare objects residing in two databases, select one database as the reference and the other as candidate. The reference database will also execute the comparison program and store its results. To compare objects residing in the same database, select that database as both the reference and the candidate.

* Reference Database CDB1_qn_fra_PDB1
Must be version 11g or later.

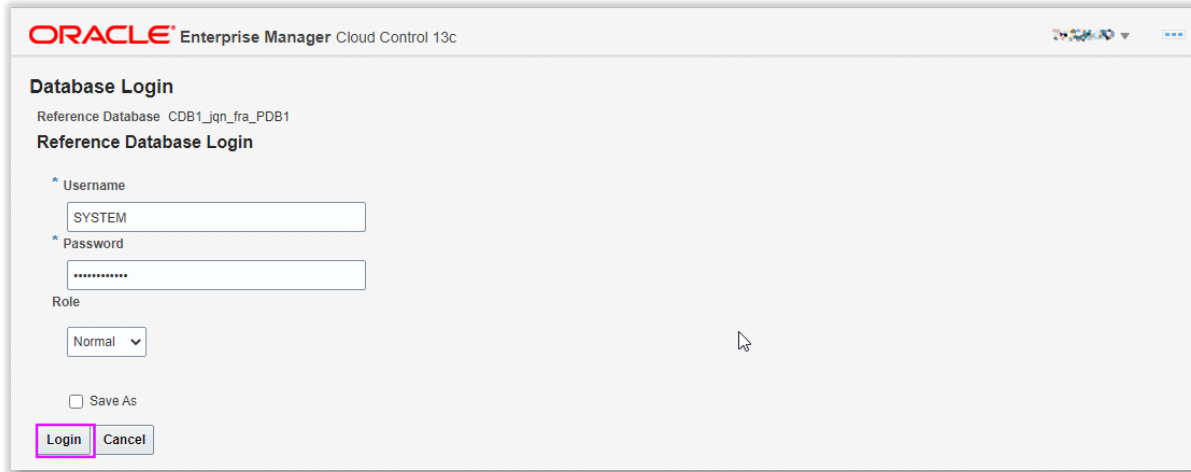
* Candidate Database CDB1_qn_fra_PDB1
Must be version 10g or later.

OK Cancel



To perform a local comparison, set reference and candidate database to the same target.

33 LOGIN TO REFERENCE DATABASE



The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The title bar reads "ORACLE Enterprise Manager Cloud Control 13c". The main content area is titled "Database Login" and shows "Reference Database CDB1_jqn_fra_PDB1". Below this, there is a section for "Reference Database Login" with the following fields:

- * Username: A text input field containing "SYSTEM".
- * Password: A password input field with masked characters "*****".
- Role: A dropdown menu currently set to "Normal".
- Save As: An unchecked checkbox.
- Buttons: "Login" and "Cancel" buttons at the bottom left.



If the user is not the owner of the table(s), ensure that the user has the required privileges.

34 ADD COMPARISON ITEMS

ORACLE Enterprise Manager Cloud Control 13c

Data Comparison Specification: MY_COMPARISON

Reference Database CDB1_jqn_fra_PDB1 Candidate Database CDB1_jqn_fra_PDB1
Logged in As SYSTEM Logged in As SYSTEM

Comparison Items

Specify which database objects you want to compare.

Actions Edit... Remove

Reference Schema	Reference Object	Candidate Schema	Candidate Object	Included Columns
No data to display.				

ORACLE Enterprise Manager Cloud Control 13c

Data Comparison Item: MY_COMPARISON

Reference Database CDB1_jqn_fra_PDB1 Candidate Database CDB1_jqn_fra_PDB1

OK Cancel

* Reference Object "APP_USER"."USER_DATA"

* Candidate Object "REPL_USER"."USER_DATA" **Use Default**

By default, the candidate object's name is same as that of reference. Its schema is derived from schema map if specified. Otherwise, its schema is same as that of reference. You may override this default and enter an explicit value for the candidate object, in which case, schema mapping will be ignored for this item.

Columns to Include Add... Remove

Column Name
USER_ID
ROLE
NAME
LAST_NAME
COMMENTS

If you do not specify any columns to include, all the columns present at the time of comparison job execution will be included automatically.

Comparison Index

You may optionally specify a comparison index. Index columns determine how rows get compared and categorized in the results as reference only, candidate only and non-identical rows. So the index columns must uniquely identify every row involved in the comparison. See help for more information.

Where Condition

Example: hire_date < SYSDATE - 7 and phone_number like '603%'

Hide More Options

A bucket is a range of rows in a database object being compared. Performance of comparison is often improved by splitting the database object into ranges and comparing the ranges independently.

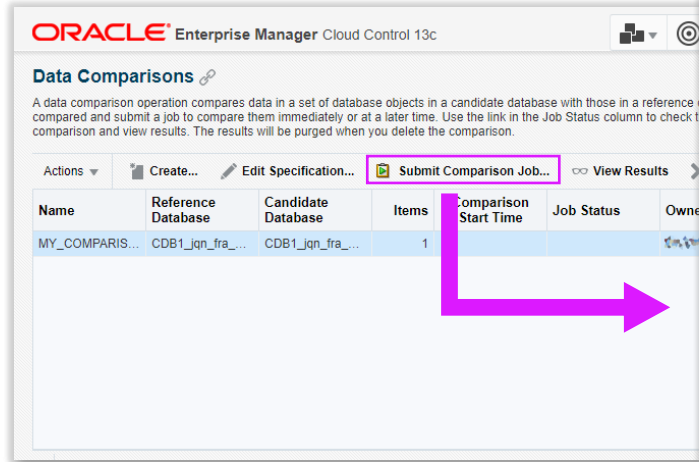
Bucket Limits Maximum Number of Buckets to Use
Minimum Number of Rows in a Bucket

Flashback Query Compare current data
 Compare data as of specified timestamp
Timestamp
 Compare data as of specified System Change Number (SCN)
Reference Database SCN
Candidate Database SCN



Override the name of the candidate object to change the schema.

35 START COMPARISON



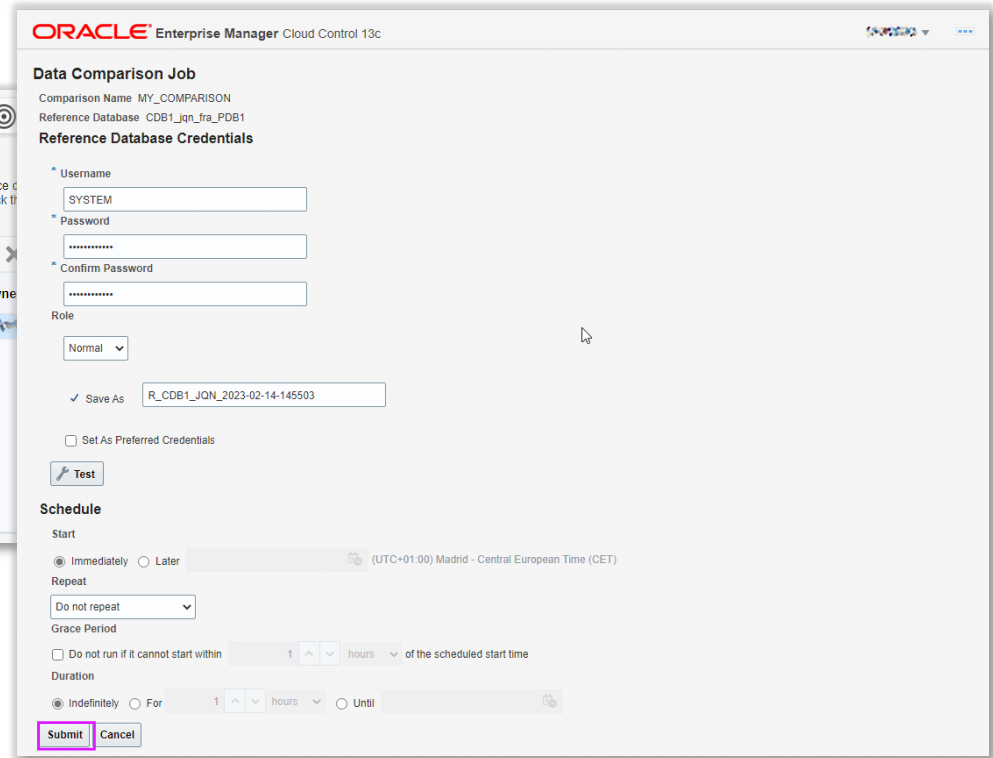
ORACLE Enterprise Manager Cloud Control 13c

Data Comparisons

A data comparison operation compares data in a set of database objects in a candidate database with those in a reference database. The comparison is performed and a job is submitted to compare them immediately or at a later time. Use the link in the Job Status column to check the job status, cancel the comparison, or view results. The results will be purged when you delete the comparison.

Actions ▼ + Create... ✎ Edit Specification... 📄 **Submit Comparison Job...** 🔍 View Results ✕

Name	Reference Database	Candidate Database	Items	Comparison Start Time	Job Status	Owner
MY_COMPARIS...	CDB1_jqn_fra...	CDB1_jqn_fra...	1			



ORACLE Enterprise Manager Cloud Control 13c

Data Comparison Job

Comparison Name MY_COMPARISON
Reference Database CDB1_jqn_fra_PDB1

Reference Database Credentials

* Username
SYSTEM

* Password

* Confirm Password

Role
Normal

Save As R_CDB1_IQN_2023-02-14-145503

Set As Preferred Credentials

🔧 Test

Schedule

Start
 Immediately Later (UTC+01:00) Madrid - Central European Time (CET)

Repeat
Do not repeat

Grace Period
 Do not run if it cannot start within 1 hours of the scheduled start time

Duration
 Indefinitely For 1 hours Until

Submit Cancel



If required a repeat interval for this comparison can be defined.

36 CHECK JOB STATUS 1/2

ORACLE Enterprise Manager Cloud Control 13c

Data Comparisons

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A data comparison operation compares data in a set of database objects in a candidate database with those in a reference database. You can create a comparison specifying which objects are to be compared and submit a job to compare them immediately or at a later time. Use the link in the Job Status column to check the status of the data comparison job. On job completion, select the data comparison and view results. The results will be purged when you delete the comparison.

Actions ▾ Create... Edit Specification... Submit Comparison Job... View Results

Name	Reference Database	Candidate Database	Items	Comparison Start Time	Job Status
MY_COMPARIS...	CDB1_jqn_fra...	CDB1_jqn_fra...	1	Feb 14, 2023 2:...	Completed with Errors

ORACLE Enterprise Manager Cloud Control 13c

Job

Job Activity > Job Run: DATA_COMPARISON_MY_COMPARISON_21 > Execution: CDB1_jqn_fra_PDB1
Execution: CDB1_jqn_fra_PDB1

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Switch to Advanced View [Delete Run](#) [Edit](#) [View Definition](#)

Summary

[Log Report](#)

Status: Succeeded
Scheduled: Feb 14, 2023 2:57:25 PM GMT+01:00
Started: Feb 14, 2023 2:57:27 PM GMT+01:00
Ended: Feb 14, 2023 2:57:31 PM GMT+01:00
Elapsed Time: 4 seconds

Type: Data Comparison
Owner:
Description: Data Comparison
Execution ID: F449AB77CD473B10E053AA19210A7628
Candidate Database Credentials: R_CDB1_QQN_2023-02-14-145503 (SYSTEM/*****)
Reference Database Credentials: R_CDB1_QQN_2023-02-14-145503 (SYSTEM/*****)

Targets:
Status: All
[Go](#)

[Expand All](#) [Collapse All](#)

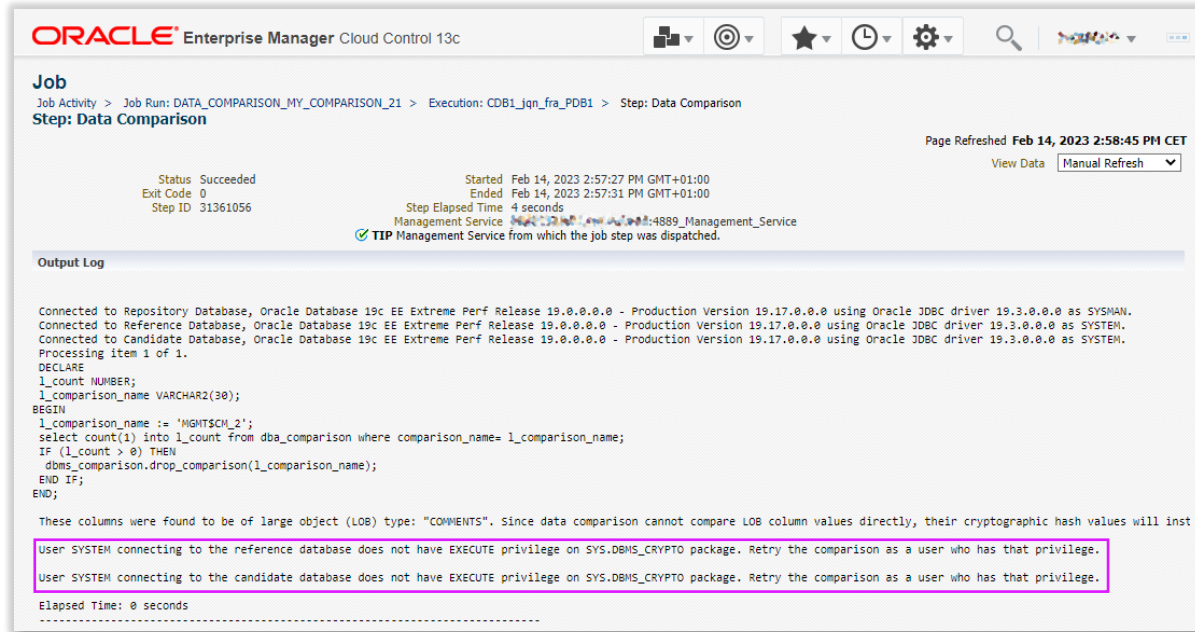
Name	Targets	Status	Started	Ended	Elapsed Time
Execution: CDB1_jqn_fra_PDB1	CDB1_jqn_fra_PDB1	Succeeded	Feb 14, 2023 2:57:27 PM GMT+01:00	Feb 14, 2023 2:57:31 PM GMT+01:00	4 seconds
Step: Data Comparison		Succeeded	Feb 14, 2023 2:57:27 PM GMT+01:00	Feb 14, 2023 2:57:31 PM GMT+01:00	4 seconds

Switch to Advanced View [Delete Run](#) [Edit](#) [View Definition](#)



To see the history of executed jobs navigate to **Enterprise > Job > Activity** and filter for job type Comparison.

37 CHECK JOB STATUS 2/2



ORACLE Enterprise Manager Cloud Control 13c

Job
Job Activity > Job Run: DATA_COMPARISON_MY_COMPARISON_21 > Execution: CDB1_qn_fra_PDB1 > Step: Data Comparison
Step: Data Comparison

Page Refreshed **Feb 14, 2023 2:58:45 PM CET**
View Data Manual Refresh

Status Succeeded
Exit Code 0
Step ID 31361056

Started Feb 14, 2023 2:57:27 PM GMT+01:00
Ended Feb 14, 2023 2:57:31 PM GMT+01:00
Step Elapsed Time 4 seconds
Management Service :4889_Management_Service
✔ TIP Management Service from which the job step was dispatched.

Output Log

```
Connected to Repository Database, Oracle Database 19c EE Extreme Perf Release 19.0.0.0.0 - Production Version 19.17.0.0.0 using Oracle JDBC driver 19.3.0.0.0 as SYSMAN.  
Connected to Reference Database, Oracle Database 19c EE Extreme Perf Release 19.0.0.0.0 - Production Version 19.17.0.0.0 using Oracle JDBC driver 19.3.0.0.0 as SYSTEM.  
Connected to Candidate Database, Oracle Database 19c EE Extreme Perf Release 19.0.0.0.0 - Production Version 19.17.0.0.0 using Oracle JDBC driver 19.3.0.0.0 as SYSTEM.  
Processing item 1 of 1.  
DECLARE  
  l_count NUMBER;  
  l_comparison_name VARCHAR2(30);  
BEGIN  
  l_comparison_name := 'MGHTSCH2';  
  select count(1) into l_count from dba_comparison where comparison_name= l_comparison_name;  
  IF (l_count > 0) THEN  
    dbms_comparison.drop_comparison(l_comparison_name);  
  END IF;  
END;
```

These columns were found to be of large object (LOB) type: "COMMENTS". Since data comparison cannot compare LOB column values directly, their cryptographic hash values will inst

User SYSTEM connecting to the reference database does not have EXECUTE privilege on SYS.DBMS_CRYPTO package. Retry the comparison as a user who has that privilege.

User SYSTEM connecting to the candidate database does not have EXECUTE privilege on SYS.DBMS_CRYPTO package. Retry the comparison as a user who has that privilege.

Elapsed Time: 0 seconds
.....



The output log provides useful information about the executed commands and error messages.

38 VIEW RESULTS

The screenshot displays the Oracle Enterprise Manager Cloud Control 13c interface. The top panel shows the 'Data Comparisons' section with a table of comparison jobs. A pink box highlights the 'View Results' button, with a pink arrow pointing to the 'Data Comparison Results: MY_COMPARISON' window.

Data Comparisons Table:

Name	Reference Database	Candidate Database	Items	Comparison Start Time	Job Status
MY_COMPARIS...	CDB1_jqn_fra_...	CDB1_jqn_fra_...	1	Feb 14, 2023 2:...	Completed with Errors

Data Comparison Results: MY_COMPARISON

Reference Database: CDB1_jqn_fra_PDB1 | Candidate Database: CDB1_jqn_fra_PDB1

View: View Row Differences | Export To Excel

Reference Schema	Reference Object	Candidate Schema	Candidate Object	Result	Reference Only Rows	Candidate Only Rows	Non-identical Rows
APP_USER	USER_DATA	REPL_USER	USER_DATA		1	1	0

Columns Hidden: 1

Messages: Executed Statements

Severity	Message
	These columns were found to be of large object (LOB) type: "COMMENTS". Since data comparison cannot compare LOB column values directly, their cryptographic hash val...



Use the Execute Statements tab to see all created views and executed commands.

39 VIEW ROW DIFFERENCES

The image shows two overlapping screenshots from Oracle Enterprise Manager Cloud Control 13c. The background screenshot displays 'Data Comparison Results: MY_COMPARISON' with a 'View' dropdown menu where 'View Row Differences' is highlighted with a pink box. A pink arrow points from this box to the foreground screenshot. The foreground screenshot shows 'Row Data Differences: MY_COMPARISON' with a table of differences between a reference and candidate database.

Data Comparison Results: MY_COMPARISON
Reference Database: CDB1_jqn_fra_PDB1 | Candidate Database: CDB1_jqn_fra_PDB1

Row Data Differences: MY_COMPARISON
Reference Database: CDB1_jqn_fra_PDB1 | Candidate Database: CDB1_jqn_fra_PDB1
Reference Object: "APP_USER"."USER_DATA" | Candidate Object: "REPL_USER"."USER_DATA"

Row Source	USER_ID	NAME	LAST_NAME	ROLE	COMMENTS
Reference	1	Christian	Gohmann	Data Eng. Associate Manager	E90616D5C7111303D7EAF34842FBE30C
Candidate	1	Christian	Gohmann	Principal Consultant	E90616D5C7111303D7EAF34842FBE30C



Row differences can be exported as Excel file.

FURTHER INFORMATION

41 LINKS

- **Oracle Database PL/SQL Packages and Types Reference 21c**

https://docs.oracle.com/en/database/oracle/oracle-database/21/arpls/DBMS_COMPARISON.html#GUID-4876F3C2-B410-49DF-8823-38963163D899

- **Oracle Replication Administrator's Guide 18c**

<https://docs.oracle.com/en/database/oracle/oracle-database/18/strep/comparing-and-converging-data.html#GUID-A6644AD9-8EB7-4528-9E53-A6CF0616A5E9>

- **My Oracle Support**

<https://support.oracle.com>

42 QUESTIONS AND ANSWERS



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