

ORACLE Database 23^{ai}

PART-1

THE FUTURE

Solution and Innovation

Oracle Database 23ai brings AI algorithms to where the data resides, rather than having to move it to where the AI algorithm is.



www.oracle.com



<https://whizdba.wordpress.com>

ORACLE Database 23^{ai}

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Oracle Database 23ai represents the next long-term support release of Oracle Database, with a significant focus on AI, developer productivity, and mission-critical reliability.



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‘ai’ stands for Artificial Intelligence

It includes over 300 new features with a focus on artificial intelligence (AI). Hence the name.



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It is available to try for FREE:

1. On Oracle Cloud Infrastructure (OCI) as Autonomous Database
2. As Autonomous Database Container Image
3. As Oracle Database 23ai in Virtual Box VM.

<https://www.oracle.com/au/database/free/>



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This demo is prepared using Autonomous Transaction Database 23ai over Cloud.

The screenshot shows the Oracle Cloud interface for an Autonomous Database. The top navigation bar includes the Oracle Cloud logo, a search bar, and location information (India West (Mumbai)). Below the header, the page title is "Overview > Autonomous Database > Autonomous Database details". On the left, there's a large green box with the letters "ATP" in white. To its right, the word "AVAILABLE" is displayed with an info icon. The main content area is divided into sections: "Autonomous Database information", "Tool configuration", and "Tags". Under "Autonomous Database information", key details are listed: Database name (redacted), Workload type (Transaction Processing), Compartment (redacted) (root), OCID (...ydg2eq), Created (Sat, Jun 29, 2024, 12:08:21 UTC), License type (License included), Database version (23ai), Lifecycle state (Available), Instance type (Free), and Character set (AL32UTF8). The "Database version" field is highlighted with a red box. The "Tool configuration" section contains tabs for "General information" (selected) and "Disaster recovery". The "General information" tab shows the same details as the main summary. The "Disaster recovery" tab lists Role (-), Local (Not enabled), and Cross-region (Not enabled). The "Backup" section includes fields for Automatic backup retention period (60 days), Total backup storage (-), Last automatic backup (No active backups exist for this database), and Next long-term backup (-). A small icon of a life preserver is visible on the right side of the "Backup" section.



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The ATP database on OCI is connected from VSCode using SQL Developer extension.

This done using Wallet downloaded from the OCI and new db user created for this demo

```
1 select banner_full from v$version;
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS QUERY RESULT SCRIPT OUTPUT

BANNER_FULL

Oracle Database 23ai Enterprise Edition Release 23.0.0.0.0 - Production
Version 23.5.0.24.06

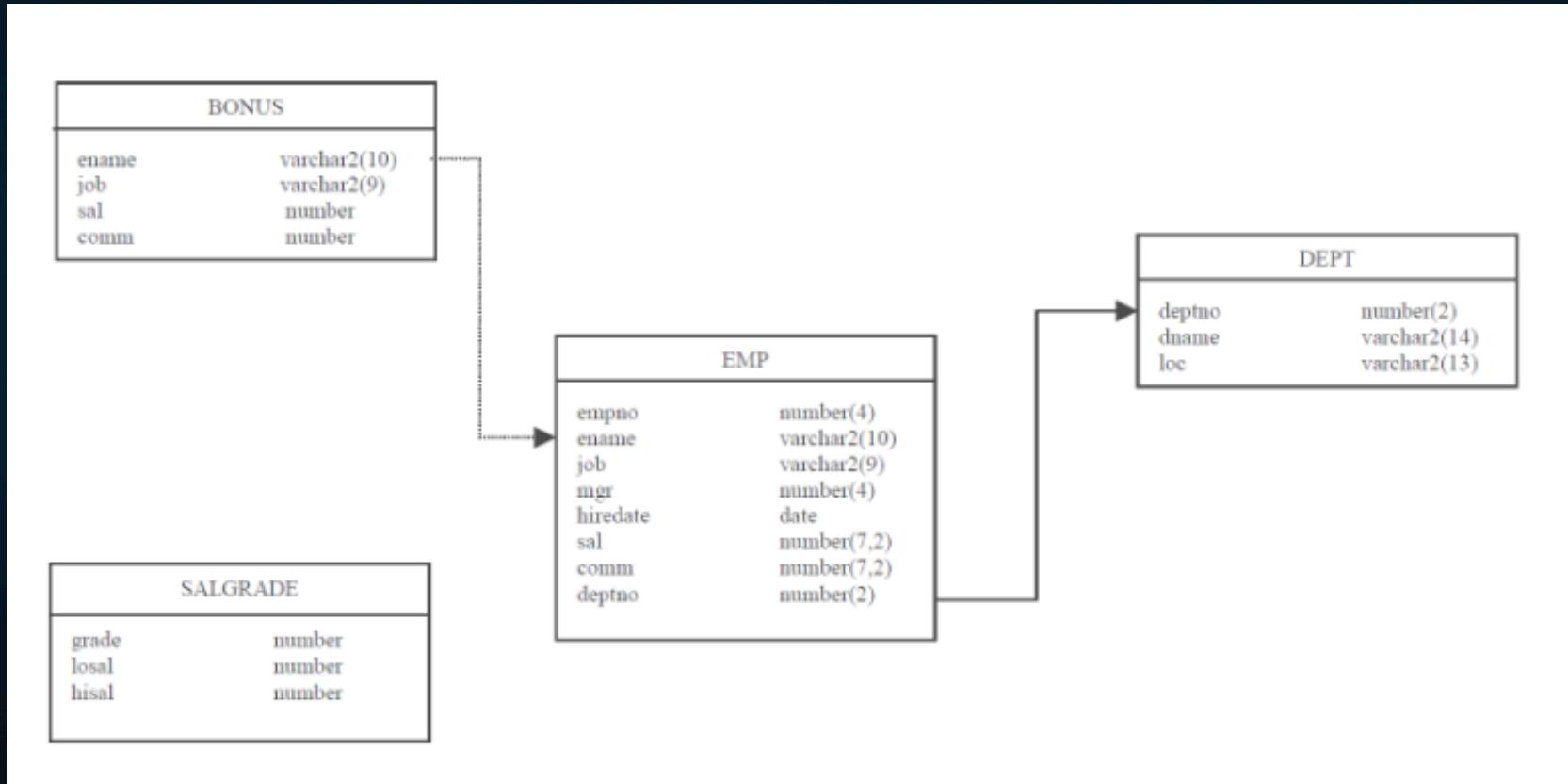


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Tables used for demo purpose



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Tables used for demo purpose

DEPT

```
SQL> --All Departments  
SQL> SELECT * FROM DEPT;
```

DEPTNO	DNAME	LOC
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON



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Tables used for demo purpose

EMP

```
SQL> SELECT * FROM EMP;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	SMITH	CLERK	7902	17/12/80	800		20
7499	ALLEN	SALESMAN	7698	20/02/81	1600	300	30
7521	WARD	SALESMAN	7698	22/02/81	1250	500	30
7566	JONES	MANAGER	7839	02/04/81	2975		20
7654	MARTIN	SALESMAN	7698	28/09/81	1250	1400	30
7698	BLAKE	MANAGER	7839	01/05/81	2850		30
7782	CLARK	MANAGER	7839	09/06/81	2450		10
7788	SCOTT	ANALYST	7566	09/12/82	3000		20
7839	KING	PRESIDENT		17/11/81	5000		10
7844	TURNER	SALESMAN	7698	08/09/81	1500	0	30
7876	ADAMS	CLERK	7788	12/01/83	1100		20
7900	JAMES	CLERK	7698	03/12/81	950		30
7902	FORD	ANALYST	7566	03/12/81	3000		20
7934	MILLER	CLERK	7782	23/01/82	1300		10

14 rows selected.



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Lets see some of the cool features in this release



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SELECT Without FROM Clause

```
1  SELECT SYSDATE,USER;
2  SELECT SQRT(529);
```

PROBLEMS

OUTPUT

DEBUG CONSOLE

TERMINAL

PORTS

QUERY RESULT

SCRIPT OUTPUT

SQL HISTORY

SYSDATE USER

29/06/24 VMAHAWAR

SQRT (529)

23



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GROUP BY Column Alias or Position

Until now you when you tried to use GROUP BY on a expression column.

You might have noticed repetition of the logic in group by clause. Especially date columns.



GROUP BY Column Alias or Position

For example:

To fetch the Month in which max number of employees were hired from emp table.



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(Prior to 23ai)

```
SELECT to_char(hiredate, 'MM') HIRE_MONTH  
      ,count(empno) EMP_COUNT  
  FROM emp  
GROUP BY to_char(hiredate, 'MM')  
ORDER BY EMP_COUNT DESC  
OFFSET 0 ROWS  
FETCH NEXT 1 ROWS ONLY;
```

MS OUTPUT DEBUG CONSOLE TERMINAL PORTS QUERY RESULT SCRIPT OUTPUT SQL HISTORY

:fetched: 1 in 0.394 seconds

HIRE_MONTH	EMP_COUNT
12	4



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(In 23ai)

GROUP BY Column Alias or Position

```
SELECT to_char(hiredate, 'MM') HIRE_MONTH
      ,count(empno) EMP_COUNT
   FROM emp
  GROUP BY HIRE_MONTH
 ORDER BY EMP_COUNT DESC
OFFSET 0 ROWS
FETCH NEXT 1 ROWS ONLY;
```

MS OUTPUT DEBUG CONSOLE TERMINAL PORTS QUERY RESULT SCRIPT OUTPUT SQL HISTORY

1 row fetched: 1 in 0.648 seconds

HIRE_MONTH	EMP_COUNT
12	4



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SQL BOOLEAN or BOOL Data Type

Now you can create column in table with BOOLEAN datatype

```
...
1  CREATE TABLE bool_example
2  (id NUMBER
3  ,c1 BOOLEAN
4  ,c2 BOOL);
5
```

PROBLEMS

OUTPUT

DEBUG CONSOLE

TERMINAL

PO

Table BOOL_EXAMPLE created.



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Below are the values you can pass to Boolean column

Table 2-6 String Literals To Represent "TRUE" and "FALSE"

STATE	TRUE	FALSE
-	'true'	'false'
-	'yes'	'no'
-	'on'	'off'
-	'1'	'0'
-	't'	'f'
-	'y'	'n'



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USING BOOL columns in WHERE Clause

```
SQL> SELECT * from bool_example;
```

ID	C1	C2
1	1	
2	0	1
3	0	0
4	0	1
5	0	1
6	0	1
7	1	0
8	1	1

8 rows selected.

```
SQL> SELECT * FROM bool_example WHERE NOT c2;
```

ID	C1	C2
3	0	0
7	1	0



<https://whizdba.wordpress.com>

USING BOOL columns in WHERE Clause

```
SQL> SELECT * FROM bool_example WHERE c1 AND c2;
```

ID	C1	C2
8	1	1

1 row selected.

```
SQL> SELECT * FROM bool_example WHERE c1 AND TRUE;
```

ID	C1	C2
1	1	
7	1	0
8	1	1

3 rows selected.



MULTIPLE Records in VALUES

VALUES clause can have multiple records
8 rows gets inserted in bool_example table

```
...  
1  INSERT INTO bool_example  
2  VALUES  
3  (1, TRUE, NULL), (2, FALSE, true),(3, 0, 'off'),(4, 'no', 'yes'),  
4  (5, 'f', 't' ),(6, false, true),(7, 'on', 'off'),(8, -3.14, 1);  
5
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS QUERY RESULT SCRIPT OUTPUT

8 rows inserted.



<https://whizdba.wordpress.com>

Direct Joins for UPDATE and DELETE Statements

23ai allows joins to table in FROM clause similar to
SELECT clause



Direct Joins for UPDATE and DELETE Statements (Prior to 23ai)

If you had to update salary of all employees in
RESEARCH department by 10%



Direct Joins for UPDATE and DELETE Statements (Prior to 23ai)

If you had to update salary of all employees in RESEARCH department by 10%

```
SQL>
SQL> --Lets update salary of all employees in RESEARCH department by 10%
SQL> UPDATE EMP
      2      SET SAL = SAL * 1.1
      3  WHERE DEPTNO IN (SELECT DEPTNO FROM DEPT WHERE DNAME='RESEARCH');

5 rows updated.
```



Direct Joins for UPDATE and DELETE Statements (In 23ai)

```
SQL> --Lets update salary of all employees in RESEARCH department by 10%
```

```
SQL> UPDATE EMP  
2      SET SAL = SAL * 1.1  
3      FROM DEPT  
4      WHERE EMP.DEPTNO = DEPT.DEPTNO  
5      AND DEPT.DNAME = 'RESEARCH';
```

```
5 rows updated.
```



Unicode 15.0 Support

Unicode 15.0 adds 4,489 characters, for a total of 149,186 characters.

These additions include:

2 new scripts, for a total of 161 scripts,

along with 20 new emoji characters, and

4,193 CJK (Chinese, Japanese, and Korean) ideographs.

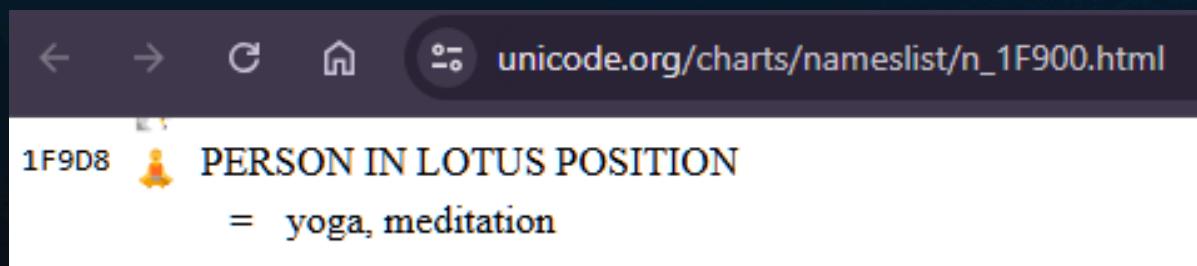
https://www.unicode.org/charts/nameslist/n_1F900.html



<https://whizdba.wordpress.com>

Unicode 15.0 Support

Example to Emoji for Yoga and Meditation
from Unicode 15.0 in Oracle SQL



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Unicode 15.0 Support

```
-- "PERSON IN LOTUS POSITION" has unicode point - 1F9D8"
SELECT '🧘' AS "Yoga-Emoji"
      ,ASCII('🧘 ') "ASCII_for_Yoga"
      ,CHR(4036994968) AS "Yoga_Emoji_using_ASCII"
FROM dual;
```

EMS 2 OUTPUT DEBUG CONSOLE TERMINAL PORTS QUERY RESULT SCRIPT OUTPUT SQL HISTORY

ws fetched: 1 in 0.209 seconds

Yoga-Emoji	ASCII_for_Yoga	Yoga_Emoji_using_ASCII
🧘	4036994968	🧘

<https://decodeunicode.org/en/u+1F9D8>



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DB_DEVELOPER_ROLE

In 23ai a new role allows administrators to quickly assign developers only the privileges they need to design, build, and deploy applications for the Oracle Database.

This is done by below:

```
GRANT DB_DEVELOPER_ROLE TO <USER_NAME>;
```



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DB_DEVELOPER_ROLE

```
SQL> select grantee,granted_role from dba_role_privs  
2 where grantee = 'VMAHAWAR';
```

GRANTEE	GRANTED_ROLE
VMAHAWAR	GRAPH_DEVELOPER
VMAHAWAR	DWROLE
VMAHAWAR	CONSOLE_DEVELOPER
VMAHAWAR	OML_DEVELOPER
VMAHAWAR	CONNECT
VMAHAWAR	RESOURCE

```
6 rows selected.
```

```
SQL>  
SQL> GRANT DB_DEVELOPER_ROLE TO VMAHAWAR;
```

```
Grant succeeded.
```



<https://whizdba.wordpress.com>

DB_DEVELOPER_ROLE

Below is the dba_role_privs snapshot of user after granting role

```
SQL>
SQL> select grantee,granted_role from dba_role_privs
  2 where grantee = 'VMAHAWAR';

GRANTEE      GRANTED_ROLE
-----
VMAHAWAR    GRAPH_DEVELOPER
VMAHAWAR    DWROLE
VMAHAWAR    CONSOLE_DEVELOPER
VMAHAWAR    OML_DEVELOPER
VMAHAWAR    CONNECT
VMAHAWAR    RESOURCE
VMAHAWAR    DB_DEVELOPER_ROLE

7 rows selected.
```



DB_DEVELOPER_ROLE

Now lets see what are the privs the default role -
DB_DEVELOPER_ROLE has



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```
SQL> select grantee,'ROLE' as TYPE,granted_role as NAME from dba_role_privs
  2 where grantee IN ('DB_DEVELOPER_ROLE')
  3 UNION ALL
  4 select grantee,'PRIVILEGE' as TYPE, PRIVILEGE as NAME from dba_sys_privs
  5 where grantee='DB_DEVELOPER_ROLE';
```

GRANTEE	TYPE	NAME
DB_DEVELOPER_ROLE	ROLE	CTXAPP
DB_DEVELOPER_ROLE	ROLE	RESOURCE
DB_DEVELOPER_ROLE	PRIVILEGE	CREATE DOMAIN
DB_DEVELOPER_ROLE	PRIVILEGE	CREATE MLE
DB_DEVELOPER_ROLE	PRIVILEGE	EXECUTE DYNAMIC MLE
DB_DEVELOPER_ROLE	PRIVILEGE	CREATE CUBE BUILD PROCESS
DB_DEVELOPER_ROLE	PRIVILEGE	CREATE CUBE
DB_DEVELOPER_ROLE	PRIVILEGE	CREATE CUBE DIMENSION
DB_DEVELOPER_ROLE	PRIVILEGE	CREATE MINING MODEL
DB_DEVELOPER_ROLE	PRIVILEGE	CREATE JOB
DB_DEVELOPER_ROLE	PRIVILEGE	DEBUG CONNECT SESSION
DB_DEVELOPER_ROLE	PRIVILEGE	ON COMMIT REFRESH
DB_DEVELOPER_ROLE	PRIVILEGE	CREATE DIMENSION
DB_DEVELOPER_ROLE	PRIVILEGE	FORCE TRANSACTION
DB_DEVELOPER_ROLE	PRIVILEGE	CREATE SESSION



VECTOR data type in Oracle 23ai

A vector is a $1 \times n$ or $n \times 1$ matrix.

A $1 \times n$ matrix is called a row vector

While an $n \times 1$ matrix is a column vector.



VECTOR data type in Oracle 23ai

3 Types of Vector Search

1. Search for similarity
2. Retrieval Augmented Generation (RAG)
3. Search for outlier



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VECTOR data type in Oracle 23ai

Check Vector Search Demo in Below Oracle Link

Explore Oracle 23c for Fast AI-Powered Data Search

Discover how Oracle's AI Vector Search in Database 23c revolutionizes data handling by integrating semantic search with business data, ensuring fast, precise, and secure insights.

oracle.com



<https://whizdba.wordpress.com>

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VECTOR data type in Oracle 23ai

1. Store the vector along with the data.

```
CREATE TABLE my_vectors  
  (id NUMBER,  
   embedding VECTOR);
```



<https://whizdba.wordpress.com>

VECTOR data type in Oracle 23ai

2. Insert it in database

UTL_TO_TEXT

UTL_TO_CHUNK

UTL_TO_EMBED



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VECTOR data type in Oracle 23ai

3. Get the Vector_Distance. Embed using the Model of your choice.

SELECT QUERY to call the VECTOR_DISTANCE function.



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VECTOR data type in Oracle 23ai

4. Get the input text/prompt

Convert that to vector and

perform vector search by passing the search vector to query against the Vector Database



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Github link to the scripts is

<https://github.com/vmahawar/oracle23ai>



<https://whizdba.wordpress.com>

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Thank You

Have a nice day!



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