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## Let Us Take the Advantage of **Pseudo Columns** in Oracle

### Pseudo Column:

- Pseudo Columns Behave Like a Table Column, but is Not Actually Stored in a Table.
- Upon Pseudo Columns Only SELECT Statements Can Be Implemented, But INSERT, UPDATE or DELETE Cannot be Implemented.
- The Available PSEUDO COLUMNS Are...
  - CURRVAL
  - NEXTVAL
  - LEVEL
  - ROWID
  - ROWNUM

### CURRVAL And NEXTVAL Pseudo Columns:

- These Pseudo Columns Are Applied Upon the SEQUENCE Schema Object.
- CURRVAL Returns the CURRENT Value of a Sequence.
- NEXTVAL INCREMENTS The Sequence and Returns the NEXT VALUE.
- The CURRVAL And NEXTVAL Can be Used Only in...
  - The SELECT List of a SELECT Statement.
  - The VALUES Clause of an INSERT Statement.
  - The SET Clause of an UPDATE Statement.

### Restrictions:

- The CURRVAL and NEXTVAL Cannot Be Used in...
  - A Sub Query.
  - A View's Query or SNAPSHOT's Query.
  - A SELECT With the DISTINCT Option.
  - A SELECT With a GROUP BY or ORDER BY Clause.



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- A SELECT Statements With UNION, INTERSECT, MINUS SET Operators.
- The WHERE Clause of a SELECT.
- The DEFAULT Option in CREATE TABLE or ALTER TABLE Statement.
- The Condition of a CHECK Constraint.

#### Syntax:

- `SEQUENCENAME.CURRVAL` --- > Returns the Current Value of the Sequence.
- `SEQUENCENAME.NEXTVAL` --- > Increments the Sequence Value by the Declared Specification.

#### SEQUENCE Schema Object:

- A SEQUENCE is a Schema Object That Can Generate UNIQUE Sequential Values.
- The SEQUENCE Values Are Often Used for PRIMARY KEY's and UNIQUE KEY's.
- To Refer to The CURRENT or NEXT Value of a SEQUENCE in The SCHEMA of Another User, The Following Privileges Should Be Available...
  - SELECT OBJECT PRIVILEGE
  - SELECT ANY SEQUENCE
- For SEQUENCES in Other Schema the QUALIFYING SYNTAX is
  - **SCHEMANAME.SEQUENCENAME.CURRVAL**
  - **SCHEMANAME.SEQUENCENAME.NEXTVAL**
- To Refer to The Value of a SEQUENCE on a REMOTE Database, The SEQUENCE Should Be Qualified with a Complete or Partial Name of The Database Link.
  - **SCHEMANAME.SEQUENCENAME.CURRVAL@DBLINK**
  - **SCHEMANAME.SEQUENCENAME.NEXTVAL@DBLINK**
- In a Single SELECT Statement, All Referenced Sequences, LONG Columns, Updated Tables, and Locked Tables, Must Be Located on The Same Database.
- When a SEQUENCE Is Created, We Can Define its INITI VALUE And the INCREMENT Between Its Values.
- The First References to The NEXTVAL Returns the SEQUENCES Initial Value.
- Before The CURRVAL Can Be Used for a SEQUENCE in a Session, First the SEQUENCE Should Be Incremented With NEXTVAL.



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- A SEQUENCE Can Be Incremented Only Once in a Single SQL Statement.
- A SEQUENCE Can Be Accessed by Many Users Concurrently with No WAITING, No LOCKING.
- CURRVAL and NEXTVAL Should Be Qualified with The Name of The Sequence.

### **Creating Sequences:**

#### **Purpose:**

- An Object from Which Multiple Users May Generate Unique Integers.
- CAN Be Used to Generate PRIMARY KEY Values Automatically.

#### **Syntax:**

```
CREATE SEQUENCE SequenceName
INCREMENT BY Integer
START WITH Integer
MAXVAL Integer/NOMAX VALUE
MINVAL Integer/NOMIN VALUE
CYCLE/NOCYCLE
CACHE Integer/NOCACHE
ORDER/ NOORDER;
```

- SEQUENCE Can be Either Incremented Sequence OR Decrement Sequence.

#### **INCREMENT BY Clause:**

- Specifies The Interval Between the Sequences Numbers.
- Value Can Be Positive or Negative, But Cannot Be 0.
- If The Value is Positive, it is Incremented Sequence Else it is Decrement Sequence.
- If Omitted Default to Increment By 1.

#### **MINVALUE Clause:**

- Specifies The Sequence's Minimum Value.

#### **NOMINVALUE Clause:**

- Specifies a Minimum Value of 1 For an Ascending Sequence OR -(10)26 For Descending Sequence.

#### **MAXVALUE Clause:**



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- Specifies The Maximum Value That Can Be Generated.

NOMAXVALUE Clause:

- Specifies a Maximum Value of 1027 for Ascending Sequence OR -1 For Descending Sequence.

CYCLE Clause:

- Specifies The Sequence Will Continue to Generate Values After Reaching Either Maximum or Minimum Value.

NOCYCLE Clause:

- Specifies The SEQUENCE Cannot Generate More Values After the Targeted Limit.

CACHE Clause:

- Specifies Pre-Allocation of SEQUENCE Numbers, The Minimum is 2.

NOCACHE Clause:

- Specifies Values of a SEQUENCE Are Not Pre-Allocated.

ORDER Clause:

- Guarantees The Sequence Numbers to Be Generated in The Order of Request.

NOORDER Clause:

- Does Not Guarantee the Sequence Number with Order.

Note:

- If The Above Parameters Are Not Specified by Default
  - START WITH Will Be 1.
  - INCREMENT BY Will be Positive 1.
  - SEQUENCE IS NOCYCLE
  - The CACHE Value Will Be 20.
  - SEQUENCE IS ORDER Sequence.

Illustrations:

```
SQL> CREATE TABLE Sample(Sampid NUMBER(4) CONSTRAINT Sampid_PK PRIMARY  
KEY, Sampname VARCHAR2(25), SampDate DATE);
```

**Creation of Incremental Sequence:**



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```
SQL>CREATE SEQUENCE Sampleseq01
        INCREMENT BY 1
        START WITH 0
        MINVALUE 0
        MAXVALUE 5
        NOCACHE
        NOCYCLE;
```

#### Activating And Attaching the Sequence to a Table:

```
SQL>INSERT INTO Sample01
        VALUES (SampleSeq.NEXTVAL, 'SAMPLE', SYSDATE);
```

#### Creating Sequence With CYCLE:

```
SQL>CREATE SEQUENCE Sampleseq02
        INCREMENT BY 1
        START WITH 0
        MINVALUE 0
        MAXVALUE 5
        NOCACHE
        CYCLE;
```

#### Creation of Decremental Sequence:

```
SQL>CREATE SEQUENCE Sampleseq03
        INCREMENT BY -1
        START WITH 5
        MAXVALUE 5
        MINVALUE 0
        NOCACHE
        NOCYCLE;
```

#### Modifying a Sequence:

- The ALTER Command Can Be Used to Change the Present Status of a SEQUENCE.
- The ALTER SEQUENCE Command Can Be Used to Change...
- Increment Value
- Maximum Value.
- Minimum Value.



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- Cycle Option.
- Cache Option.

Syntax:

```
SQL> ALTER SEQUENCE SequenceName
      [INCREMENT BY n]
      [{MAXVALUE n/NOMAXVALUE}]
      [{MINVALUE n/NOMINVALUE}]
      [{CYCLE/NOCYCLE}]
      [{CACHE n/NOCACHE}];
```

Illustration:

```
SQL>ALTER SEQUENCE SampleSeq
      MAXVALUE 10
      CACHE
      NOCYCLE;
```

Guidelines For Altering a Sequence:

- The ALTER Privilege Should Be Available.
- Only The Future Sequence Numbers Are Affected by The ALTER SEQUENCE Statement.
- The START WITH Option Cannot Be Changed Using ALTER SEQUENCE.
- To Change the START WITH Option, Drop the SEQUENCE And Then Recreate The SEQUENCE.
- Some Validation Performed, i.e., A NEW MAXVALUE Cannot Be Imposed That is Less Than the Current SEQUENCE Number.

Viewing the Current Value of a Sequence:

```
SQL>SELECT Sampleseq.CURRVAL FROM DUAL;
```

Dropping An Existing Sequence:

- A SEQUENCE Can Be DROPPED At Any Time.
- Once Removed , The SEQUENCE Can No Longer Be Referenced.

```
SQL> DROP SEQUENCE SampleSeq;
```



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### Confirming Sequences:

- All SEQUENCES That Have Been Created Are Documented in The Data Dictionary.
- The Data Dictionary in Which the Information of SEQUENCES Are Stored is USER\_OBJECTS.
- The Settings of The SEQUENCE Can Be Confirmed By SELECTING on USER\_SEQUENCES Catalog.

```
SQL> SELECT SEQUENCE_NAME, MIN_VALUE, MAX_VALUE, INCREMENT_BY, LAST_NUMBER  
FROM User_Sequences;
```

### LEVEL Pseudo Column:

- This Pseudo Column Return 1 For a Child of a ROOT And So on.
  - Child --- > Any Non-Root Node.
  - Root --- > Highest Node Within an Inverted Tree.
  - Parent --- > Any Node/Row That Has Children.
  - Leaf --- > Any Node Without Children.
- To Establish the Hierarchical Relationship with LEVEL We Need.
  - START WITH Clause.
  - CONNECT BY Clause.

```
SQL> SELECT Ename, Job, MGR, Level FROM Emp;  
SQL> SELECT LPAD(' ', 2 * (LEVEL - 1)) Org_Level, Ename, Empno, Mgr, Job  
FROM Emp START WITH Job='PRESIDENT' CONNECT BY PRIOR Empno=MGR;  
SQL> SELECT LPAD(' ', 2 * (LEVEL - 1)) || Ename Org_Level, Ename, Empno, Mgr,  
Job FROM Emp START WITH Job='PRESIDENT' CONNECT BY PRIOR Empno=MGR;  
SQL> SELECT LPAD(' ', 2 * (LEVEL - 1)) || Ename Org_Level, Ename, Empno, Mgr,  
Job FROM Emp WHERE Job!='ANALYST' START WITH Job='PRESIDENT' CONNECT  
BY PRIOR Empno=MGR;  
SQL> SELECT LPAD(' ', 2 * (LEVEL - 1)) || Ename Org_Level, Ename, Empno, Mgr,  
Job FROM Emp START WITH Job='PRESIDENT' CONNECT BY PRIOR Empno=MGR  
AND LEVEL <=2;
```

### Selecting Nth Highest Value from Table:



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#### Syntax:

```
SQL>SELECT LEVEL, MAX(ColName) FROM TableName WHERE LEVEL = &LEVELNO  
CONNECT BY PRIOR ColName > ColName GROUP BY LEVEL;
```

#### ILLUSTRATION:

```
SQL> SELECT LEVEL , MAX(Sal) FROM Emp WHERE LEVEL = &LEVELNO  
CONNECT BY PRIOR Sal > Sal GROUP BY LEVEL;
```

#### Selecting Nth Lowest Value from Table:

#### Syntax:

```
SQL>SELECT LEVEL, MIN(ColName) FROM TableName WHERE LEVEL = &LEVELNO  
CONNECT BY PRIOR ColName < ColName GROUP BY LEVEL;
```

#### ILLUSTRATION:

```
SQL> SELECT LEVEL , MIN(Sal) FROM Emp WHERE LEVEL = &LEVELNO  
CONNECT BY PRIOR Sal < Sal GROUP BY LEVEL;
```

#### ROWNUM Pseudo Column:

- For Each Row Returned by a Query, The ROWNUM Pseudo Column Returns a Number Indicating the Order in Which Oracle Selects the Rows from a Set of Joined Rows or Non-Joined Rows.
- The First Row Selected Has a ROWNUM of 1, The Second Has 2. And So On...
- The ROWNUM Can Be Used to Limit the Number of Rows Returned by The Query.
- When ORDER BY Clause Follows a ROWNUM, The Rows Will Be Re-Ordered by ORDER BY Clause.
- If ORDER BY Clause is Embedded in a Sub Query and ROWNUM Condition is Placed in the TOP\_LEVEL Query, Then The ROWNUM, Condition Can Be Forced To Get Applied After The Ordering Of The Rows.
- Conditions Testing for ROWNUM Values Greater Than a Positive Integer Are Always FALSE.

```
SQL> SELECT LPAD(' ', ROWNUM, '*') FROM Emp;  
SQL> SELECT ROWNUM, Ename, Sal FROM Emp;
```

#### Querying For Top 'N' Records:



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- We Can Ask for Nth Largest OR Smallest Values of a Column.
- Never Use ROWNUM And ORDER BY Clause Together as Oracle First Fetches the Rows According to ROWNUM And Then Sorts the Found Rows.
- From Oracle 8i, ORDER BY Clause Can Be Used in INLINE VIEWS.

```
SQL>SELECT ROWNUM, Ename, Sal FROM Emp WHERE ROWNUM <6  
ORDER BY SAL DESC;
```

-- Wrong Way.

```
SQL>SELECT * FROM (SELECT * FROM Emp ORDER BY Sal DESC) WHERE ROWNUM  
<6; -
```

-Proper Way.

### ROWID Pseudo Column:

- This Pseudo Column Returns a ROW's Address for Each Row Stored in The Database.
- ROWID Values Contain Information Necessary to Locate the Physical Area of The Data Base Row.
  - The Row Belongs to Which Data Block in the Data File.
  - The Row Belongs to Which Row in The Data Block(First Row is 0).
  - The Row Belongs to Which Data File(First File is 1)
- The Rows in Different Tables That Are Stored Together in The Same Cluster Can Have the Same ROWID.

### Uses of ROWID Values:

- ROWID is The Fastest Means of Accessing a Single Row from Data Base.
- ROWID Can Show How a Tables Rows Are Physically Stored.
- ROWID's Are UNIQUE Identifiers for a Row in a Table.
- A ROWID Can Never Change During the Life Time of Its Row.
- ROWID's Should Not Be Assigned as PRIMARY KEY's As There is a Chance of ROWID To Change When The Database is EXPORTED or IMPORTED.
- When a Row is DELETED, ORACLE May Reassign Its ROWID To a New Row That is Inserted.
- The ROWID Can Never Be INSERTED, UPDATED and DELETED Manually.



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- The ROWID Pseudo Column Can Be Used in SELECT and WHERE Clauses.

```
SQL>SELECT ROWID, Ename, Job FROM Emp WHERE Empno=20;
SQL>SELECT Ename, Sal, Job FROM Emp WHERE ROWID = 'AACQQAACAAAAEHAAA';
SQL>SELECT Ename, Sal, Job FROM Emp WHERE ROWID < 'AACQQAACAAAAEHAAA';
SQL>SELECT B.Sal, Sum(A.Sal) "Cum Sal" FROM Emp A, Emp B WHERE
A.ROWID <=B.ROWID GROUP BY B.ROWID, B.Sal;
SQL> SELECT B.Ename, B.Job, B.Sal, Sum(A.Sal) "Cum Sal" FROM Emp A, Emp
B WHERE A.ROWID <= B.ROWID GROUP BY B.ROWID, B.Sal;
```

### **New Pseudo Columns (Oracle 10g):**

- CONNECT\_BY\_ISCYCLE
- CONNECT\_BY\_ISLEAF

#### **i. CONNECT\_BY\_ISCYCLE PsedoColumn:**

- The CONNECT\_BY\_ISCYCLE Pseudo Column Returns 1 If the Current Row Has a Child Which is Also Its Ancestor Otherwise It Returns 0.
- We Can Specify CONNECT\_BY\_ISCYCLE Only if We Have Specified the NOCYCLE parameter of The CONNECT BY Clause.
- NOCYCLE Enables Oracle to Return the Results of A Query That Would Otherwise Fail Because of A CONNECT BY LOOP in The Database.

```
SQL>SELECT Ename, CONNECT_BY_ISCYCLE "Cycle", LEVEL,
SYS_CONNECT_BY_PATH(Sal, '/') SalPath FROM Emp START WITH Ename='KING'
CONNECT BY NOCYCLE PRIOR Empno=MGR;
```

#### **ii. CONNECT BY ISLEAF Pseudocolumn:**

- The CONNECT\_BY\_ISLEAF Pseudo Column Returns 1, If the Current Row is A Leaf of The Tree Defined by The CONNECT BY Condition, Else It Returns 0.
- This Information Indicates Whether a Given Row Can Be Further Expanded To Show More of The Hierarchy.

```
SQL> SELECT Ename "Employee", CONNECT_BY_ISLEAF "IsLeaf",
SYS_CONNECT_BY_PATH(Ename, '/') Path FROM Emp START WITH Empno=7839
CONNECT BY PRIOR Empno=MGR;
```



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