

Data Dictionary

Introduction to the Data Dictionary

- One of the most important parts of an Oracle database is its **data dictionary**, which is a **read-only** set of tables that provides information about the database.
- A data dictionary contains:
 1. The definitions of all schema objects in the database (tables, views, indexes, clusters, synonyms, sequences, procedures, functions, packages, triggers, and so on)
 2. How much space has been allocated for, and is currently used by, the schema objects
 3. Default values for columns
 4. Integrity constraint information
 5. The names of Oracle users
 6. Privileges and roles each user has been granted
 7. Auditing information, such as who has accessed or updated various schema objects
 8. Other general database information

Introduction to the Data Dictionary

- The data dictionary is structured in tables and views, just like other database data.
- All the data dictionary tables and views for a given database are stored in that database's `SYSTEM` tablespace.
- It is an important tool for all users, from end users to application designers and database administrators.
- To access the data dictionary, we have to use SQL statements.
- It is read-only , hence we can use only the `SELECT` statement.

Structure of the Data Dictionary

- A database's data dictionary consists of:
 1. **Base tables** : The underlying tables that store information about the associated database. Only Oracle should write to and read these tables. Users rarely access them directly because they are normalized, and most of the data is stored in a cryptic format.
 2. **User-accessible views** : The views that summarize and display the information stored in the base tables of the data dictionary. These views decode the base table data into useful information, such as user or table names, using joins and **WHERE** clauses to simplify the information. Most users are given access to the views rather than the base tables.
- The Oracle user **SYS** owns all base tables and user-accessible views of the data dictionary.

How the Data Dictionary Is Used

- The data dictionary has three primary uses:
 1. Oracle accesses the data dictionary to find information about users, schema objects, and storage structures.
 2. Oracle modifies the data dictionary every time that a data definition language (DDL) statement is issued.
 3. Any Oracle user can use the data dictionary as a read-only reference for information about the database.

How Oracle Uses the Data Dictionary

- Data in the base tables of the data dictionary *is necessary for Oracle to function*. Therefore, only Oracle should write or change data dictionary information.
- Oracle provides scripts to modify the data dictionary tables when a database is upgraded or downgraded.
- During database operation, Oracle reads the data dictionary to ascertain that schema objects exist and that users have proper access to them. Oracle also updates the data dictionary continuously to reflect changes in database structures, auditing, grants, and data.
- Much of the data dictionary information is cached in the SGA in the **dictionary cache**, because Oracle constantly accesses the data dictionary during database operation to validate user access and to verify the state of schema objects. All information is stored in memory using the LRU (least recently used) algorithm.

How Users and DBAs Can Use the Data Dictionary

- The views of the data dictionary serve as a reference for all database users. You access the data dictionary views through the SQL language. Some views are accessible to all Oracle users, and others are intended for database administrators only.
- The data dictionary is always available when the database is open. It resides in the **SYSTEM** tablespace, which is always online.
- The data dictionary consists of sets of views. In many cases, a set consists of three views containing similar information and distinguished from each other by their prefixes:

Prefix	Scope
USER	user's view (what is in the user's schema)
ALL	expanded user's view (what the user can access)
DBA	database administrator's view (what is in all users' schemas)

How Users and DBAs Can Use the Data Dictionary

The set of columns is identical across views with these exceptions:

- Views with the prefix `USER` usually exclude the column `OWNER`. This column is implied in the `USER` views to be the user issuing the query.
- Some `DBA` views have additional columns containing information useful to the administrator.

Views with the Prefix USER

- The views most likely to be of interest to typical database users are those with the prefix `USER`. These views:
- Refer to the user's own private environment in the database, including information about schema objects created by the user, grants made by the user, and so on.
- Display only rows pertinent to the user.
- Have columns identical to the other views, except that the column `OWNER` is implied (the current user).
- Return a subset of the information in the `ALL` views
- Can have abbreviated `PUBLIC` synonyms for convenience
- For example, the following query returns all the objects contained in your schema:

```
SELECT object_name, object_type FROM  
USER_OBJECTS;
```

Views with the Prefix ALL

- Views with the prefix `ALL` refer to the user's overall perspective of the database.
- These views return information about schema objects to which the user has access through public or explicit grants of privileges and roles, in addition to schema objects that the user owns.
- For example, the following query returns information about all the objects to which you have access:

```
SELECT owner, object_name, object_type FROM  
ALL_OBJECTS;
```

Views with the Prefix DBA

- Views with the prefix `DBA` show a global view of the entire database. Therefore, they are meant to be queried only by database administrators.
- Any user granted the system privilege `SELECT ANY TABLE` can query the `DBA`-prefixed views of the data dictionary.
- Synonyms are not created for these views, because the `DBA` views should be queried only by administrators. Therefore, to query the `DBA` views, administrators must prefix the view name with its owner, `SYS`, as in the following:

```
SELECT owner, object_name, object_type FROM  
SYS.DBA_OBJECTS;
```
- Administrators can run the script file `DBA_SYNONYMS.SQL` to create private synonyms for the `DBA` views in their accounts if they have the `SELECT ANY TABLE` system privilege. Executing this script creates synonyms for the current user only.

The DUAL Table

- The table named `DUAL` is a small table in the data dictionary that Oracle and user-written programs can reference to guarantee a known result.
- This table has one column called `DUMMY` and one row containing the value `X`.