Oracle (PL/SQL)

Lesson 2: Introduction to Data Dictionary

Lesson Objectives

- To understand the following topics:
  - Identifying key data dictionary components
  - Identifying the contents and uses of Data Dictionary
  - Querying the Data Dictionary

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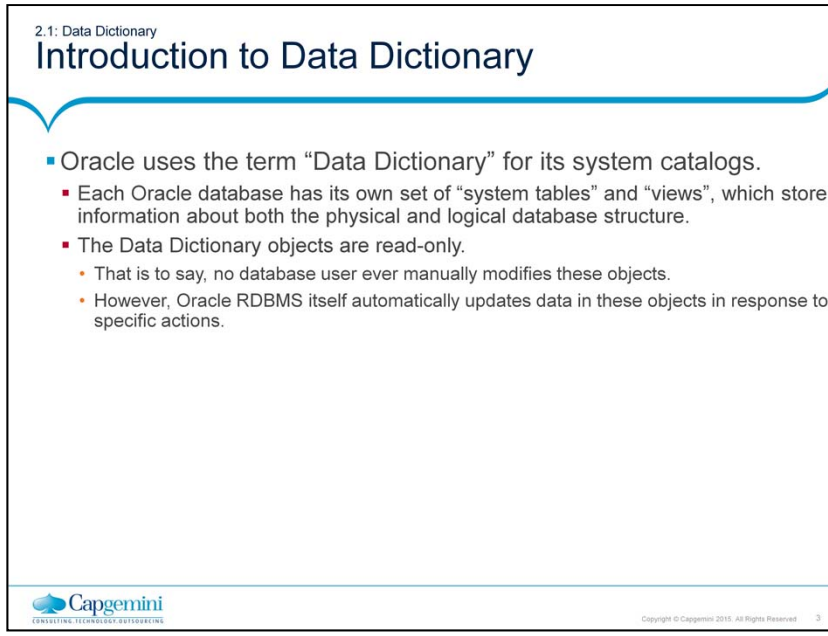
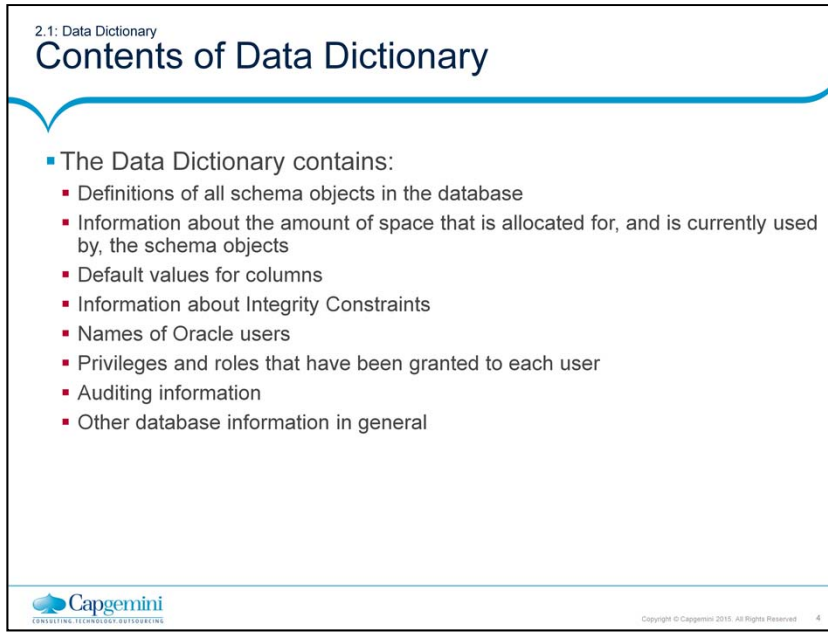


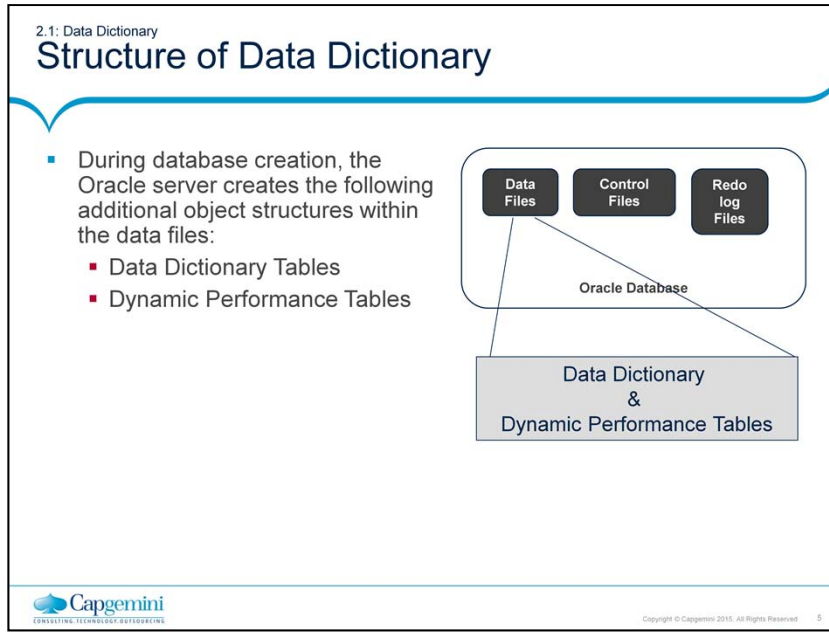
Introduction to Data Dictionary:

- **For example:** Suppose an user USER1 creates a new object (table, view, stored procedure, etc.), adds a column or a constraint to a table, and so forth. Then the appropriate Data Dictionary tables are updated at once behind the scenes, and the corresponding changes are visible through the system views.



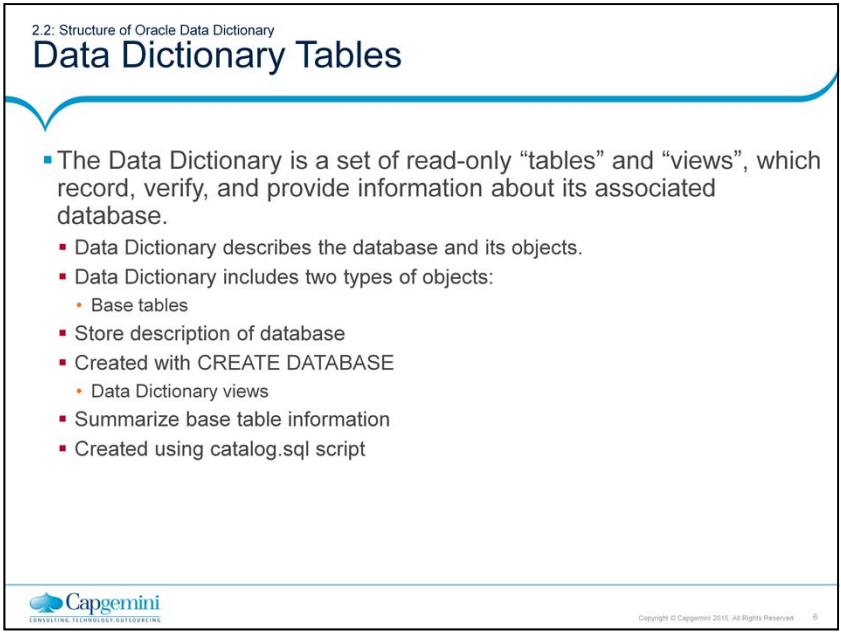
Contents of Data Dictionary:

- It contains definitions of all schema objects in the database (tables, views, indexes, clusters, synonyms, sequences, procedures, functions, packages, triggers, and so on), auditing information, such as who has accessed or updated various other general database information, etc.
- The Data Dictionary provides information about:
  - Logical and physical database structure
  - Definitions and space allocations of objects
  - Integrity constraints
  - Users
  - Roles
  - Privileges
  - Auditing



<u>Structure of Oracle Data Dictionary</u>:

- 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 “SYSTEM tablespace” of the database.
- During database creation, the Oracle server creates additional object structures within the data files.
  - Data Dictionary Tables
  - Dynamic Performance Tables



Data Dictionary Tables:

- Data Dictionary Tables include two types of objects:
  - **Base tables:**

    Base Tables are underlying tables, which store information about the database. The base tables are the first objects created in any Oracle database. They are automatically created when the Oracle server runs the “sql.bsq script” at the time the database is created. Only the Oracle server should write to these tables. Users rarely access them directly, because most of the data is stored in a cryptic format that is difficult to understand.
  - **Data Dictionary views:**

    These user accessible views summarize base table information and are created by using “catalog.sql script”. They display the information stored in the base tables in readable and / or simplified form by using joins, column aliases, and so on.

2.2: Structure of Oracle Data Dictionary

How is the Data Dictionary Used?

- Three primary uses of Data Dictionary:
  - Used by Oracle Server to find information about:
    - Users
    - Schema objects
    - Storage structures
  - Modified by Oracle Server when a DDL statement is executed
  - Used by users and DBAs as a read-only reference for information about the database.

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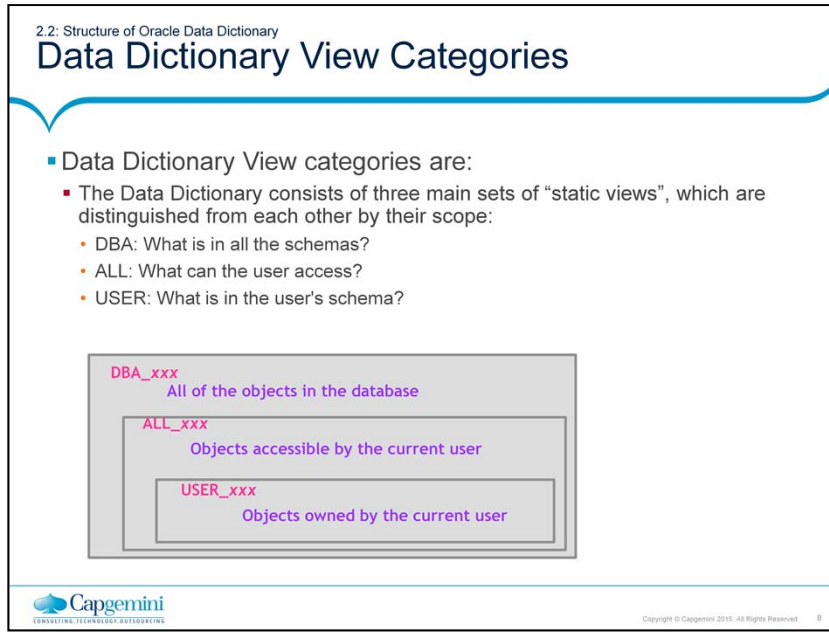


Data Dictionary View Categories:

- The Data Dictionary consists of three main sets of "static views", which are distinguished from each other by their scope:
  - **DBA: What is in all the schemas?**

    It displays all relevant information in the entire database. DBA_ views are intended only for administrators. They can be accessed only by users with the SELECT_ANY_TABLE privilege. (This privilege is assigned to the DBA role when the system is initially installed.)
  - **ALL: What can the user access?**

    It displays all the information accessible to the current user, including information from the schema of the current user. It displays information from objects in other schemas, as well, if the current user has access to those objects by way of grants of privileges or roles.
  - **USER: What is in the user's schema?**

    It displays all the information from the schema of the current user. No special privileges are required to query these Views.

contd.

Data Dictionary View Categories (contd.):

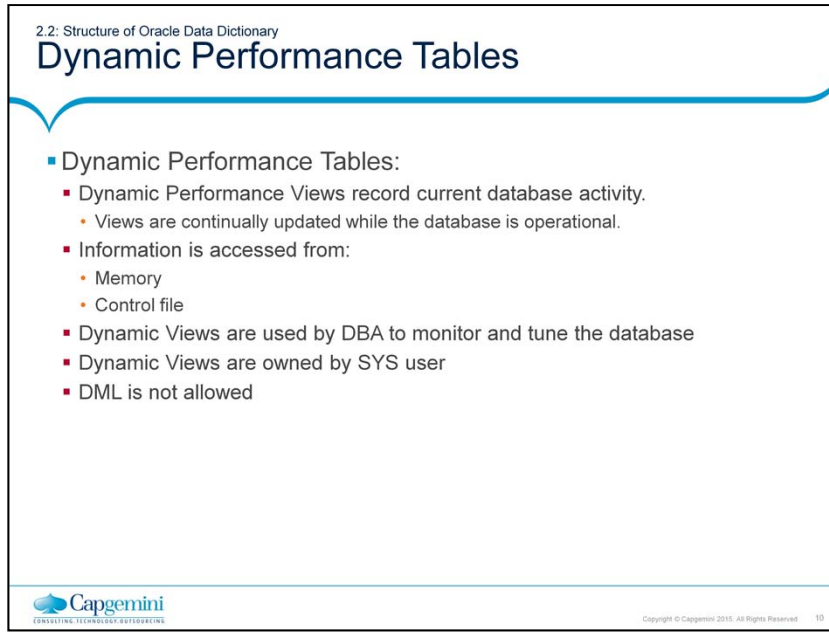
- **For example**:
  - The following query returns all the objects contained in the users schema:

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

  - The following query returns information about all the objects to which you have access:

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

- Data Dictionary Views are “static views” that answer questions such as:
  - Was the object ever created?
  - What is the object a part of?
  - Who owns the object?
  - What privileges do users have?
- The name "static" denotes that the information in this group of Views changes only when a change is made to the Data Dictionary (for example: a column is added to a table, a new database user is created, etc).
- The “dynamic views” are constantly updated while a database is in use.
- Examples of Data Dictionary Views for the information on Schema objects:
  - USER_TABLES
  - USER_INDEXES
  - USER_TAB_COLUMNS
  - ALL_CONSTRAINTS



Dynamic Performance Tables:

- Dynamic Performance Views record current database activity.
  - Views are continually updated while the database is operational
  - Information is accessed from:
    - Memory
    - Control file
  - Dynamic Views are used by DBA to monitor and tune the database
  - Dynamic Views are owned by SYS user
  - DML is not allowed
- These virtual tables exist in memory only when the database is running, to reflect real-time conditions of the database operation. They point to actual sources of information in “memory” and the “control file”.
- SYS owns the Dynamic Performance tables. Their names begin with V_$.
- Views are created on these tables, and then public synonyms are created for the views. The synonym names begin with V$.

  For example:
  - The V$DATAFILE view contains information about the datafiles in the database, and
  - The V$FIXED_TABLE view contains information about all of the dynamic performance tables and views in the database.

contd.

Dynamic Performance Tables (contd.):

- The Dynamic Tables answer questions such as:
  - Is the object online and available?
  - Is the object open?
  - What locks are being held?
  - Is the session active?

- To display the backup status of all online datafiles, V$BACKUP dynamic performance table can be queried. This view shows the datafile status, such as, backup is in progress, offline, description of error.

- To get an overview of the data dictionary, the DICTIONARY view or its synonym DICT can be queried.

  For example:

- To narrow your responses, you can include the where clause :

```
SELECT * FROM dictionary;
```

- To get an overview of the columns in the Data Dictionary and Dynamic Performance views, the DICT_COLUMNS view can be queried.

```
SELECT * FROM dictionary WHERE table_name
like 'EMP%'
```

2.2: Structure of Oracle Data Dictionary

Some Data Dictionary tables

- Given below are a few examples of Data Dictionary:
  - General Overview
    - DICTIONARY, DICT_COLUMNS
  - Schema objects
    - DBA_TABLES, DBA_INDEXES, DBA_TAB_COLUMNS, DBA_CONSTRAINTS
  - Space allocation
    - DBA_SEGMENTS, DBA_EXTENTS
  - Database structure
    - DBA_TABLESPACES, DBA_DATA_FILES

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2.2: Structure of Oracle Data Dictionary

Using the Data Dictionary Tables

- Example 1:
  - To list details of tables owned by current user:

```
SQL>SELECT TABLE_NAME, TABLESPACE_NAME, BLOCKS FROM
USER_TABLES;
```

- Example 2:
  - The USER_ERRORS data dictionary view contains information about the last error that occurred in a user's schema.

```
SQL>SELECT * FROM USER_ERRORS;
```

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Summary

- In this lesson you have learnt about:
  - Use of the Data Dictionary Views to retrieve information about the database and instance
  - Obtaining information about Data Dictionary Views from DICTIONARY and DICT_COLUMNS

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Review Question

- Question 1: Data Dictionary contains definitions of all schema objects in the database.
  - True / False
- Question 2: DBA_ views are intended for all users in database.
  - True / False
- Question 3: Data dictionary view category ALL_xxx displays all the information from the schema of the current user.
  - True / False

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