

Database System Catalog

ACS 575: Database Systems

Instructor: Dr. Jin Soung Yoo, Professor
Department of Computer Science
Purdue University Fort Wayne

References

- ❑ Oracle Administrator Manual
- ❑ <https://docs.oracle.com/en/database/oracle/oracle-database/12.2/refrn/static-data-dictionary-views.html#GUID-8865F65B-EF6D-44A5-B0A1-3179EFF0C36A>

System Catalogue

- A repository of all the *meta-data* relevant to the objects stored in the database—and also of information concerning the DBMS itself.
 - The term metadata is often defined as *data about data*.
- Also called *data dictionary* in Oracle
- It allows you to:
 - Manage the database
 - Tune the database
 - Monitor the database

System Catalog

- ❑ Data that provides information about the tables, views, constraints, stored procedures, etc. objects stored within the database.
- ❑ E.g., the dictionary about table will store information such as:
 - its name
 - when it was created and when it was last accessed
 - the names and data types of its attributes (i.e. structural information)
 - its owner, who may read and write to it (i.e. security information)
 - where the data is stored (i.e. physical information)
 - what indexes are associated with a specific table.

Statistics and Catalogs

- Statistical information of objects
 - # of tuples and # of pages for each table.
 - # of distinct key values and # of pages for each index.
 - Index height, low/high key values for each tree index.
- Catalogs updated periodically.
 - Updating whenever data changes is too expensive; lots of approximation anyway
 - To gather data statistics manually, you might need
SQL> ANALYZE TABLE table_name COMPUTE STATISTICS;

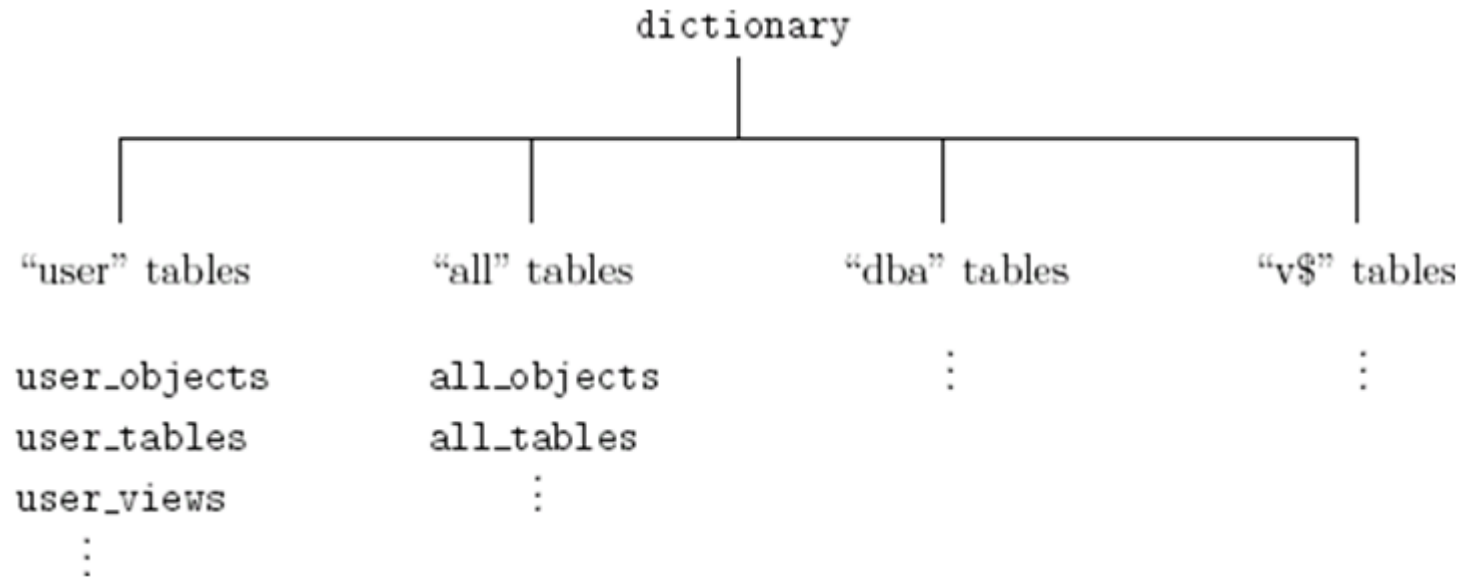
Oracle Data Dictionary

- ❑ Data dictionary is the system catalog of Oracle, which is a read-only set of tables that provides administrative metadata about the database.
- ❑ A data dictionary contains information such as the following:
 - The definitions of every schema object in the database, including default values for columns and integrity constraint information
 - The amount of space allocated for and currently used by the schema objects
 - The names of Oracle Database users, privileges and roles granted to users, and auditing information related to users

Oracle Data Dictionary (Cont.)

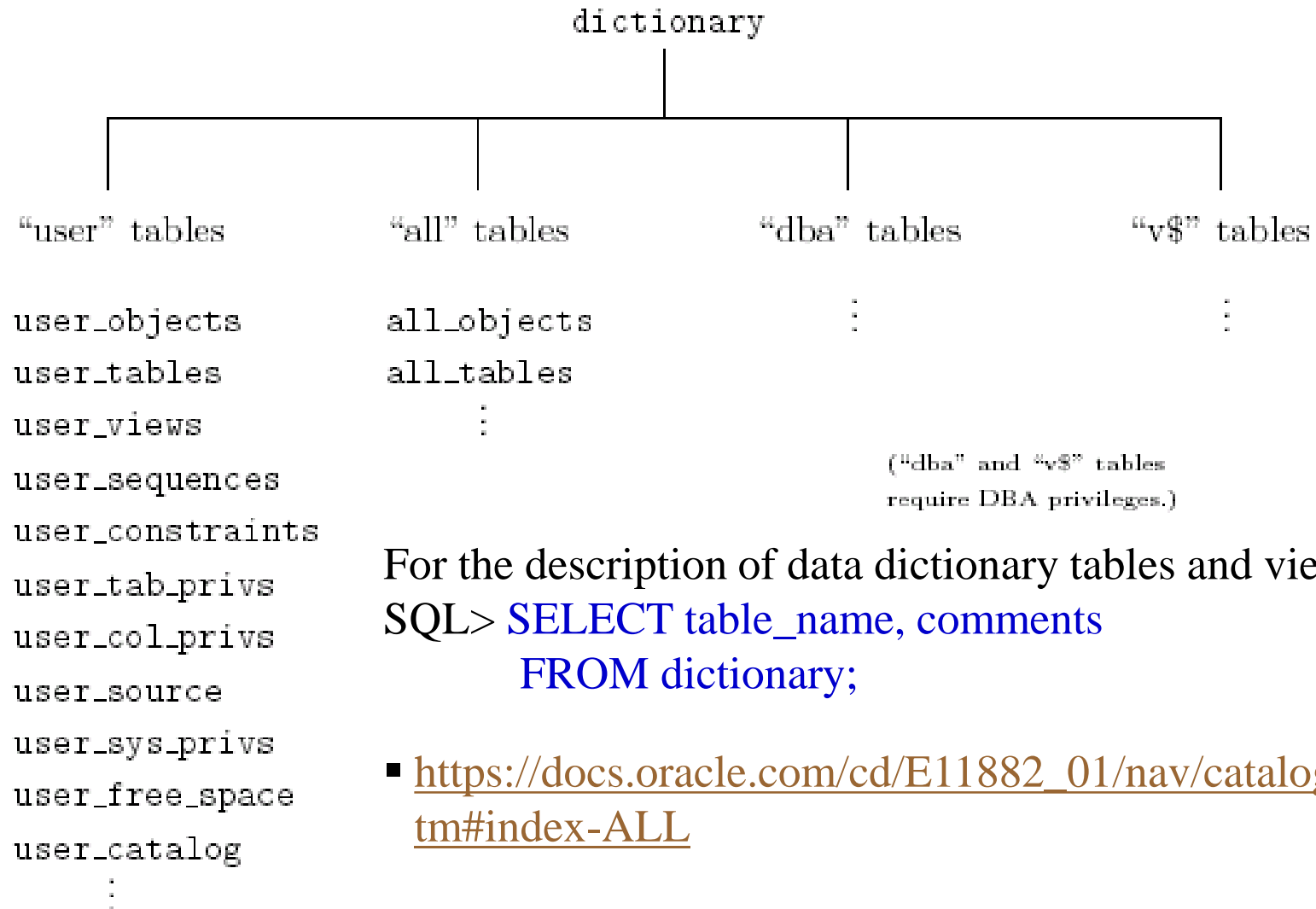
- ❑ The data dictionary is a central part of data management for every Oracle database. For example, the database performs the following actions:
 - Accesses the data dictionary to find information about users, schema objects, and storage structures
 - Modifies the data dictionary every time that a DDL statement is issued
- ❑ Refer to <https://docs.oracle.com/en/database/oracle/oracle-database/19/cncpt/data-dictionary-and-dynamic-performance-views.html#GUID-A6D74845-1EF1-45D9-B822-9BFA212BFDB4>

Architecture of Oracle Data Dictionary



- ❑ **'User_' views** describe the objects that pertain to the user you are logged in as.
- ❑ **'All_' views** describe the objects you have access to.
- ❑ **'DBA_' views** contain information only relevant and accessible to database administrators.
- ❑ **'V\$_' views** reflect the internal state of the DBMS and are mainly useful to DBAs for performance audit and optimization

Dictionary Tables (Views)



For the description of data dictionary tables and views

SQL> **SELECT** table_name, comments
FROM dictionary;

- https://docs.oracle.com/cd/E11882_01/nav/catalog_views.htm#index-ALL

Dictionary Tables (/Views) Commonly Used

Table	Description
ALL_ARGUMENTS	Arguments in object accessible to the user
ALL_CATALOG	All tables, views, synonyms, sequences accessible to the user
ALL_COL_COMMENTS	Comments on columns of accessible tables and views
ALL_CONSTRAINTS	Constraint definitions on accessible tables
ALL_CONS_COLUMNS	Information about accessible columns in constraint definitions
ALL_DB_LINKS	Database links accessible to the user
ALL_ERRORS	Current errors on stored objects that user is allowed to create
ALL_INDEXES	Descriptions of indexes on tables accessible to the user
ALL_IND_COLUMNS	COLUMNS comprising INDEXes on accessible TABLES
ALL_LOBS	Description of LOBs contained in tables accessible to the user
ALL_OBJECTS	Objects accessible to the user
ALL_OBJECT_TABLES	Description of all object tables accessible to the user
ALL_SEQUENCES	Description of SEQUENCEs accessible to the user
ALL_SNAPSHOTS	Snapshots the user can access
ALL_SOURCE	Current source on stored objects that user is allowed to create
ALL_SYNONYMS	All synonyms accessible to the user
ALL_TABLES	Description of relational tables accessible to the user

Dictionary Tables(/Views) Commonly Used

Table	Description
ALL_TAB_COLUMNS	Columns of user's tables, views and clusters
ALL_TAB_COL_STATISTICS	Columns of user's tables, views and clusters
ALL_TAB_COMMENTS	Comments on tables and views accessible to the user
ALL_TRIGGERS	Triggers accessible to the current user
ALL_TRIGGER_COLS	Column usage in user's triggers or in triggers on user's tables
ALL_TYPES	Description of types accessible to the user
ALL_UPDATABLE_COLUMNS	Description of all updatable columns
ALL_USERS	Information about all users of the database
ALL_VIEWS	Description of views accessible to the user
DATABASE_COMPATIBLE_LEVEL	Database compatible parameter set via init.ora
DBA_DB_LINKS	All database links in the database
DBA_ERRORS	Current errors on all stored objects in the database
DBA_OBJECTS	All objects in the database
DBA_ROLES	All Roles which exist in the database
DBA_ROLE_PRIVS	Roles granted to users and roles

Dictionary Tables(/Views) Commonly Used

Table	Description
DBA_SOURCE	Source of all stored objects in the database
DBA_TABLESPACES	Description of all tablespaces
DBA_TAB_PRIVS	All grants on objects in the database
DBA_TRIGGERS	All triggers in the database
DBA_TS_QUOTAS	Tablespace quotas for all users
DBA_USERS	Information about all users of the database
DBA_VIEWS	Description of all views in the database
DICTIONARY	Description of data dictionary tables and views
DICT_COLUMNS	Description of columns in data dictionary tables and views
GLOBAL_NAME	global database name
NLS_DATABASE_PARAMETERS	Permanent NLS parameters of the database
NLS_INSTANCE_PARAMETERS	NLS parameters of the instance
NLS_SESSION_PARAMETERS	NLS parameters of the user session
PRODUCT_COMPONENT_VERSION	version and status information for component products
ROLE_TAB_PRIVS	Table privileges granted to roles
SESSION_PRIVS	Privileges which the user currently has set

Oracle Dictionary Tables Commonly Used

Table	Description
SESSION_ROLES	Roles which the user currently has enabled.
SYSTEM_PRIVILEGE_MAP	Description table for privilege type codes. Maps privilege type numbers to type names
TABLE_PRIVILEGES	Grants on objects for which the user is the grantor, grantee, owner, or an enabled role or PUBLIC is the grantee
TABLE_PRIVILEGE_MAP	Description table for privilege (auditing option) type codes. Maps privilege (auditing option) type numbers to type names

Application: Reverse Engineering a Data Model

□ The following tables are mostly used for that.

Table	Description
USER_TABLES	Lists each table that belongs to your Oracle user.
USER_TAB_COMMENTS	Shows comments on the tables and views.
USER_TAB_COLUMNS	Tells you the names, data types, default values, etc. of each column in each table.
USER_COL_COMMENTS	Shows comments on the columns.
USER_CONSTRAINTS	Gives you all constraints (either single- or multi-column), such as primary key, foreign key, not null, check constraints, etc.
USER_CONS_COLUMNS	Maps constraints to columns (since a constraint can act on one or many columns).
USER_INDEXES	Lists indexes defined on columns (either defined explicitly when creating the data model or defined automatically by Oracle, as is the case with indexes on primary keys).
USER_IND_COLUMNS	Maps indexes to columns.
USER_VIEWS	Lists all views, along with the text used to originally create them.
USER_SYNONYMS	Lists the synonyms and original table names.
USER_SEQUENCES	Lists all sequences, including min value, max value, and amount by which to increment.
USER_TRIGGERS	Contains trigger names, criteria for activating each trigger, and the code that is run.
USER_SOURCE	Contains the source code for all PL/SQL objects, including functions, procedures, packages, and package bodies.