Oracle databases.
SQL language. Defining data

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Oracle SQL language has been presented in terms of the categories of commands called (Lorentz et al., 2016):

- Data Definition Language (DDL)

- Data Control Language (DCL)

- Transaction Processing Language (TPL) and

- Data Manipulation Language (DML).

Features of Oracle databases

Starting an instance is a synonym with the startup of the database.

Mounting the database is the process of associating a database with a previously started instance.

Opening the database is the process by which the database is made available to users for database regular operations.
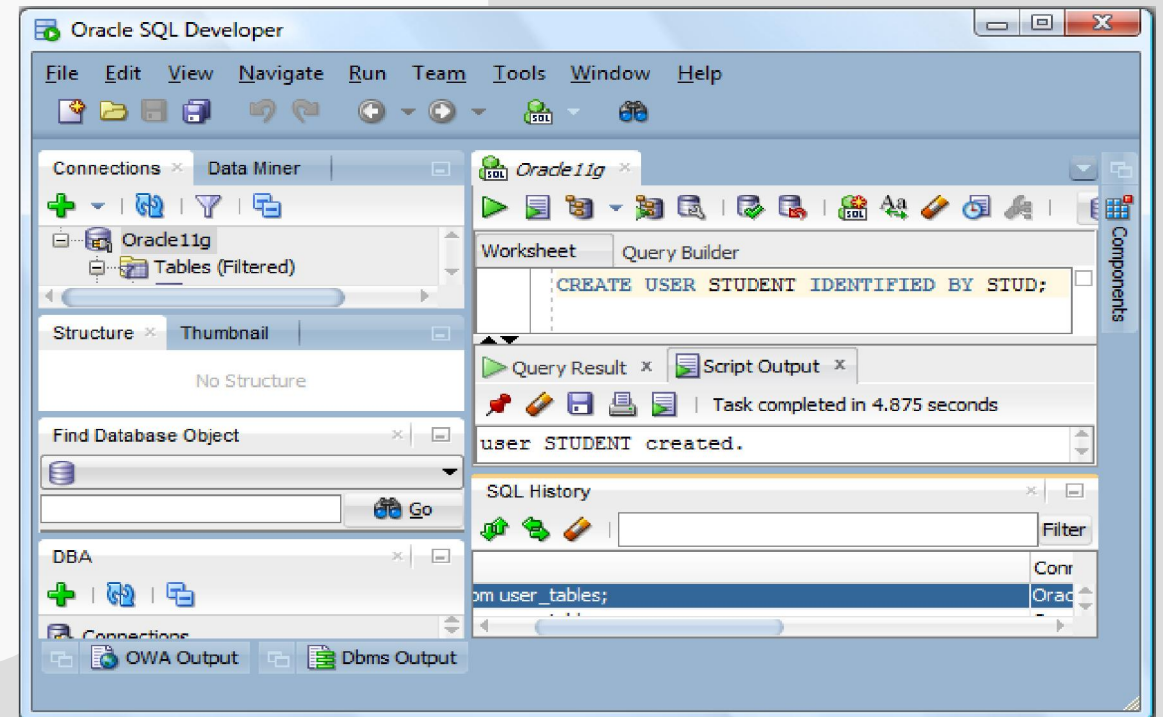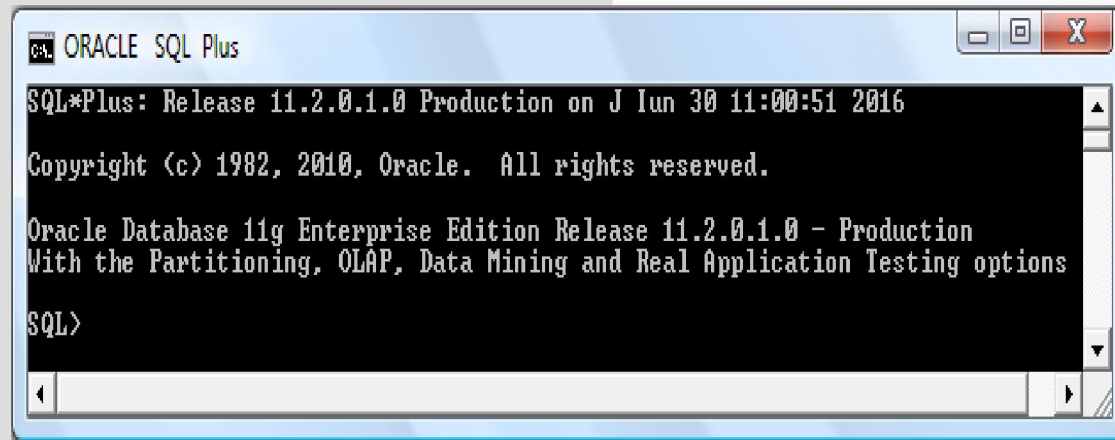
Closing the Oracle database

Oracle Data Dictionary - is the core of Oracle database. It is automatically created when the database is created.

Accessing the Oracle database

→ SQL *Plus

→ Oracle tools: SQL Developer, Application Express, Oracle Express Edition, Oracle Forms, Oracle Reports etc.

→ a function call (C++, Java, etc.)

Data dictionary provides the following information:

- the names of all database objects, including tables, views, indexes, synonyms, procedures, functions

- the users name of the Oracle database

- roles and privileges granted to each user

- integrity restrictions, the default values for columns

- usability and space allocation, audit information.

Oracle users and privileges. DCL Commands

DCL Language (Data Control Language) contains commands for:
- creating users, roles
- granting and revoking access rights to objects of an Oracle database.

E.g.: To set the user STUDENT with password STUD and grant rights to create tables, sequences, and views.

CREATE USER STUDENT IDENTIFIED BY STUD;

GRANT CREATE TABLE, CREATE SEQUENCE, CREATE VIEW TO STUDENT;

E.g.: To grant credentials and resources rights to user STUDENT:

GRANT CONNECT, RESOURCE TO STUDENT;

SQL Language. Oracle data types

SEQUEL Language (Structured English Query Language)
- 1974, Chamberlin and Boyce

In 1980, Chamberlin changed SEQUEL name into SQL (Structured Query Language) (Tudor, 2011).

Oracle database management system uses SQL Oracle query language (Structured Query Language) which has taken over the commands from the SQL standard.

Oracle data types

Type	Features
VARCHAR2 (nr)	variable-length character string with a maximum number of characters
CHAR (nr)	character string of fixed length (nr of characters)
NUMBER (p, s)	numeric: p (precision) = 1..38, s (scale) = -84..127
LONG	character string of length > 2 GB
DATE	Date
RAW (nr)	binary data type; maximum (nr) = 2000 bytes
LONG RAW	variable length > 2GB to store graphics, sounds, documents
ROWID	address of each row in the table
BLOB	binary large object (max 4 GB) to store unstructured data (text, image, video, spatial data)
BFILE	contains a pointer to a binary file outside the database

DDL Commands

DDL Language (Data Definition Language) contains an important category of commands of SQL language that enable the creating, modification, and deleting of the database objects.

Command	Action
CREATE	Creates a new object in a database: TABLE, INDEX, CLUSTER, TABLESPACE, SEQUENCE, VIEW, MATERIALIZED VIEW, USER, ROLE, PROCEDURE, FUNCTION, TRIGGER
ALTER	Modifies some of the properties of an object
DROP	Deletes an object from the database

Creating tables - SQL language (Oracle version):

CREATE TABLE table_ name (field1 datatype1 [field_definition1],
[field2 datatype2 [field_definition2]] [, ...]);

Integrity restrictions
NOT NULL
UNIQUE
PRIMARY KEY
FOREIGN KEY
CHECK

Example: To consider the evidence of the orders concluded by a company with various international companies via agents employed in the company. The orders contain products distributed by agents operating in certain countries / cities.

COMPANIES

company_code	company_name	city	country

ORDERS

order_no	company_code	agent_code	data

AGENTS

| agent_code	name	country	job

create table companies
(company_code number(2) primary key,
company_name varchar2(20) not null,
city varchar2(20), country varchar2(15)
check (country in ('GERMANY',
'SWITZERLAND', 'TURKEY',
'SLOVAKIA', 'NETHERLAND',
'ROMANIA', 'NORWAY')));

```
create table agents (agent_code varchar2(3) primary key,
                name varchar2(25) not null,
                  country varchar2(15) check (country in ('GERMANY',
                  'SWITZERLAND', 'TURKEY','SLOVAKIA',
                  'NETHERLAND', 'ROMANIA', 'NORWAY')),
                  job varchar2(20));

create table orders
(order_no number(4) primary key,
company_code number(2) not null,
agent_code varchar2(3) not null,
data date default sysdate,
FOREIGN KEY (agent_code) REFERENCES agents(agent_code),
FOREIGN KEY (company_code) REFERENCES companies (company_code));
```

E.g.: To display the structure of AGENTS table

DESC AGENTS;
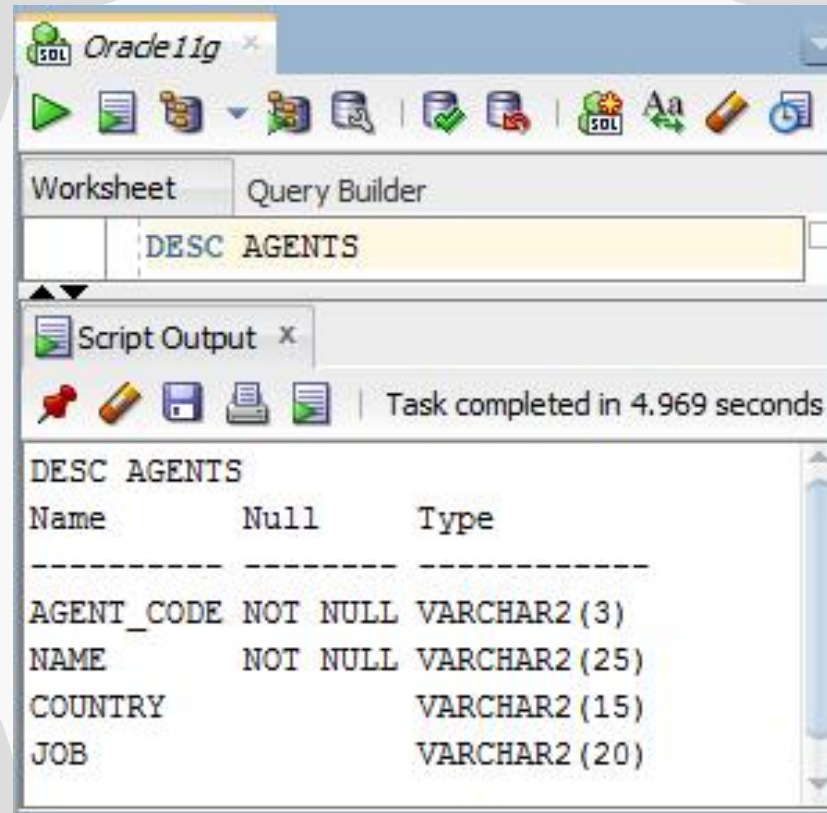
Altering table structure

ALTER TABLE table_ name
ADD (column_name column_definition)
| MODIFY (column_name column_update) | RENAME TO new_name
| ADD (CONSTRAINT constraint_name constraint_definition)
| DROP | DISABLE CONSTRAINT constraint_name

→ ADD clause adds a column or a restriction

→ MODIFY clause modifies the definition of a column

→ DROP removes a column, or a constraint

Applications

- Add address column to the "Orders "table:

    ALTER TABLE Orders ADD (address VARCHAR2(30));

- Modify the address column to type VARCHAR2(40) in the "Orders "table:

    ALTER TABLE Orders MODIFY (address VARCHAR2(40));

-Add to the "Orders "table the validation constraint for company_code column:

to have a value between 10 and 100:

    ALTER TABLE Orders ADD (CONSTRAINT c1

    CHECK (company_code > 10 and company_code < 100));

Deleting tables

DROP TABLE

TRUNCATE TABLE (deletes the records and frees the space allocated to it)

Bibliography

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Tudor, N. L., Information Systems and Oracle Database Management, Matrix Rom Publishing House Bucharest, 2011