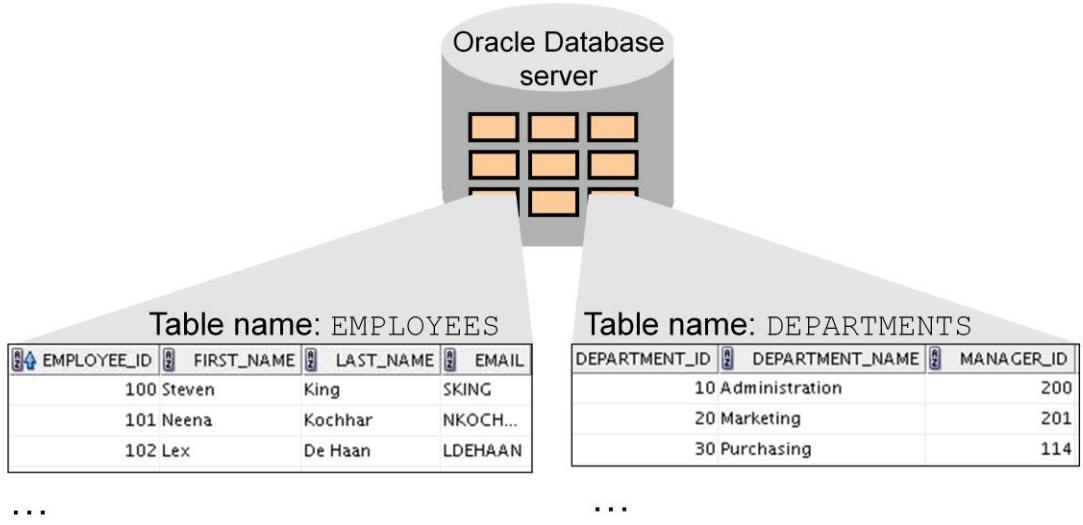
2

Introducing Oracle Database

Relational Databases

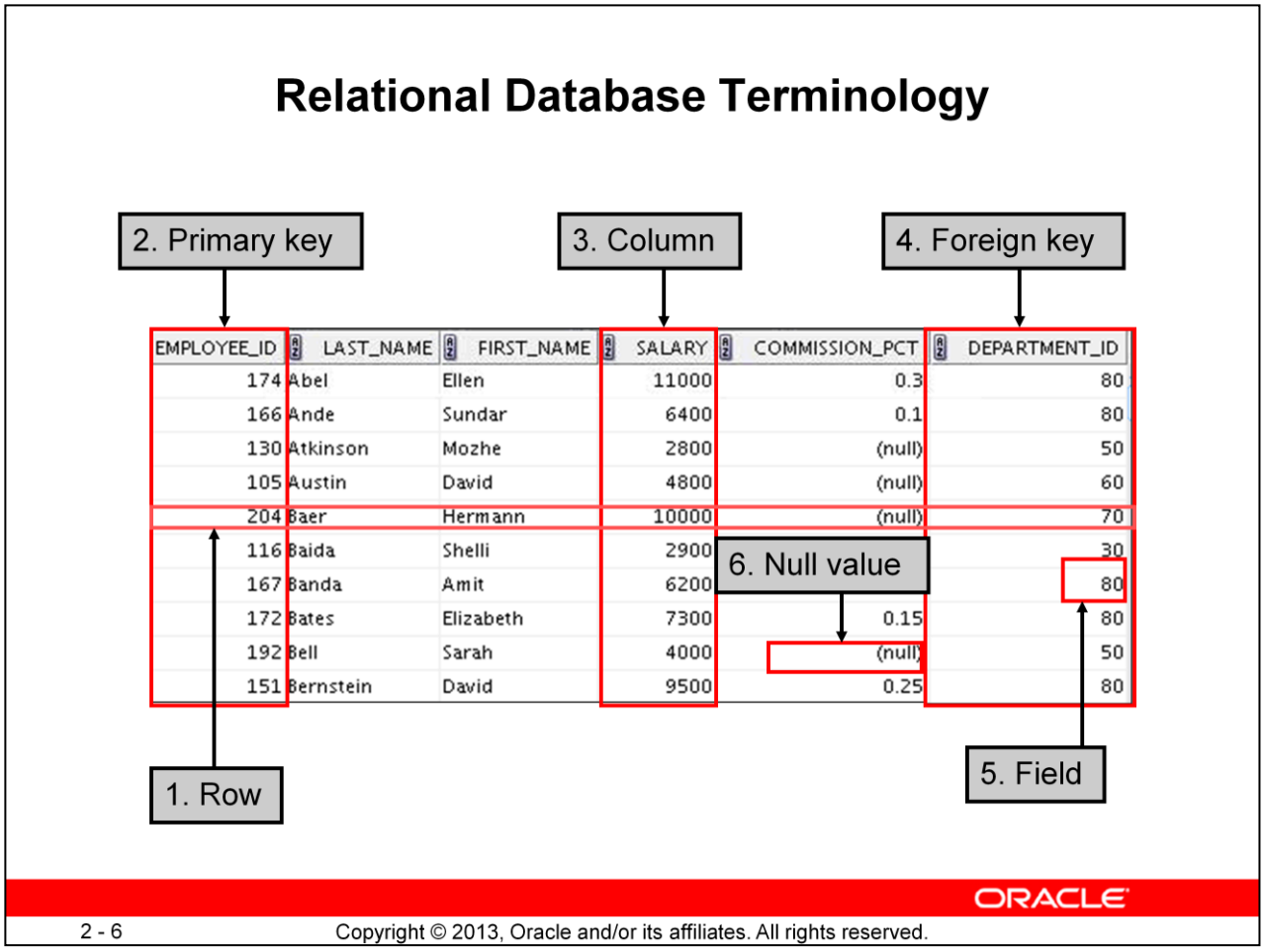
A relational database is a collection of two-dimensional tables.



Oracle Database is a relational database management system (RDBMS). In a relational database, data is organized as a number of differently sized tables. Each table contains information about one or more features and can be linked to other tables by a common value.

The relational database model consists of three components: a collection of objects or relations (tables), a set of operators to manage the tables, and data integrity rules.

For example, you may want to store information about all the employees in your company. In a relational database, you can create several tables (such as an employee table, a department table, and a salary table) to store different pieces of information about your employees.



A relational database can contain one or many tables. A *table* is the basic storage structure in an RDBMS. A table contains data about something, such as employees, invoices, or customers.

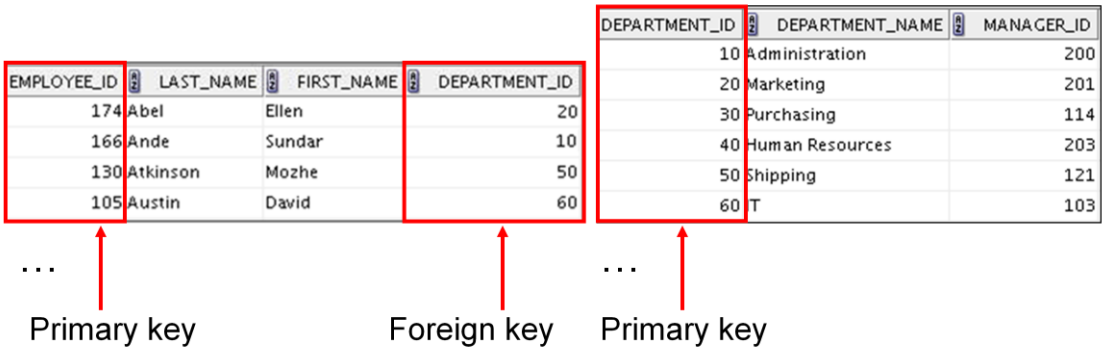
The slide shows the contents of the `EMPLOYEES` table *(*or *relation*). The following terms are illustrated in the slide:

1. A single *row* representing all data required for a particular employee. Each row in a table can be identified by a primary key, which allows no duplicate rows. The order of rows is insignificant. You can specify a row order when you retrieve the data.
2. A *column* or attribute containing the employee number. The employee number identifies a *unique* employee in the `EMPLOYEES` table. In this example, the `EMPLOYEE_ID` column that contains the employee number is designated as the *primary key*. A primary key must contain a value, and the value must be unique.
3. A column that is not a key value. A column represents one kind of data in a table. In this example, the `SALARY` column contains the salaries of all employees. Column order is insignificant when storing data. You can specify a column order when you retrieve the data.

Relating Multiple Tables

To relate tables, you define:

- **Primary key (PK):** Uniquely identifies each row of data in a table
- **Foreign key (FK):** Relates data in one data with data in another table



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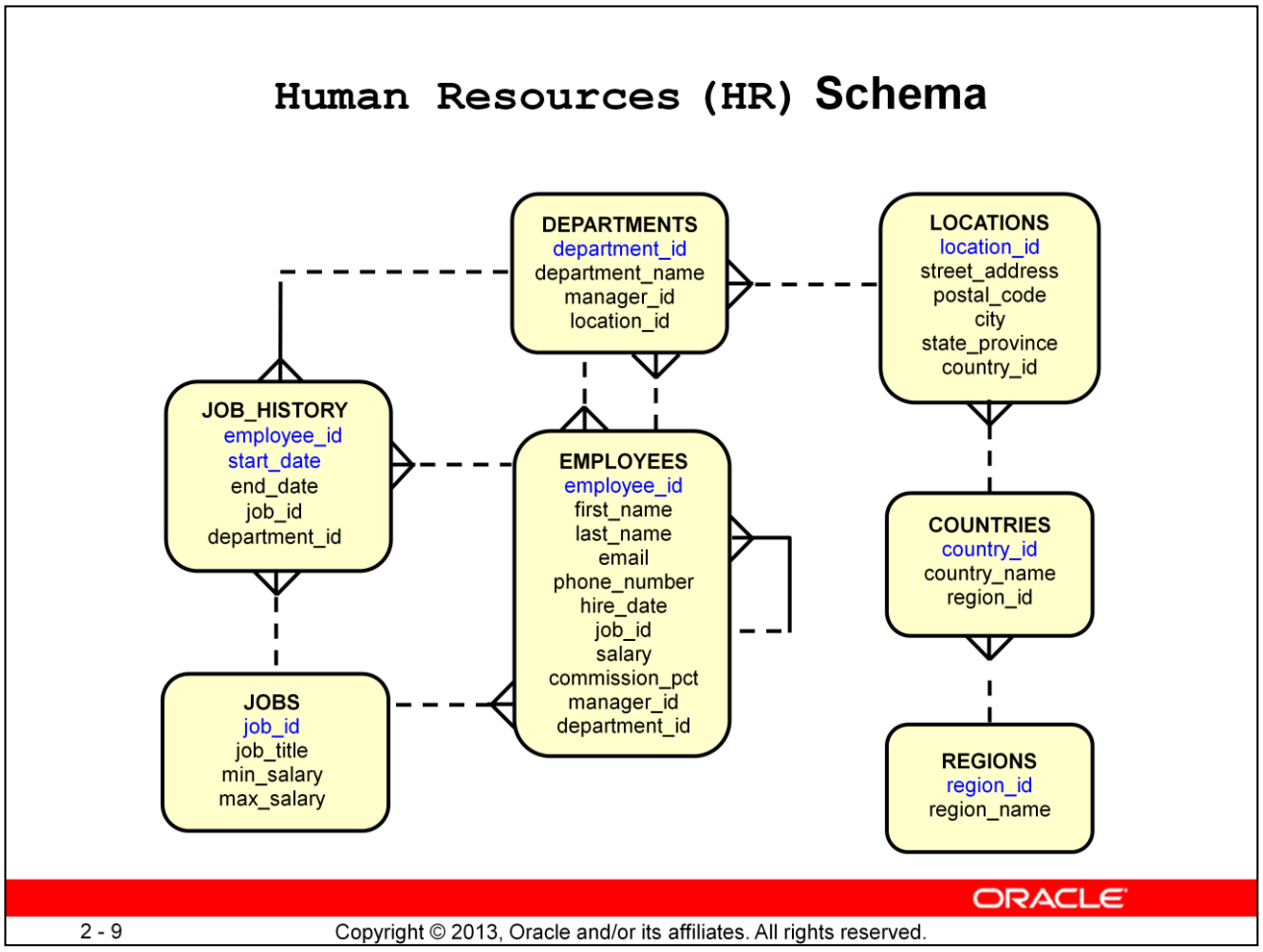
Each table contains data that describes exactly one entity. For example, the `EMPLOYEES` table contains information about employees. Because data about different entities is stored in different tables, you may need to combine two or more tables to answer a particular question. For example, you may want to know the location of the department where an employee works. In this scenario, you need information from the `EMPLOYEES` table (which contains data about employees) and the `DEPARTMENTS` table (which contains information about departments). With RDBMS, you can relate the data in one table to the data in another by using foreign keys. A foreign key is a column (or a set of columns) that refers to a primary key in the same table or another table.

You can use the ability to relate data in one table to data in another table to organize information in separate, manageable units. Employee data can be kept logically distinct from department data by storing it in a separate table.



The slide displays the Entity Relationship diagram for one of the sample schemas shipped with the database.

In the `Human Resource (HR)` records, each employee has an identification number, email address, job identification code, salary, and manager. Some employees earn commissions in addition to their salaries.

The company also tracks information about jobs within the organization. Each job has an identification code, job title, and a minimum and maximum salary range for the job. Some employees have been with the company for a long time and have held different positions within the company. When an employee resigns, the duration for which the employee worked, the job identification number, and the department are recorded.

Because the sample company is regionally diverse, it tracks the locations of its warehouses and departments. Each employee is assigned to a department, and each department is identified by a unique department number or by a short name. Each department is associated with one location, and each location has a full address that includes the street name, postal code, city, state or province, and the country code.

In places where the departments and warehouses are located, the company records such details as the country name, currency symbol, currency name, and the region where the

Structured Query Language (SQL)

- SQL is a set of statements that are used to access data in the Oracle database.
- SQL provides statements for a variety of tasks, including:
  - Querying data
  - Inserting, updating, and deleting rows in a table
  - Creating, replacing, altering, and dropping objects
  - Controlling access to the database and its objects
  - Guaranteeing database consistency and integrity

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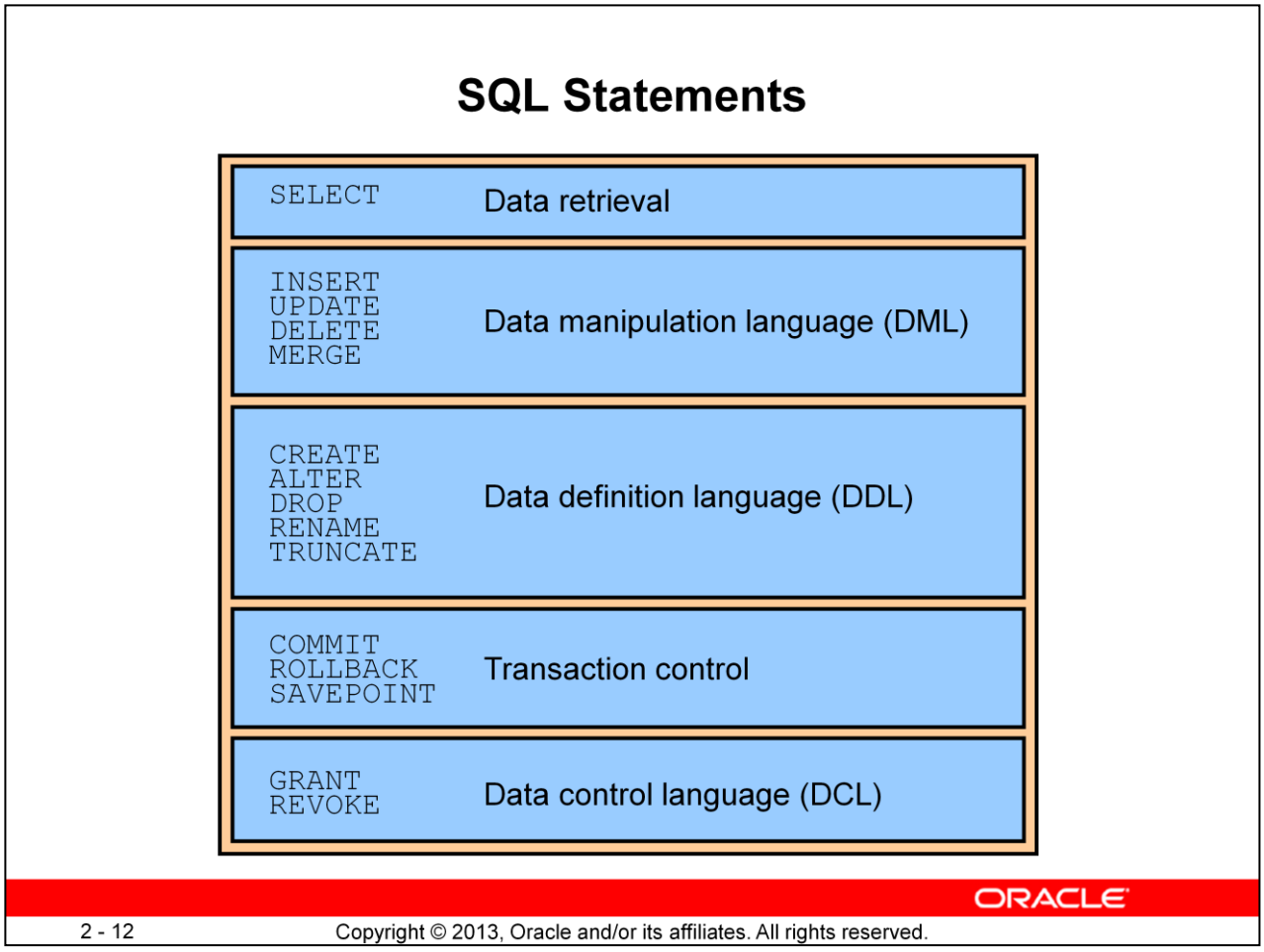
Structured Query Language (SQL) is a universal standard from the International Standards Organization (ISO). It is a set of statements used by all programs and users to access data in an Oracle database. Application programs and Oracle tools often enable users to access the database without directly using SQL. However, these applications use SQL when executing user requests.

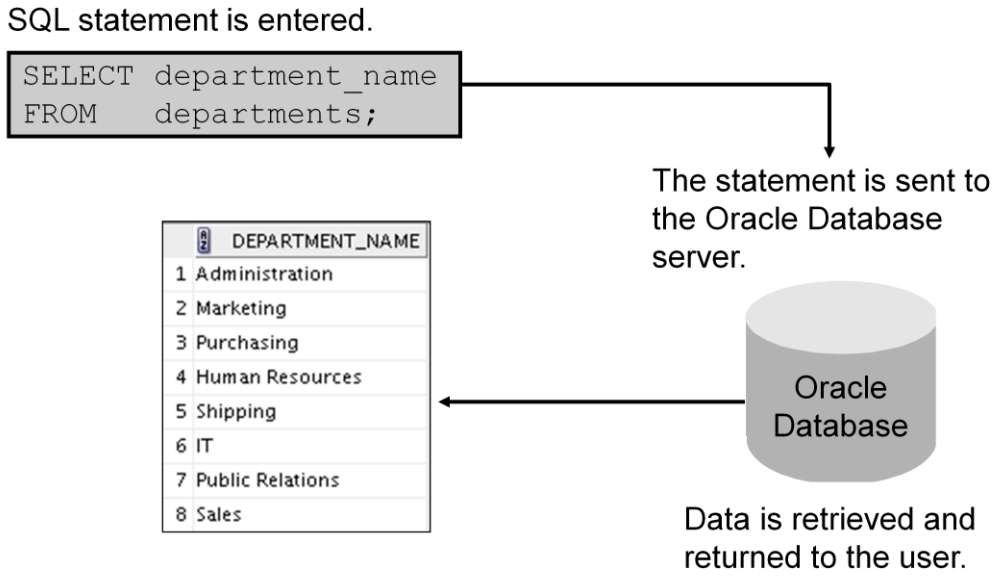
SQL enables you to work with data at the logical level. For example, to retrieve a set of rows from a table, you define a condition that is used to filter the rows. All rows that satisfy the condition are retrieved in a single step and can be passed as a unit to an application or to another SQL statement. You do not need to know how the rows are physically stored or retrieved. All SQL statements use the optimizer component of Oracle Database to determine the most efficient means of accessing the specified data.

SQL provides statements for a variety of tasks as listed in the slide. For more information about SQL, refer to the *Oracle Database SQL Reference*.



Oracle SQL complies with industry-accepted standards. To ensure compliance with evolving standards, key Oracle Corporation personnel actively participate on SQL standards committees such as the American National Standards Institute (ANSI) and the ISO.

Using SQL to Access the Database

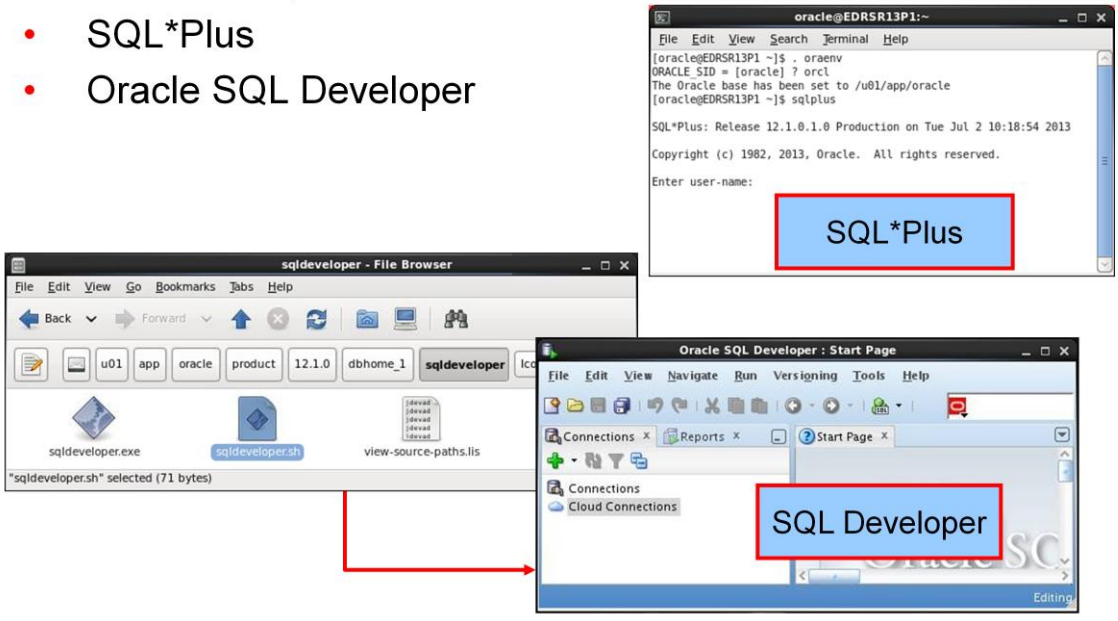


You can communicate with the Oracle Database server by using SQL. The SQL statement is entered by the user or executed in a program. The statement is processed, and the data is returned to the user.

Development Tools for Oracle Database

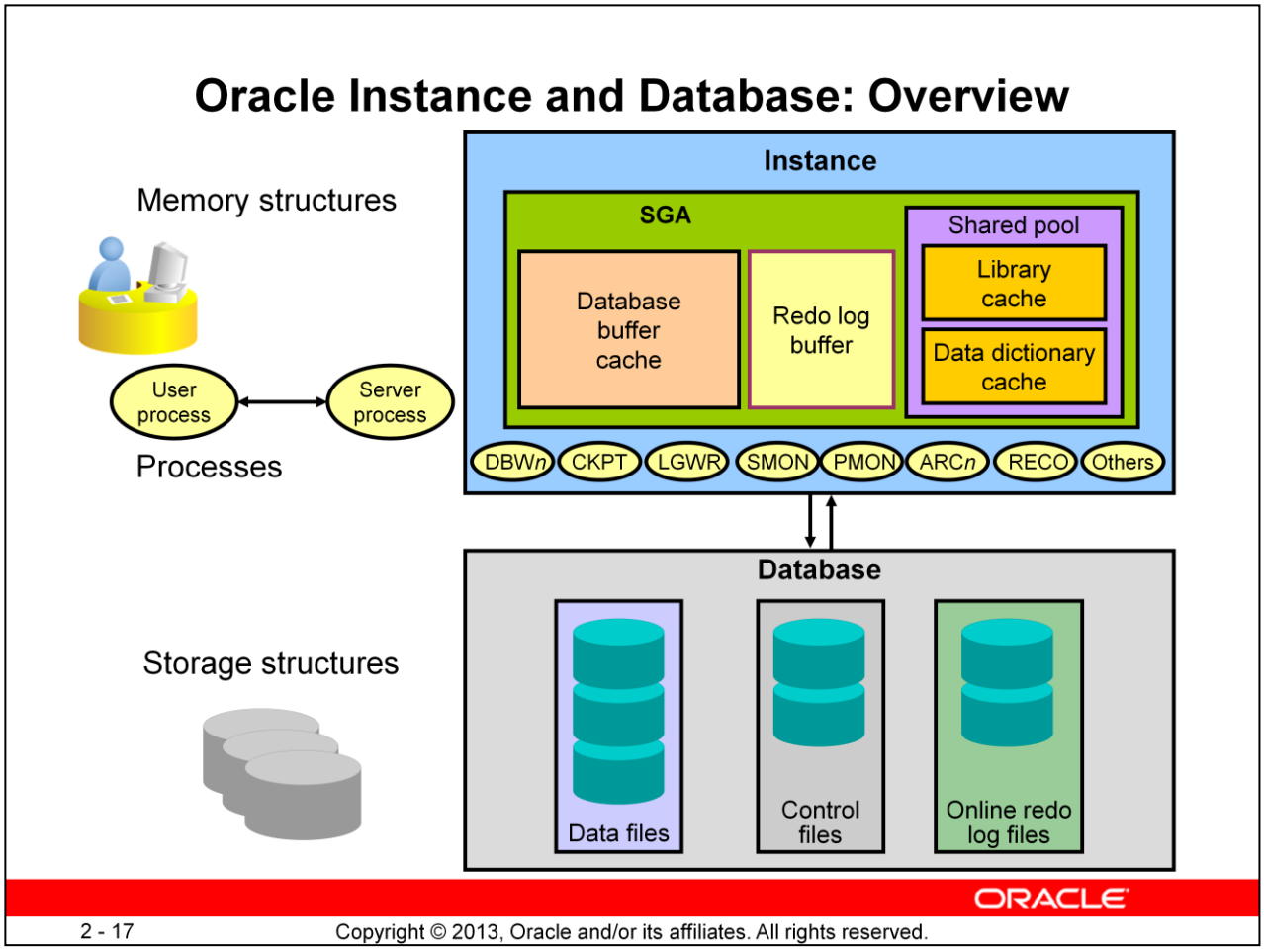
Common development environments for Oracle Database:

- SQL*Plus
- Oracle SQL Developer



- **SQL*Plus:** A command-line tool that is used to run all SQL commands
- **Oracle SQL Developer:** A graphical tool that is used to run all SQL commands

You learn how to use these tools later in the course.



An Oracle database consists of two main components: an instance and a database.

- **The instance:** Consists of the System Global Area (SGA), which is a collection of memory structures, and the background processes that perform tasks within the database. Every time an instance is started, the SGA is allocated and the background processes are started.
- **The database:** Consists of both physical structures and logical structures. Because the physical and logical structures are separate, the physical storage of data can be managed without affecting access to logical storage structures. The physical storage structures include:
  - **Control files:** Where the database configuration is stored
  - **Redo log files:** Have information required for database recovery
  - **Data files:** Where all data is stored

An Oracle instance uses memory structures and processes to manage and access the database storage structures. All memory structures exist in the main memory of the computers that constitute the database server. Processes are jobs that work in the memory of these computers. A process is defined as a “thread of control” or a mechanism in an operating system that can run a series of steps.

The Oracle instance and Oracle database are discussed in detail in later lessons.

Common Tasks of an Oracle Database Administrator

- Installing and updating Oracle Database software
- Creating databases
- Performing upgrades of the database and software
- Starting up and shutting down the instance
- Managing the database's storage structures
- Managing users and security
- Managing schema objects
- Backing up and recovering when necessary
- Proactively monitoring the database and taking preventive or corrective action as required
- Monitoring and tuning performance

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In small-to-midsize database environments, you may be the only person performing these tasks. In large enterprise environments, the job is often divided among several DBAs, each with an area of specialty (such as the database security administrator or database tuning expert).

Tools for Administering an Oracle Database

- Oracle Universal Installer (OUI)
- Database Configuration Assistant (DBCA)
- Database Upgrade Assistant (DBUA)
- Oracle Net Manager
- Oracle Net Configuration Assistant
- Oracle Enterprise Manager
- SQL*Plus
- SQL Developer
- Recovery Manager (RMAN)
- Oracle Secure Backup
- Data Pump
- SQL*Loader

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You can use the following tools for installation and upgrade:

- **Oracle Universal Installer (OUI):** Installs your Oracle software and options; can automatically launch the Database Configuration Assistant to create a database
- **Database Configuration Assistant (DBCA):** Creates a database from Oracle-supplied templates, enabling you to copy a preconfigured seed database (Alternatively, you can create your own database and templates.)
- **Database Upgrade Assistant (DBUA):** Guides you through the upgrade of your existing database to a new Oracle release
- **Oracle Net Manager (netmgr):** Configures network connectivity for your Oracle databases and applications
- **Oracle Net Configuration Assistant (netca):** Is a graphical, wizard-based tool that is used to configure and manage Oracle Network configurations