

## **Class Note: Chapter 1**

# **Introduction to Oracle**

(Updated May 10, 2019)

[The “class note” is the typical material I would prepare for my face-to-face class. Since this is an Internet based class, I am sharing the notes with everyone assuming you are in the class.]

Most everyone has heard the cliché, "information is power." Is this ever true? When you think about it, one of the most important assets of any institution is its information. For example, a typical business must keep track of its customers, orders, product inventory, and employee information for obvious reasons. Additionally, the analysis of pertinent business information can help make a company more competitive. For example, a sales analyst can use current sales data to forecast future sales and identify trends that might help to improve overall business profitability.

## **1.1 Information Management**

In today's world of high technology, computers manage most information because they make it easy to organize, store, and protect valuable data. The proliferation of powerful computers, mobile devices and networks has made it possible for all businesses, large and small alike, to quickly and safely make information readily available to people that require access to it.

### **1.1.1. Databases**

Computers typically store and organize large amounts of information within a database. A database, whether or not a computer manages it, is nothing more than an orderly collection of related information. A database safely stores information and organizes it for fast retrieval. For example, a business can use a database to store tables of customer records, corresponding sales orders, product parts, and employee lists. Various workers can then use the database to efficiently perform their jobs. For example, salespeople can quickly enter or look up sales orders, advertising executives can study and forecast product sales, and warehouse personnel can efficiently manage product inventories.

### **1.1.2. Types of Databases**

Databases come in many varieties. Inverted list, hierarchic, and network database models are older types of database systems that, in general, are inflexible and difficult to work with. These types of database systems were

originally designed primarily for prescribed transactions that input data rather than dynamic environments where data analysis is critical.

The very weaknesses of these earlier systems are exactly why relational database systems now dominate information management systems. Relational databases are easy to understand, design, and build. Relational databases store and present all information in tables, an easily understood concept. Furthermore, relational databases hide the complexities of data access from the user, making application development relatively simple when compared to other types of database systems.

Object-oriented databases are a relatively new type of system that supports the object-oriented development paradigm. The primary goal of object-oriented thinking is to raise the level of abstraction so that it is more natural to design and build an information management system. For example, in an object-oriented database, complex data structures called objects closely model the entities in a business system, while methods match the business operations that act upon the objects in the system. So, rather than store tables of, say, customers, orders, and order line items, a database stores instances of customers and sales order objects. Associated methods stored in the database describe how to add, change, and delete customer and sales order objects.

## **1.2 Database Management Systems**

A database management system (DBMS) is computer software that manages access to databases. A typical multiuser DBMS performs the following tasks, and more:

- A DBMS safely manages shared access to a single database among multiple concurrent users. For example, a DBMS locks data as users add and update information, so that users do not destructively interfere with one another's work.
- A DBMS uses computer resources wisely so that a large number of application users can perform work with fast response times for maximum productivity.
- A DBMS protects database information in such a way that it can reconstruct work lost due to anything from a simple power outage to catastrophic site disasters.

You can purchase any one of several commercially available DBMSs to build and manage databases. The market-leading DBMS in use today is Oracle Corporation's Oracle Data Server, also known simply as Oracle. The latest version of Oracle is Oracle 12c released in 2016, and it is an object-relational database management system

(ORDBMS). That is, Oracle is a database server that offers the capabilities of both relational and object-oriented database systems. The goal of this course is to teach you how Oracle works and how to get started using the software's most typically used features.

### **1.3 Brief History of Oracle Database Products**

Oracle7, originally released in early 1993, set a lofty standard for high-end relational database management systems. Oracle7's many features made it a potent database server for all types of common business applications, including:

- Online transaction processing (OLTP)—applications that process many small update transactions, such as banking, reservation, and order-entry systems
- Decision support systems (DSS)—applications that query targeted information from a database for the purposes of data analysis
- Data warehousing—applications that access large, read-only databases that are specifically optimized for fast access to even the most esoteric bits of information

Oracle8.0, released in the summer of 1997, added many new features to extend the power of Oracle7 and make Oracle suitable for even the most demanding and complex application environments. Oracle8.0 features included data partitioning, object types and methods, large object (LOB) data types, password management, the Recovery Manager utility, and more.

Oracle8i, released in the spring of 1999, enhanced the original release of Oracle8 in two primary areas: data warehousing and Web-based application development. For data warehousing, Oracle8i includes many new features specifically designed to increase the performance of complex query processing, such as materialized views, automatic query rewrite, and function-based indexes. For Web-based application development, Oracle8i ships with a Java VM (virtual machine) so that developers can build all application components using Java (including Java-based stored procedures, functions, and packages), or access existing database information using Java applications. Oracle8i also includes Oracle's Internet File System (IFS), which is essentially a drag-and-drop interface for manipulating database information.

Oracle 9i was the next version in line with Oracle's pursuit to enhance the database in many areas but particularly in terms of support for large customers by increasing performance and scalability but at the same time making the database easier to manage thereby reducing the total cost of ownership (TCO). Oracle 9i outperforms previous versions of Oracle database due to its performance, ease of management, scalability,

security, availability, windows2000 integration, Internet content management, e-commerce integration, packaged applications and business intelligence.

Oracle announced its release of Oracle10g in 2003. Most of the fanfare on this release centers on the grid capabilities of Oracle's latest offering (hence the "g" on Oracle10g). In general, Oracle 10g is a superset of Oracle9i, containing additional functionality. Oracle Database 10g is the first database designed for Enterprise Grid Computing. Oracle Database 10g cuts costs while providing the highest quality of service. It allows Information Technology (IT) department to rapidly respond to the needs of the business while greatly lowering risk. Above all, it's easy to deploy and manage. Consolidation and integration of traditionally disparate business intelligence systems into a single integrated engine is further enhanced in Oracle Database 10g. Database size limits have been raised to millions of terabytes. Business Intelligence applications can be consolidated alongside transactional applications using Real Application Clusters automatic service provisioning to manage resource allocation. Oracle10g contains enhancements in virtually all areas of the database server, resulting in an Oracle database with improvements in scalability, availability, performance, manageability, multimedia datatype support, and functionality.

Oracle released its Oracle 11g database in 2007. Oracle claimed that it made database infrastructure far more efficient, resilient, and manageable. For example, very compelling new features in the realm of partitioning ease the design and management of partitioned tables immensely. It includes new features such as Real Application Testing, the Database Replay tool, SQL Performance Analyzer, Edition-based Redefinition.

Oracle released its new version of 12c database product line in 2013. It claimed the following new features for the new database management system:

1. New Multitenant Architecture for Database Consolidation on the Cloud;
2. Automatic Data Optimization;
3. Defense-in-Depth Security;
4. Maximum Availability for Database Clouds;
5. Efficient Database Management;
6. Simplifying Analysis of Big Data;

Oracle released its Oracle 18c database in 2018, aiming to capitalize the needs of cloud applications.

### 1.3.1 Oracle License Options

Eastern Illinois University has a corporate license of Oracle database. Thus, it is legal for our students to use any of its available versions of database for learning purpose.

Over the years, Oracle database was available in several different license formats for its various versions of Oracle 7, 8, 8i, 9i, and 10g:

#### *Standard Edition*

This is the basic version of Oracle that includes the most commonly used options and features.

#### *Enterprise Edition*

This is the complete version of Oracle that provides multiuser access to all features, including features for high-end database processing, Web-based database access, and data warehousing.

#### *Personal Edition*

This is a single-user development database license that provides access to most of the Oracle Enterprise Edition features.

#### *Lite Edition*

This is an Oracle-compatible database designed for use in mobile computing environments; Oracle Lite is not discussed in this book.

As of May 10, 2019, Oracle has the following versions for downloading:

Version	Release Edition
Oracle 12c	Enterprise Edition and Standard Edition
Oracle 11g	Enterprise Edition, Standard Edition and Express Edition

For the purpose of this course, any of the above software editions will be suffice since we focus on the core technology, particularly the structured query language (SQL) access to the database.

Oracle is available on most popular operating systems, including Windows, Unix and Linux. You will need to download the database version that matches your hardware and operating system. For example, if you have a Windows based laptop, you need to find out if it is a 32 bit or 64 bit system before you choose the download.

## 1.4 Oracle Fundamentals

Before proceeding to the next chapter to install Oracle database on your computer, you should understand some of the basic terms related to Oracle and relational database systems. If you already have experience working with Oracle, the following sections contain information that you might already know.

### 1.4.1. Databases and Instances

An Oracle database is a collection of related operating system files that Oracle uses to store and manage a set of related information. Structurally, an Oracle database has three primary types of files: data files, log files, and control files. Subsequent class notes will explain more about the purpose and management of each type of database file.

A database instance is the set of operating system processes and memory areas that Oracle database uses to manage database access. You cannot access an Oracle database until after you "start up" an instance that associates itself with the physical database files.

**A Note:** Sometimes people use the terms database service or server as synonyms for a database instance. For now this is all that you need to understand about Oracle databases and instances. You'll learn more about databases and instances later in this course.

### 1.4.2. Tables

Tables are the basic data structure in any relational database. A table is nothing more than an organized collection of records, or rows, that all have the same attributes, or columns. Figure 1-1 illustrates atypical CUSTOMERS table in a relational database. Notice that each customer record in the example CUSTOMERS table has the same attributes, including an ID, a company name, a last name, a first name, and so on. For now, this is all that you need to understand about tables. You'll learn more about building and using tables in an Oracle database later in the course.

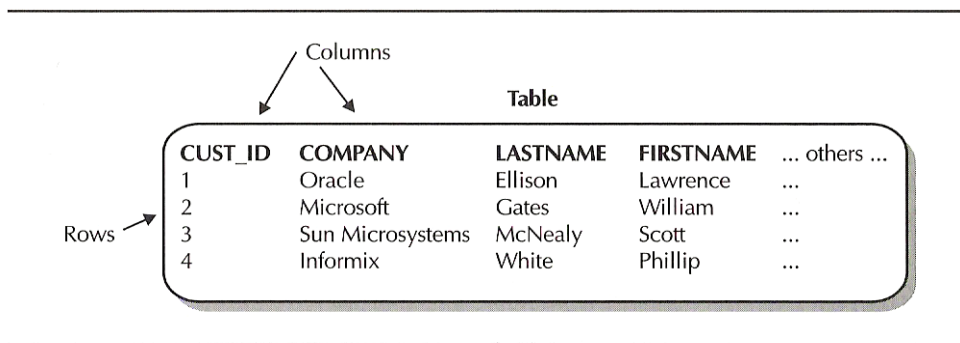
## 1.5 SQL and Data Access

To work with a commercial relational database system, such as Oracle, applications must use Structured Query Language (SQL) commands. SQL (pronounced both "sequel"

and "ess-que-ell") is a simple command language that allows database administrators, developers, and application users to:

- Retrieve, enter, update, and delete database data
- Create, alter, and drop database objects, such as tables

In fact, the only way that an application can interact with an Oracle database is to issue a SQL command. Sophisticated graphical user interfaces might hide the complexities of SQL commands from users, but under the covers, an application always communicates with Oracle using SQL.



**FIGURE 1.1.** *A table is a set of records with the same attributes*

If you currently do not have any experience with SQL, don't panic. SQL is a relatively simple language to learn because you build SQL commands by combining intuitive keywords and clauses that ask Oracle to perform specific tasks. For example, the following SQL statement is a simple query that retrieves specific columns of all rows in the PARTS table.

```
SELECT id, description, unitprice FROM parts;
```

<u>ID</u>	<u>DESCRIPTION</u>	<u>UNITPRICE</u>
1	Fax Machine	299
2	Copy Machine	4895
3	Laptop PC	2100
4	Desktop PC	1200
5	Scanner	99

At this point, you don't need to know much more about SQL. SQL will be the primary content for this course. In this course, you will use SQL statements to access Oracle and perform tasks. We will provide you with a complete introduction to the basics of the most commonly used SQL commands.

## 1.6 Database Users and Sessions

Oracle is a DBMS that manages shared access to a database among one or more users. To provide database access to someone, you or an administrator must create a database user account for the person. To perform work with Oracle, you must start an application and establish a connection to Oracle using your account's username and password. A database session starts when you establish a connection to an Oracle database, and ends when you disconnect. You will learn more about database users and basic database security later in this course.

## 1.7 SQL\* Plus

One type of application that you can use to enter SQL commands and interact with an Oracle database system is an ad hoc query tool, such as Oracle's SQL\* Plus. SQL\* Plus provides you with a very simple command-line interface that you can use to enter SQL statements and then view the results of each statement execution. In effect, SQL\* Plus lets you talk with an Oracle database server so that you can either query the database for information, or input, update, or delete data in the database.

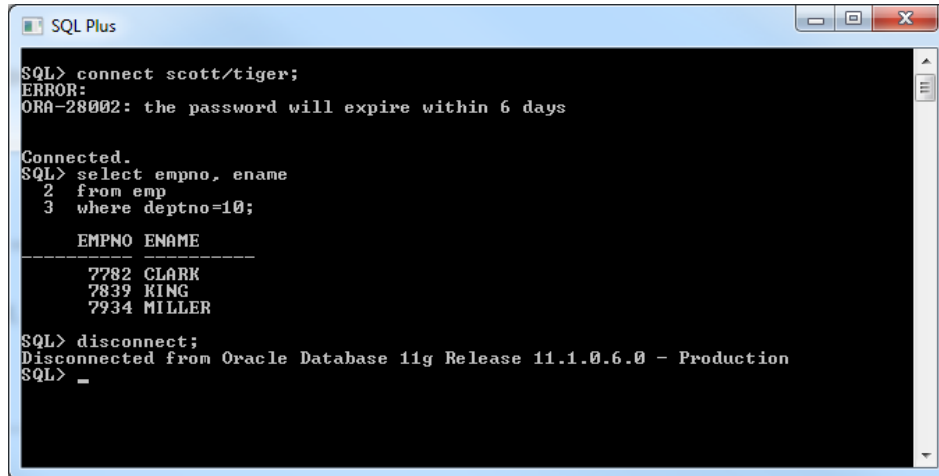
For example, the following commands demonstrate a simple SQL\* Plus session that connects to an Oracle database, retrieves some data from the CUSTOMERS table, and then terminates the session by disconnecting from the database.

```
SQL> CONNECT scott/tiger;
Connected.
SQL> SELECT empno, ename
2   FROM emp
3   WHERE deptno = 10;

EMPNO ENAME
-----
7782  CLARK
7839  KING
7934  MILLER
SQL> DISCONNECT;
Disconnected from Oracle Enterprise Edition
```

The following screen shot shows how it looks like on an actual SQL\* Plus window. More details will be taught in next class.





```
SQL Plus
SQL> connect scott/tiger;
ERROR:
ORA-28002: the password will expire within 6 days

Connected.
SQL> select empno, ename
2  from emp
3  where deptno=10;

-----
EMPNO ENAME
-----
 7782 CLARK
 7839 KING
 7934 MILLER

SQL> disconnect;
Disconnected from Oracle Database 11g Release 11.1.0.6.0 - Production
SQL> _
```

Figure 1.2 Screen shot of using Oracle SQL\* Plus

The examples and practice exercises throughout the chapters in this course use SQL\* Plus to communicate with Oracle. Next week, we will begin teaching you how to get started with SQL\* Plus.

## 1.8 Onward

Oracle is a powerful product that you will use to manage information. Now that you have a general idea of what Oracle is all about, we will present essential Oracle concepts and corresponding practice exercises so that you can quickly become proficient using Oracle for information management.