SQL Course

Introduction

An **I**ntroduction **T**o **D**atabases
Objectives

- This module defines **what a database is** and describes the **central concepts of a database**.
- It also explains the benefits of using database technology compared to traditional file processing techniques.

"**Database** is a logically coherent collection of related data". It should provide:

- **A single source of information** for user groups and multiple applications.
- **Independence** from the way information is actually stored in files on disk.
- **Concurrency Control** so that concurrent applications or users operations will appear to happen one after another (i.e. no interference between users or applications operating on data at the same time).
- **Data integrity** control. This controls the type, domain values and relationships between values of the information stored within a database.
- **Data security**. This guards the privacy of information stored in the database.

- A database uses a set of concepts that describe the structure of the information contained within it. These set of concepts differ between different types of database. A **Data Model** is the set of concepts characterising the way in which data is organised within a database.
- A **Database Management System (DBMS)** is a collection of programs that enable users to create and maintain a database.
- A DBMS is a general purpose software system that enables users to define, construct and manipulate databases for various applications.
- A DBMS usually supports one particular data model. Therefore most database management systems are described by the data model they support.

Hierarchical

This type of database represents data as hierarchical tree structures. Each hierarchy represents a number of related records. Although most hierarchical databases have a query language, these query languages differ from implementation to implementation and are not standardised.

Network

This type of database represents data as record types and also represents a limited kind of relationship between records. The network data model (also knows as CODASYL DBTG Model), has an associative record-at-a-time language that must be embedded in an application programming language e.g. COBOL.

Relational

This type of database represents information as a collection of Tables. Most relational DBMSs support a high level query language called SQL (Structured Query Language).

Object Oriented

This type of database represents information as objects which contain both data and operations which can process that data. A standard for an Object Oriented data model has not yet been agreed on but proposals of standards have already been made and agreement is expected in the next few years.

Databases were first designed to allow applications and users to share information in a controlled manner. This concurrent control of database retrievals and operations is still the major advantage of using databases. However several other important benefits can be summarised from using database management systems:

- **Isolation of application programs and data:** By not embedding the storage and retrieval operations in an application, many users and applications may access the same information.
- **Denial of Unauthorised Access** to information held within a database.
- **Representation of complex data-types and relationships** among data.
- **Enforcement of integrity constraints** on data (i.e. constraints on the type information or values that a piece of data can have).
- Provide **automatic backup and recovery** of information stored in the database.