



ANALYTIXLABS

MS SQL Server

Module 1

Relational Database Management System (RDBMS)

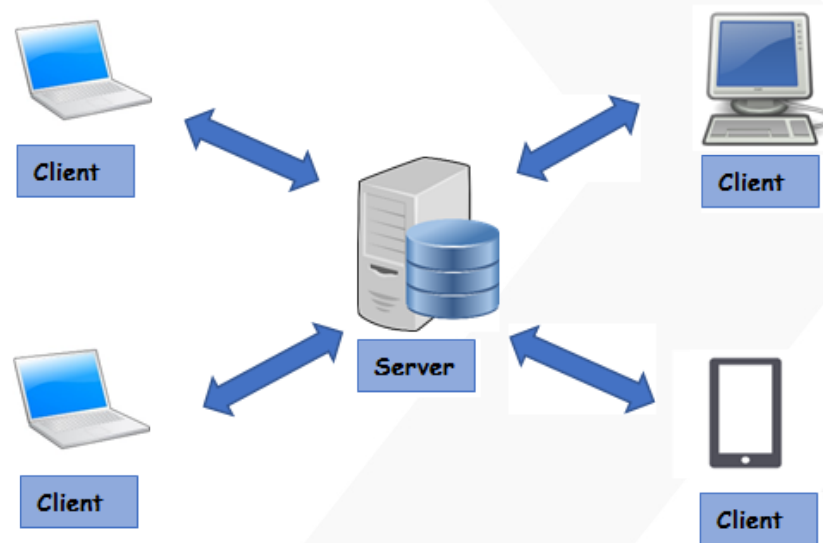
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Module 1: Introduction to RDBMS

- Lesson 1
 - Understand Server, DB, DBMS, RDBMS
 - Database Design and Structure; Key RDBMS vendors
- Lesson 2
 - Understanding Entity Relationship Diagram
 - Introduction to keys and constraints in a database
 - Table relationships and understanding Meta Data
- Lesson 3
 - Introduction to Structured Query Language(SQL)
 - MS SQL Server and SQL Server Management Studio (SSMS)

What is a Server?

A computer, device or program that is dedicated to manage network resources for carrying out some specific tasks. The purpose of a server is to share data, resources and distribute work.



DB, DBMS & RDBMS?

Database (DB) – It's a organized collection of data stored in a standardized format.

Relational Database – A tabular database in which data is stored in tables with relationships to other tables.

Database Management System (DBMS) – It's a software platform that hosts or defines a database on a hardware (computer system). It enables users to store, modify and extract information/data from the database. Supports a query language (SQL).

Relational Database Management System (RDBMS) – It's a database management system based on the relational model.

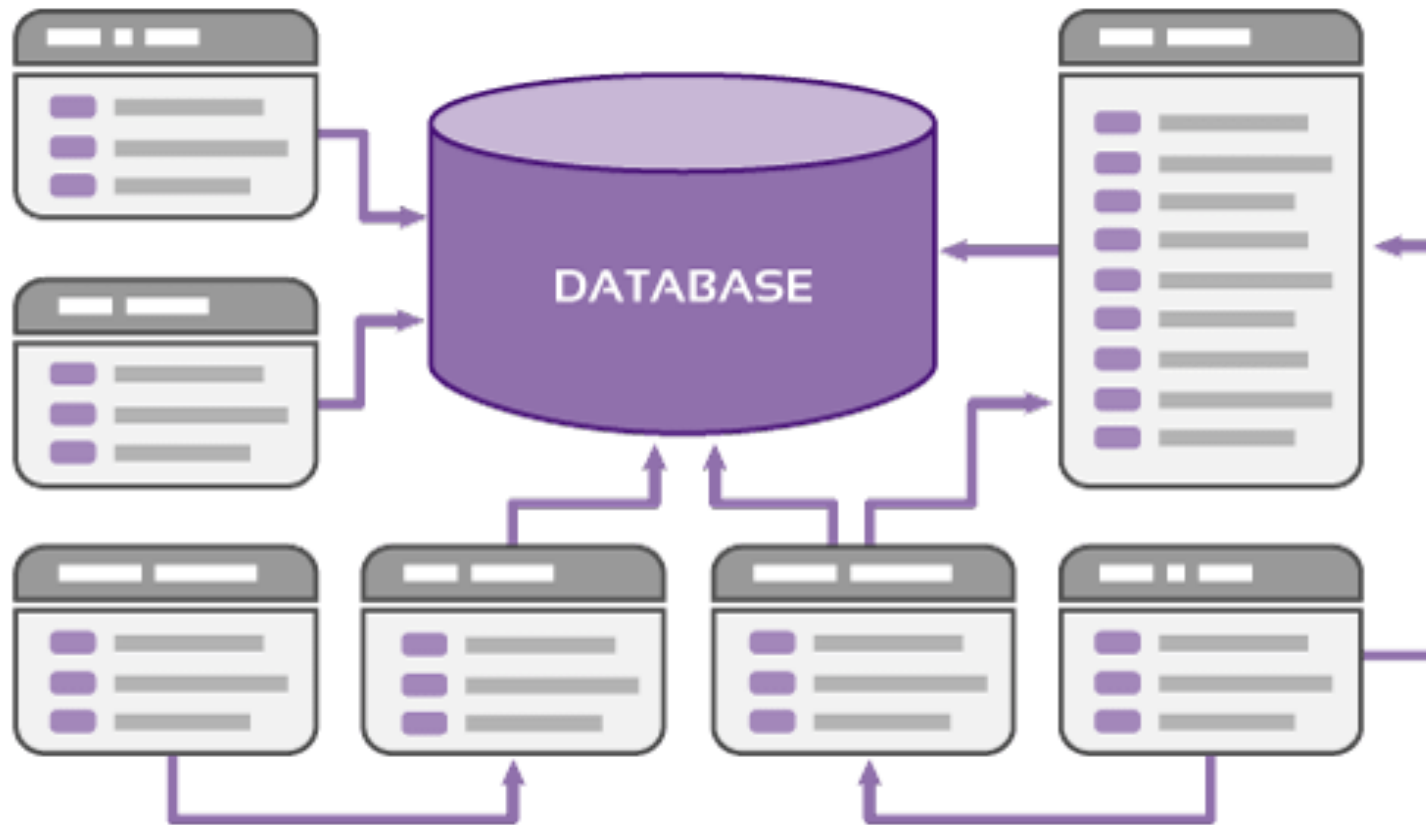
Different relational databases that exist in market



ORACLE®



Database Structure



Database

A database is a organized collection of information in a standardized format.

Database Terminology

- Table – A list of related information presented in a column/row format.
- Row is referred to as **Record**.
- Column in a table is a category of information referred to as a **Field**.

Database design

The organization of data according to a database model where database designer determines what data must be stored and how the data elements interrelate.

A general process...

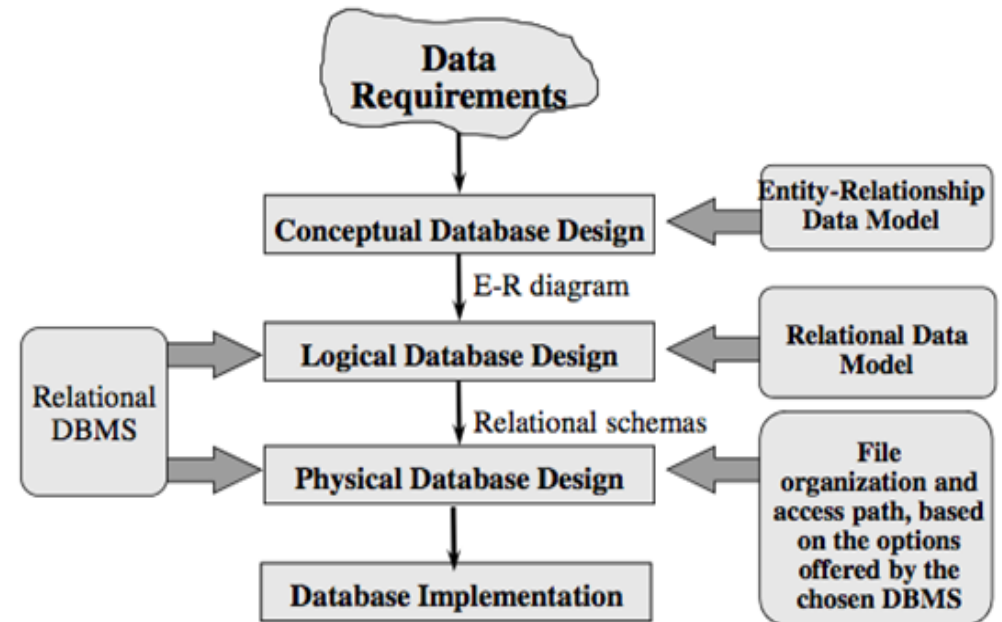
Step 1: Define the Purpose of the Database (Requirement Analysis).

Step 2: Gather Data, Organize in tables and Specify the Primary Keys.

Step 3: Create Relationships among Tables.

Step 4: Refine & Normalize the Design.

Step 5: Database Implementation.



ER Model – Basic Concepts

ER model defines the conceptual view of a database and is considered as a good option for designing databases. It works around real-world entities and the associations among them.

ER model mainly comprise of

1. Entity – An entity can be a real-world object, a generalized class of people, places or things for which data is collected, stored and maintained. E.g. Employee, Customer, Vehicle, House etc.
2. Attributes – These are characteristics of the entities. All the entities have some attributes or properties that give them their identity.
3. Keys – A field or set of fields in the records that can be used to identify the record.

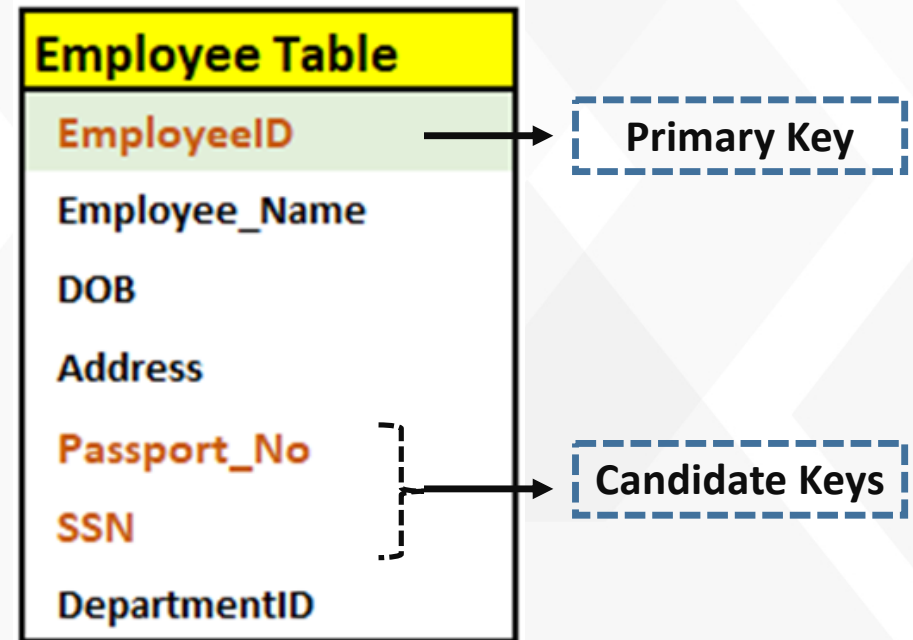
Types of Attributes

- **Simple attribute** – Atomic values, which cannot be divided further. e.g. a student's phone number is an atomic value of 10 digits.
- **Composite attribute** – Made of more than one simple attribute. e.g. a student's complete name may have first_name and last_name.
- **Derived attribute** – Derived attributes are the attributes that do not exist in the physical database, but their values are derived from other attributes present in the database. e.g. age can be derived from data_of_birth.
- **Single-value attribute** – Single-value attributes contain single value e.g. Social_Security_Number.
- **Multi-value attribute** – Multi-value attributes may contain more than one values. e.g. a person can have more than one phone number, email_address, etc.

Entity-Set and Keys

Key is an attribute or collection of attributes that uniquely identifies an entity among entity set. e.g. the email_id of a student makes him/her identifiable among students.

- **Super Key** – A set of attributes (one or more) that collectively identifies an entity in an entity set.
- **Candidate Key** – A minimal super key is called a candidate key. An entity set may have more than one candidate key.
- **Primary Key** – A primary key is one of the candidate keys chosen by the database designer to uniquely identify the entity set.



Primary Key

A primary key is a special relational database table column (or combination of columns) designated to **uniquely** identify all table records.

A primary key's main features are:

- There can be only one primary key in a table.
- It must contain a unique value for each row of data.
- It cannot contain null values.

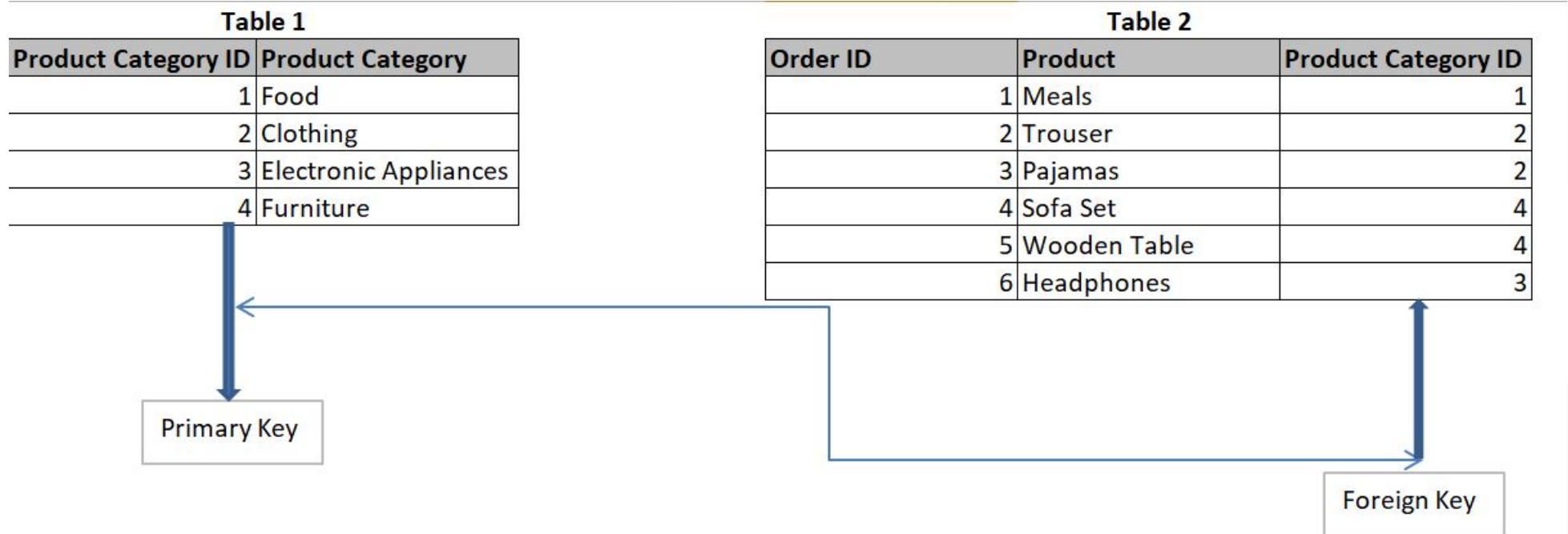
Foreign Key

A foreign key is a field (or collection of fields) in one table that refers to the PRIMARY KEY in another table. It is key element in the relational database which helps to establish a link between multiple tables.

A foreign key's main features are:

- There can be only one/more foreign keys in a table; which may consist of single or multiple fields.
- It prevents invalid data from being inserted into the foreign key column, as it has to be one of the values contained in the table it points to.
- The table containing the foreign key is called the child table, and the table containing the primary key is called the referenced or parent table.

Primary and Foreign key Example



Relationships

The power of relational database lies in the relationship that can be defined between tables. A database consisting of independent and unrelated tables serves little purpose.

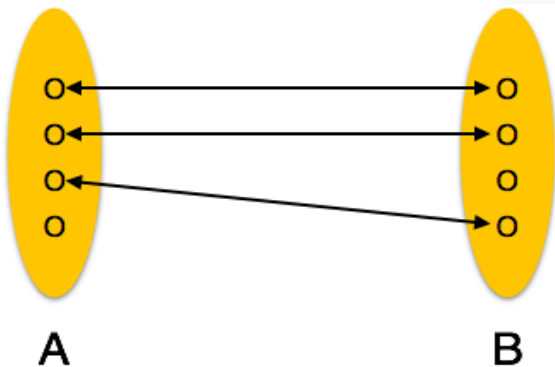
The types of relationships include:

1. **One to One** – One entity from entity set A can be associated with at most one entity of entity set B and vice versa.
2. **One to Many** – One entity from entity set A can be associated with more than one entities of entity set B however an entity from entity set B, can be associated with at most one entity.
3. **Many to One** – More than one entities from entity set A can be associated with at most one entity of entity set B, however an entity from entity set B can be associated with more than one entity from entity set A.
4. **Many to Many** – One entity from A can be associated with more than one entity from B and vice versa.

Relationships (continued..)

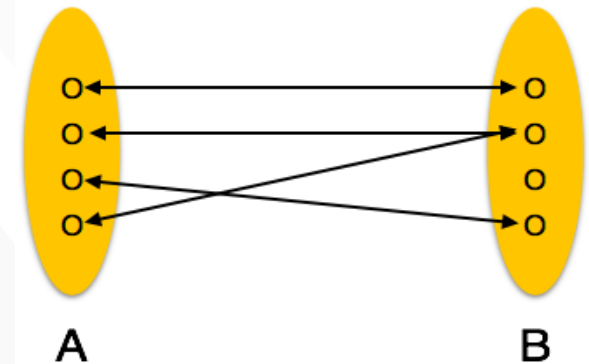
One to One

Order table
+
Return table



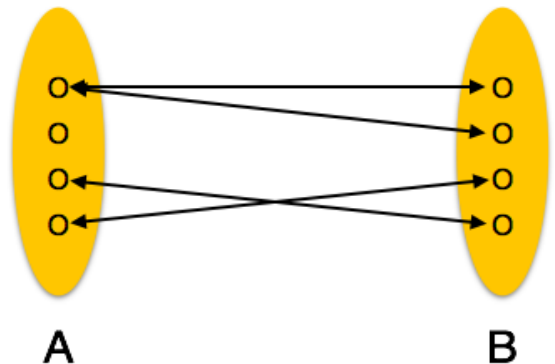
Many to One

Order table
+
Customer table



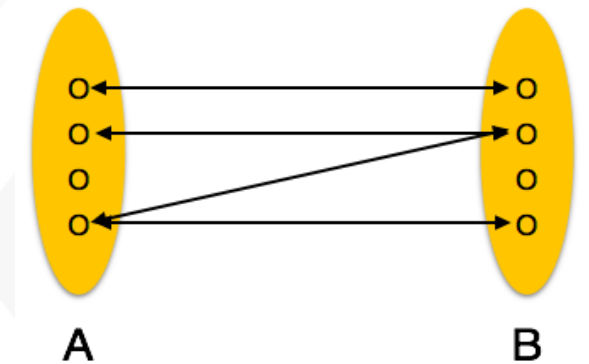
One to Many

Customer table
+
Order table



Many to Many

Student table
+
Subject table



Relationships (continued..)

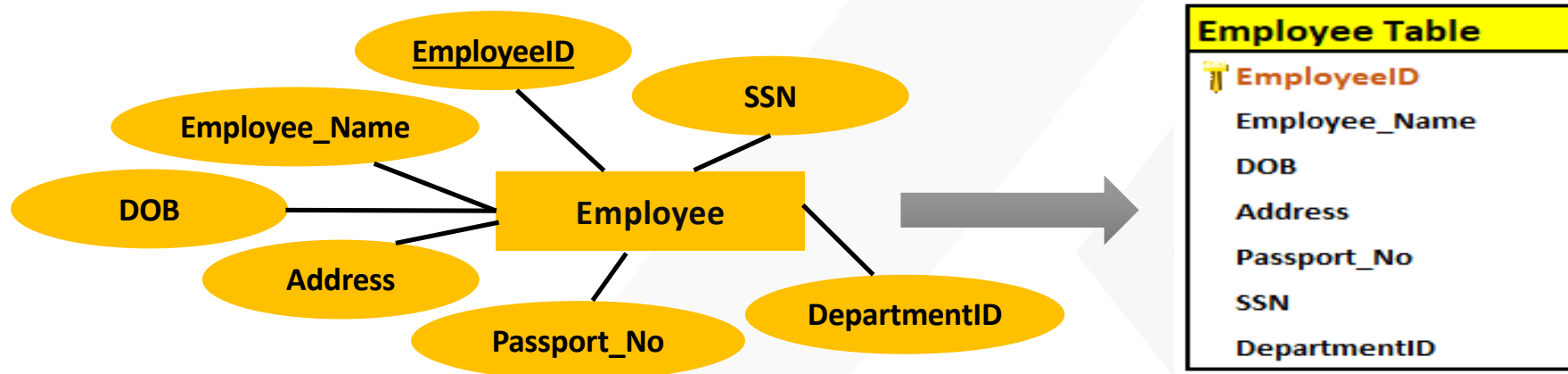
One to One Relationship				
Person Details table		Passport Details		
PersonID	Full Name	Passport ID	Person ID	
1	Varun	Z1234RT	1	
2	Akanksha	QW345TY	2	
3	Deepika	Z00FR56	3	
One to Many RelationShip				
Owner details		Address Details		
Person Name	Address ID	Address ID	Address	
Varun	1	1	Elite Premier, bangalore	
Akshit	1	2	Pristine woods, WhiteField, bangalore	
Jhanvi	2	3	Brigade Panorama	
Many To Many RelationShip				
Customer Details		Product Details		
Customer ID	Product ID	Product Name	Product ID	Customer ID
1	1	chairs	1	1
2	1	chairs	1	2
3	3	Table	2	2
2	2	Table	2	3
2	1	Appliance	3	1
1	3	Appliance	3	3

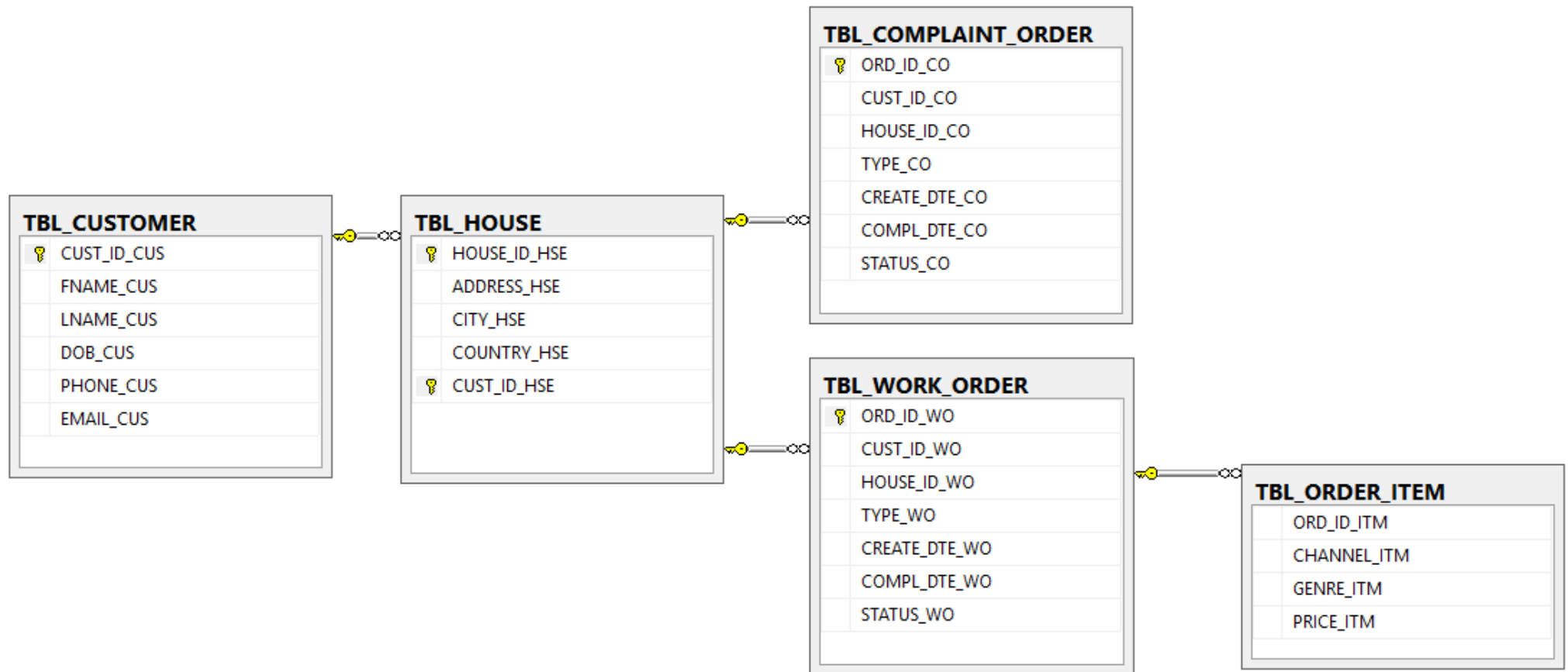
ER Model to Relational Model

ER Model, when conceptualized into diagrams, gives a good overview of entity-relationship, which is easier to understand. ER diagrams can be mapped to relational schema.

Mapping Entities:

- Create table for each entity.
- Entity's attributes should become fields of tables with their respective data types.
- Declare primary key.





Example of physical tables in DB

Customer tables contains basic customer details, and order table has information of the orders placed by the customers that exist in customer table.

Customer Table

cust_id_cust	name_cust	email_cust	phone_cust
C10001	Anderw M	anderw_m@abc.com	9896740417
C10002	Andrina Anzel	andrina_anzel@abc.com	9850495677
C10003	John Methew	john_methew@abc.com	9847534873
C10004	Elena Mark	elena_mark@abc.com	9873987535
C10005	Jorge Fenn	jorge_fenn@abc.com	9830531121

Order Table

ord_id_ord	cust_id_ord	date_ord	salesamt_ord
O10001	C10001	July 01' 2017	\$485
O10002	C10002	July 02' 2017	\$475
O10003	C10003	July 03' 2017	\$406
O10004	C10004	July 04' 2017	\$368
O10005	C10003	July 05' 2017	\$311
O10006	C10004	July 06' 2017	\$414
O10007	C10005	July 07' 2017	\$395

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C10004	Elena Mark	elena_mark@abc.com	9873987535
C10005	Jorge Fenn	jorge_fenn@abc.com	9830531121

Order Table

ord_id_ord	cust_id_ord	date_ord	salesamt_ord
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O10004	C10004	July 04' 2017	\$368
O10005	C10003	July 05' 2017	\$311
O10006	C10004	July 06' 2017	\$414
O10007	C10005	July 07' 2017	\$395

Foreign Key

Primary Key

Meta Data

It is the data about the Data. It gives information on the design of the data.

- What are the fields?
- What is the data type of each field?
- What is the size of each field?

Customer Table

cust_id_cust	name_cust	email_cust	phone_cust
C10001	Anderw M	anderw_m@abc.com	9896740417
C10002	Andrina Anzel	andrina_anzel@abc.com	9850495677
C10003	John Methew	john_methew@abc.com	9847534873
C10004	Elena Mark	elena_mark@abc.com	9873987535
C10005	Jorge Fenn	jorge_fenn@abc.com	9830531121

Meta Data

	Column Name	Data Type	Allow Nulls
🔑	cust_id_cust	int	<input type="checkbox"/>
	Name_Cust	nvarchar(40)	<input type="checkbox"/>
▶	Email_cust	nvarchar(40)	<input checked="" type="checkbox"/>
	Phone_cust	nvarchar(20)	<input checked="" type="checkbox"/>
			<input type="checkbox"/>

Introduction to SQL

SQL (Structured Query Language) is a database language designed for managing data in relational database management systems.

Today almost all RDBMS use **SQL** as the standard database query language. SQL is used to perform all types of data operations in RDBMS.

- `insert into STUDENT (Name , Number, SchoolId)
values ('John Smith', '100005', 1)`
- `select SchoolId, Name from SCHOOL`
- `select * from SCHOOL where SchoolId > 100`
- `update STUDENT set Name='John Wayne' where StudentId=2`
- `delete from STUDENT where SchoolId=3`

Using SQL one can...

- create new databases
- create new tables in a database
- create views in a database
- insert records in a database
- update records in a database
- delete records from a database
- create stored procedures in a database
- retrieve data from a database (tables/views)
- set permissions on tables, procedures, and views.
- A lot more....

SQL commands are mainly categorized into four categories

1. **DDL (Data Definition Language)** – SQL commands that can be used to define the database schema. It deals with descriptions of the database schema and is used to create and modify the structure of database objects in database.
2. **DML (Data Manipulation Language)** – The SQL commands that deals with the manipulation of data present in database belong to DML or Data Manipulation Language and this includes most of the SQL statements.
3. **DCL (Data Control Language)** – DCL includes commands such as GRANT and REVOKE which mainly deals with the rights, permissions and other controls of the database system.
4. **TCL (transaction Control Language)** – TCL commands deals with the transaction within the database.

DDL (Data Definition Language)

The Data Definition Language manages table and index structure. Following are the statements used in DDL

1. **CREATE** is used to create the database or its objects (like table, index, function, views, store procedure and triggers).
2. **DROP** is used to delete existing objects from the database.
3. **ALTER** is used to alter the structure of the database.
4. **TRUNCATE** is used to remove all records from a table, including all spaces allocated for the records are removed.
5. **RENAME** is used to rename existing object in the database.
6. **COMMENT** is used to add comments to the data dictionary.

DML (Data Manipulation Language)

The SQL commands that deals with the manipulation of data present in database belong to Data Manipulation Language and this includes most of the SQL statements.

1. **SELECT** is used to retrieve data from the a table.
2. **INSERT** is used to insert data or new records into a table.
3. **UPDATE** is used to update existing data within a table.
4. **DELETE** is used to delete records from a database table.

DCL (Data Control Language)

Data Control Language includes commands which deals with the access management i.e. rights, permissions and other controls of the database system.

1. **GRANT** gives user's access privileges to database.
2. **REVOKE** withdraw user's access privileges given by using the GRANT command.

TCL (Transaction Control Language)

TCL commands deals with the transaction within the database.

1. **COMMIT** commits a Transaction.
2. **ROLLBACK** rollbacks a transaction in case of any error occurs.
3. **SAVEPOINT** sets a save point within a transaction.
4. **SET TRANSACTION** specify characteristics for the transaction.

MS SQL Server

Relational Database Management System (RDBMS) developed by Microsoft. It is a highly scalable product that can run on anything from a single laptop, to a network of high-powered cloud servers.

Like all major RBDMS, SQL Server supports ANSI SQL, the standard SQL language.

The newest version is “SQL Server 2019”

We have different editions of SQL Server namely Enterprise, Standard, Web, Business Intelligence etc. where [SQL Server Express is free to download and use](#)

MS SQL Server consists of

- **Database Engine** is the core MS SQL Server technology that creates and drives relational databases; it is the core service for storing, processing, and securing data. It doesn't have any graphical interface; it is just a service running in the background of your computer (preferable on the server).
- **Management Studio** is graphical tool for configuring and viewing the information in the database. It can be installed on the server or on the client (or both).

and lots of other components.....

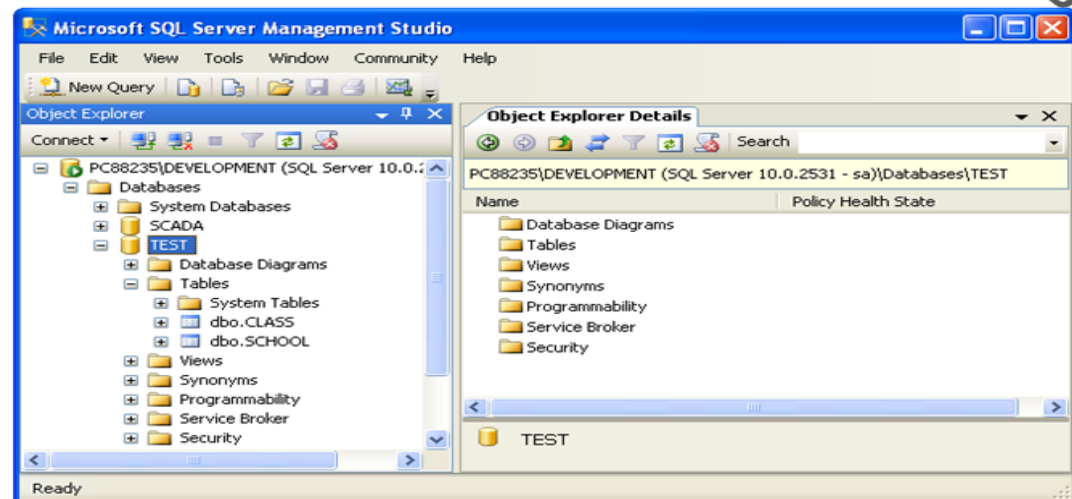


Database Engine



A Service running on the computer in the background

Management Studio 



A Graphical User Interface to the database used for configuration and management of the database

SQL Server Management Studio (SSMS)

SSMS is a GUI tool included with SQL Server for configuring, managing, and administering all components within MS SQL Server. The tool includes both script editors and graphical tools that work with objects and features of the server.

Version of SQL Server Management Studio is also available for SQL Server Express Edition, for which it is known as SQL Server Management Studio Express.

File Edit View Query Project Debug Tools Window Help

New Query | fact_trans

AdventureWorks2012 | Execute | Debug

Object Explorer

- MANUJKS (SQL Server 11.0.2100 - MANUJKS\adm)
 - Databases
 - System Databases
 - AdventureWorks2012
 - Database Diagrams
 - Tables
 - System Tables
 - FileTables
 - dbo.AWBUILDVersion
 - dbo.DatabaseLog
 - dbo.ErrorLog
 - HumanResources.Department
 - HumanResources.Employee
 - HumanResources.EmployeeDepart
 - HumanResources.EmployeePayHis
 - HumanResources.JobCandidate
 - HumanResources.Shift
 - Person.Address

SQLQuery1.sql - M...NUJKS\admin (52))*

```
SELECT * FROM [HumanResources].[Employee];
```

100 %

Results Messages

	BusinessEntityID	NationalIDNumber	LoginID	OrganizationNode	OrganizationLevel	JobTitle
1	1	295847284	adventure-works\ken0	NULL	NULL	Chief Executive Officer
2	2	245797967	adventure-works\tem0	0x58	1	Vice President of Engineering
3	3	509647174	adventure-works\rob0	0x5AC0	2	Engineering Manager
4	4	112457891	adventure-works\rob0	0x5AD6	3	Senior Tool Designer
5	5	695256908	adventure-works\gail0	0x5ADA	3	Design Engineer
6	6	998320692	adventure-works\jos0	0x5ADE	3	Design Engineer
7	7	134969118	adventure-works\dylan0	0x5AE1	3	Research and Development M

Solution Explorer

- Solution 'Solution1' (0 projects)
 - Miscellaneous Files
 - SQLQuery1.sql

Properties

Current connection parameters

Aggregate Status

- Connection failure
- Elapsed time: 00:00:00.285
- Finish time: 8/3/2018 1:06:46 AM
- Name: MANUJKS

Key Take Away..

- Server
- RDBMS System
- Entity Relationship Diagram (ERD)
- Keys and Constraints
- Table Relationships
 - One to One; One to Many; Many to Many
- Introduction to Structured Query Language (SQL)
- Categories of SQL statements (DDL, DML, DCL, TCL)
- MS SQL Server
- SQL Server Management Studio (SSMS)