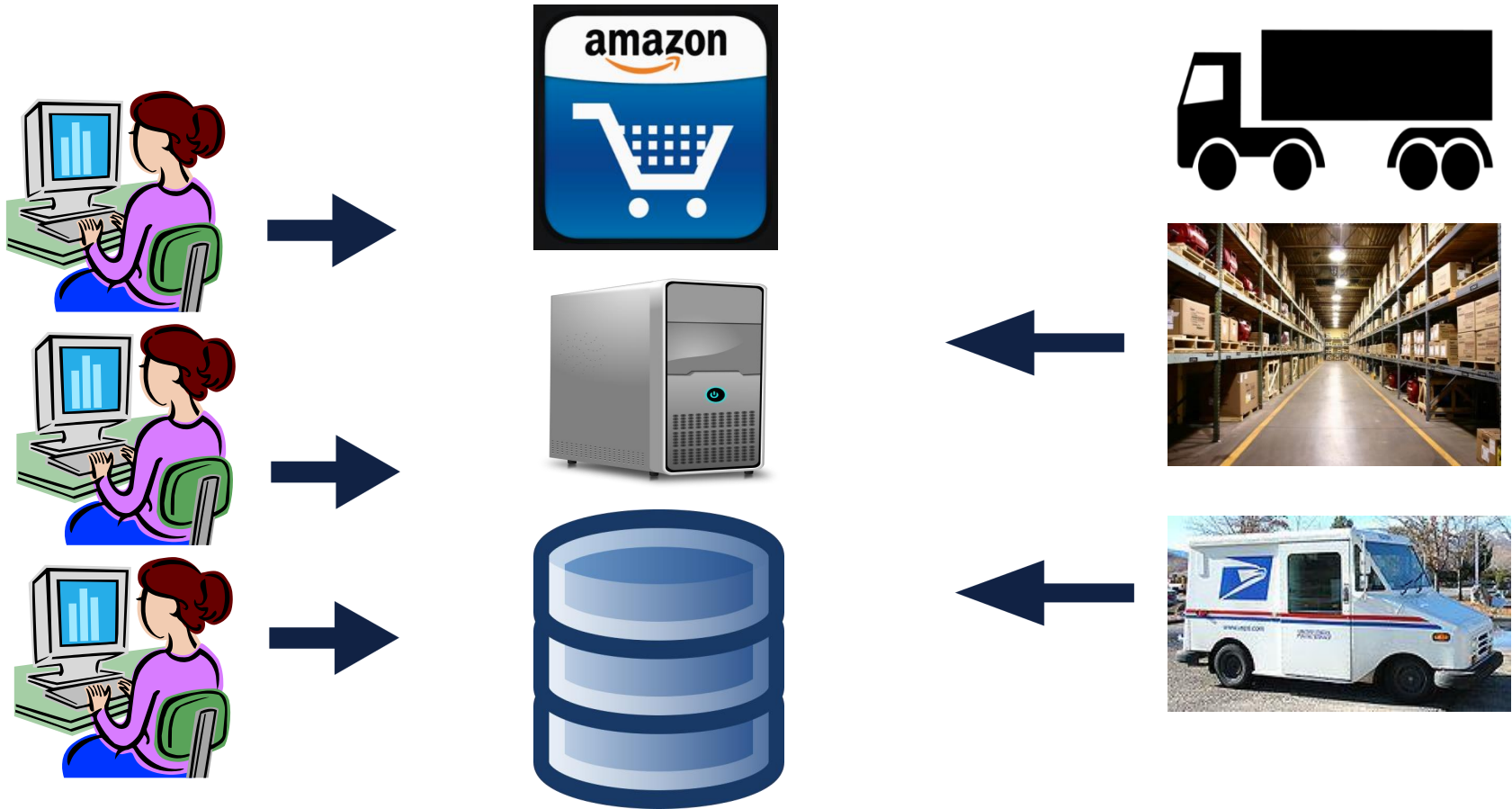


Bank system



Web store (eCommerce)



Database

A **database** is an organized collection of data. It is the collection of schemas, tables, queries, views, stored procedures, and other objects.

A **database management system (DBMS)** is a computer software application that interacts with the user, other applications, and the database itself to capture and analyze data.

Relational database management system (RDBMS) is a type of dbms having relationships between the tables using indexes and different constraints like primary key, foreign key etc.

Table

A **table** is a collection of related data held in a structured format within a database. It consists of columns, and rows.

CustomerId	FirstName	LastName	Email	Phone	AltPhone	FaxNumber	ZipCode	NewsLetter
1	John	Smith	John@gmail.com	703-543-3302	703-543-3302	NULL	22201	1
2	Jeremy	Smith	Jeremy@gmail.com	723-543-3302	NULL	NULL	22203	0
3	Mark	Long	MarkLong@Yahoo.com	722-366-5588	NULL	NULL	22031	1
4	Bob	James	bob@microsoft.com	703-366-9632	NULL	703-455-9632	22221	0
5	Adam	Marcos	adam@Marcos.com	703-566-0000	NULL	703-366-0000	22001	1

Database design

Customers + Schedules relationship

CustomerId	FirstName	LastName	Email	Phone	ZipCode	ScheduleDescription	DateNeeded	JobType
1	John	Smith	John@gmail.com	703-543-3302	22201	Kitchen remodel needed	2013-10-10	Remodeling
2	Jeremy	Smith	Jeremy@gmail.com	723-543-3302	22203	Decorating help for dinig room	2013-10-15	Decorating
3	Mark	Long	MarkLong@Yahoo.com	722-366-5588	22031	Kitchen remodel needed	2015-11-29	Remodeling
3	Mark	Long	MarkLong@Yahoo.com	722-366-5588	22031	Garade rebuild	2016-12-31	Rebuild

Duplicated data

Updated problem

Possible data ambiguity

Database design (Normalization)

Primary key

Customers

CustomerId	FirstName	LastName	Email	Phone	ZipCode
1	John	Smith	John@gmail.com	703-543-3302	22201
2	Jeremy	Smith	Jeremy@gmail.com	723-543-3302	22203
3	Mark	Long	MarkLong@Yahoo.com	722-366-5588	22031

Relationship



Schedules

ID	CustomerId	Description	DateNeeded	Job Type
1	1	Kitchen remodel needed	2013-10-10	Remodeling
2	2	Decorating help for dinig room	2013-10-15	Decorating
3	3	Kitchen remodel needed	2015-11-29	Remodeling
4	3	Garade rebuild	2016-12-31	Rebuild

Foreign Key

HomePro

HomePro.Customers

Primary Key	CustomerId	FirstName	LastName	Email	Phone	AltPhone	FaxNumber	ZipCode	NewsLetter	State	Age
	1	John	Smith	John@gmail.com	703-543-3302	703-543-3302	NULL	22201	1	VA	18
	2	Jeremy	Smith	Jeremy@gmail.com	723-543-3302	NULL	NULL	22203	0	NY	23
	3	Mark	Long	MarkLong@Yahoo.com	722-366-5588	NULL	NULL	22031	1	CA	64
	4	Bob	James	bob@microsoft.com	703-366-9632	NULL	703-455-9632	22221	0	VA	37
	5	Adam	Marcos	adam@Marcos.com	703-566-0000	NULL	703-366-0000	22001	1	NC	41

HomePro.Schedules

Primary Key	ID	CustomerId	Description	DateNeeded	Job Type
	1	1	Kitchen remodel needed	2013-10-10	Remodeling
	2	2	Decorating help for dinig room	2013-10-15	Decorating
	3	3	Kitchen remodel needed	2015-11-29	Remodeling
	4	3	Garade rebuild	2016-12-31	Rebuild

Foreign key

HomePro.Quites

Primary Key	ID	CustomerId	Description	Estimation
	1	1	Kitchen remodel	210.55
	2	3	Quote with discount	875.55
	3	3	Quote with additional work	10000.00

Foreign key

Primary key

Primary key – the column(s) that has completely unique data throughout the table

The main role of a primary key in a data table is to maintain the internal integrity of a data table.

Table can have only one primary key.

Foreign key

Foreign key – the column that links one table to another table's primary key or unique constraint

Table can have any number of foreign keys defined.

Structured Query Language (SQL)

SQL is a language used for creating, storing, fetching and updating of data and database objects in RDBMS.

SELECT

SELECT is used to retrieve rows selected from one or more tables.

Basic syntax:

```
SELECT <columns>  
FROM <Table>  
WHERE <condition>  
ORDER BY <columns>
```

Select (examples)

```
Select * from HomePro.Customers;
```

```
Select FirstName, LastName  
From HomePro.Customers  
Order by LastName;
```

Where (char, varchar)

Select * from HomePro.Customers

Where LastName = 'Smith'

Select * from HomePro.Customers

Where LastName like 'S%'

Select * from HomePro.Customers

Where LastName like '_m%'

Where (numbers)

1. Where Age = 10
2. Where Age > 10
3. Where Age > 10 and Age < 40
4. Where Age >= 10 and Age <= 40
5. Where Age between 10 and 40
6. Where Age in (10, 20, 30)

Where (date)

1. Where DateNedeed = '2015-11-29'
2. Where DateNedeed > '2014-12-30'
3. Where DateNedeed between '2015-12-01' and '2015-12-30'

NULL values

- The NULL is how SQL handles missing values.
- Arithmetic operation with NULL in SQL will return a NULL.
- NULL is an unknown and undefined value.
- It can be compared to itself.

Query with NULL

```
select  
    AltPhone,  
    IsNull(AltPhone, Phone),  
    IsNull(AltPhone, '000 000 0000'),  
    coalesce(AltPhone, FaxNumber, Phone)  
from HomePro.Customers  
where AltPhone is null;
```

Aggregate functions

Count ()

Sum ()

Max()

Min ()

Avg()

Aggregate (examples)

Select Count(*), Avg(Age)

From **Bank.Client**;

Select Count(*), Avg(Age)

From **Bank.Client**

Where Type = 'private';

Aggregate (examples)

Select ClientId, Max(Balance), Min(Balance)

From **Bank.Client**

Where Type = 'CREDIT'

Group by ClientId;

Select ClientId, Avg(Balance), Sum(Balance)

From **Bank.Client**

Group by ClientId

Having Avg(Balance) > 10000;

Types of SQL commands

SQL commands are the set of commands used to communicate and manage the data present in the database. The different type of SQL commands are

DDL - Data Definition Language

DML - Data Manipulation Language

DCL - Data Control Language

DDL commands

DDL refers to Data Definition Language, it is used to define or alter the structure of the database. The different DDL commands are-

CREATE - Used to create table in the database

DROP - Drops the table from the database

ALTER - Alters the structure of the database

TRUNCATE - Deletes all the records from the database but not its database structure

RENAME - Renames a database object

DML commands

DML refers to Data Manipulation Language, it is used for managing data present in the database. Some of the DML commands are-

SELECT

INSERT

UPDATE

DELETE

DCL commands

DCL refers to Data Control Language, these commands are used to create roles, grant permission and control access to the database objects. The three DCL commands are-

GRANT - Grants permission to a database user

REVOKE - Removes access privileges from a user provided with the GRANT command

DENY - Explicitly prevents a user from receiving a particular permission(e.g. preventing a particular user belonging to a group to receive the access controls