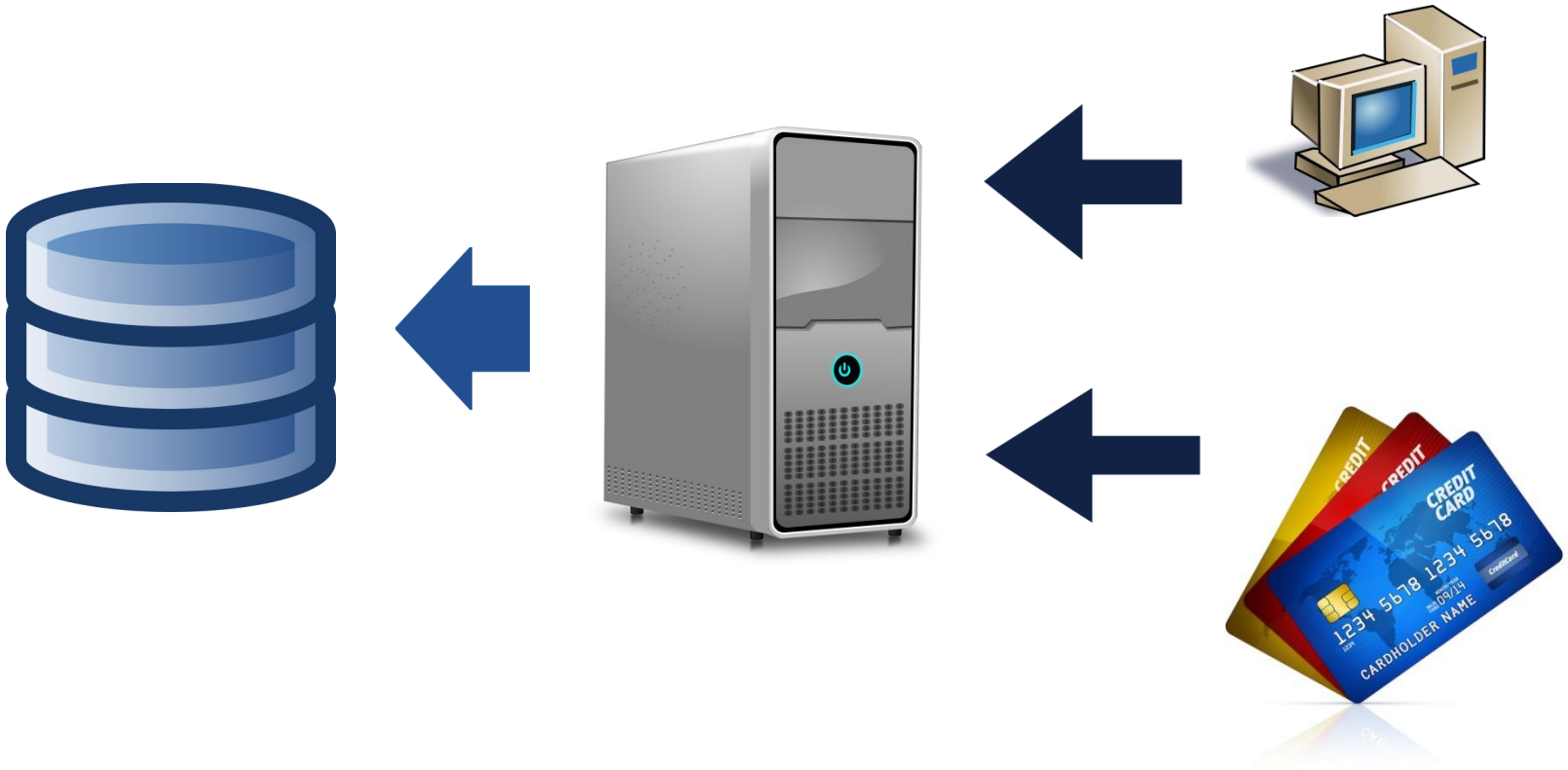
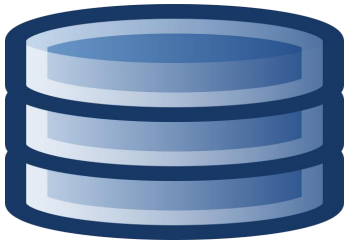
Bank system


CREDIT
CREDIT
CREDIT CARD
1234 5678 1234 5678
CARDHOLDER NAME

Web store (eCommerce)



Database

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

Problems:

- 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	JobType
1	1	Kitchen remodel needed	2013-10-10	Remodeling
2	2	Decorationg 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

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 an 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 basic

```
Select * from HomePro.Customers;

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

Where (char, varchar)

Select * from HomePro.Customers

1. Where LastName = ‘Smith’

2. Where LastName like ‘S%’

3. Where LastName like ‘_m%’

Where (numbers)

1. Where Age = 10
2. Where Age > 10
3. Where Age > 10 and Age < 90
4. Where Age in (10, 20, 30)
5. Where Age between 10 and 40

Where (date)

Select * from HomePro.Schedules

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