

# Database and Fundamental Concepts

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# Why we use the database?

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- The purpose of the database;
  - helping people and organizations keep track of things.

# Why we use the database?

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Lists are used to keep track of things without using a database.

- Shopping list,
- to-do list,
- List of paid invoices

# Why we use the database?

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Lists;

Customer Name	Job	Company	Address	Price
Ahmet	mimar	A	Çanakkale Cad. 43/5	1000 TL
Sema	öğretmen	B	Kayabaşı mah. A Blok 8/4	250 TL
Serdar	mühendis	C	Gazi Mah 6/7	350 TL
Zerrin	emekli	B	Kayabaşı mah. A Blok 8/4	700 TL
Mehmet	Öğretim elemanı	B	Kayabaşı mah. A Blok 8/4	1200 TL
Defne	Doktor	D	Gazi Mah 6/7	100 TL
Elif	avukat	A	Çanakkale Cad. 43/5	150 TL

# Why we use the database?

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## Problems with lists;

- For example, the address of company B has changed.
- Address information in 3 lines should also change
- If it is missing, information inconsistency occurs.
  
- It can cause both **a waste of time** and an **error**.

# Why we use the database?

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## Problems with lists;

- For example, company A no longer works with your company,
- If you delete the record related to company A from the list, you will lose information such as customer information and company address where the product was sold.

# Why we use the database?

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Problems with shared data;

For example, different departments of your company need to display company information;

- ❑ Communication department: company, address
- ❑ Marketing department: company, price
- ❑ Customer service: customer name, job, company

# Why we use the database?

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## Problems with shared data;

- Sharing all of this information with all departments is inconvenient for different reasons.
  - Security
  - customer privacy
  - etc.



# Why we use the database?

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The biggest drawback for lists is that it combines different types of information into a table.

# Why we use the database?

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For DMS, the process of placing different types of information in different tables is called **normalisation**.

For the previous list;

- customers
- Worked companies
- sales information

# Why we use the database?

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- Customers

Customer Name	Job
Ahmet	mimar
Sema	öğretmen
Serdar	mühendis
Zerrin	emekli
Mehmet	Öğretim elemanı
Defne	Doktor
Elif	avukat

# Why we use the database?

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- Worked Companies

Company	Address
A	Çanakkale Cad. 43/5
B	Kayabaşı mah. A Blok 8/4
C	Gazi Mah 6/7
D	Gazi Mah 6/7

# Why we use the database?

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- Sales Information

Customer Name	Price
Ahmet	1000 TL
Sema	250 TL
Serdar	350 TL
Zerrin	700 TL
Mehmet	1200 TL
Defne	100 TL
Elif	150 TL

# Why we use the database?

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When different types of information are placed in different tables, most of the problems related to the following works are eliminated;

- changing information
- deleted information
- with shared information.

# Why we use the database?

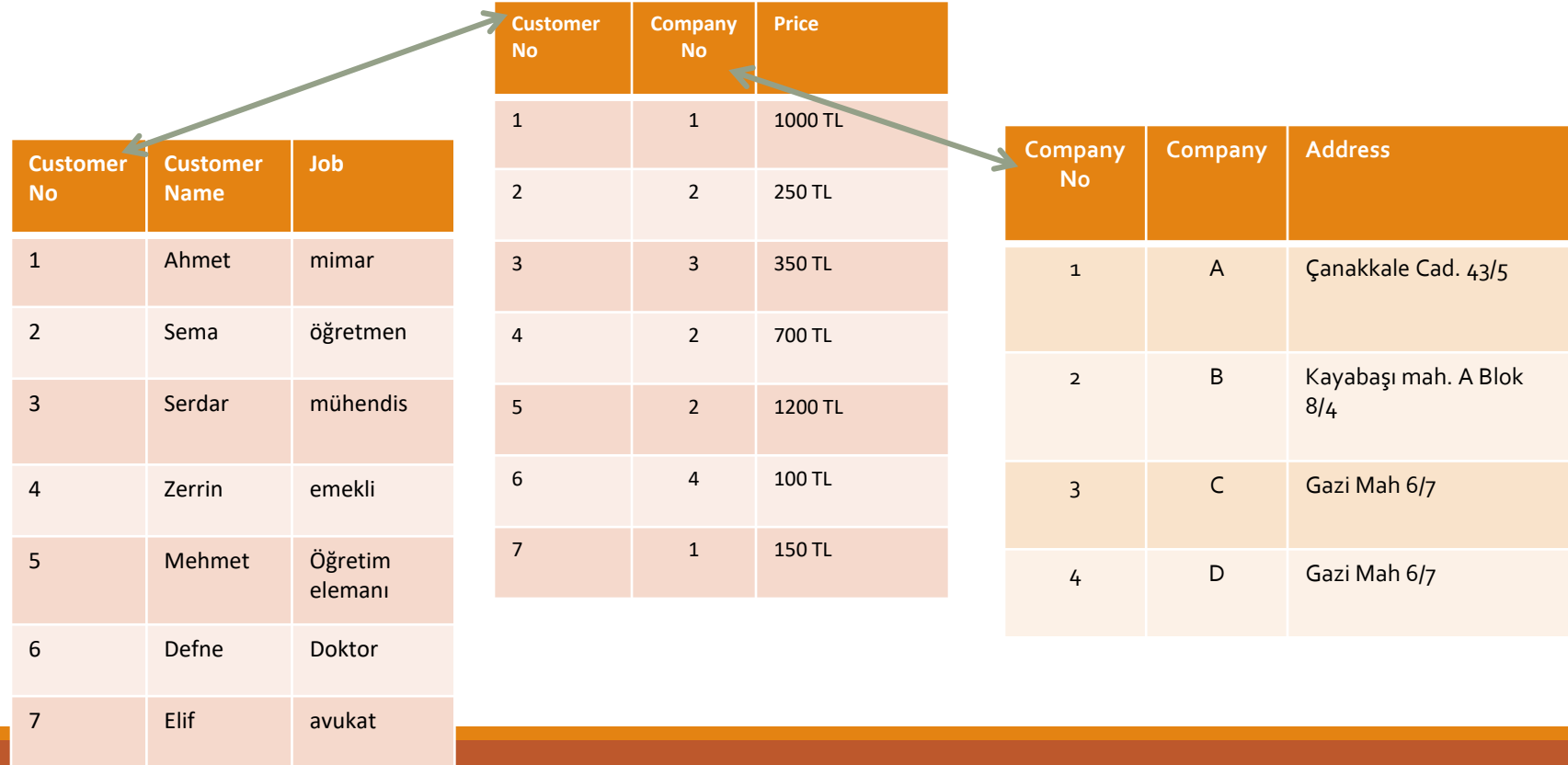
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When different types of data are in different tables;

- Relationships need to be established in order to answer questions such as which customer bought the product from which company ?

# Why we use the database?

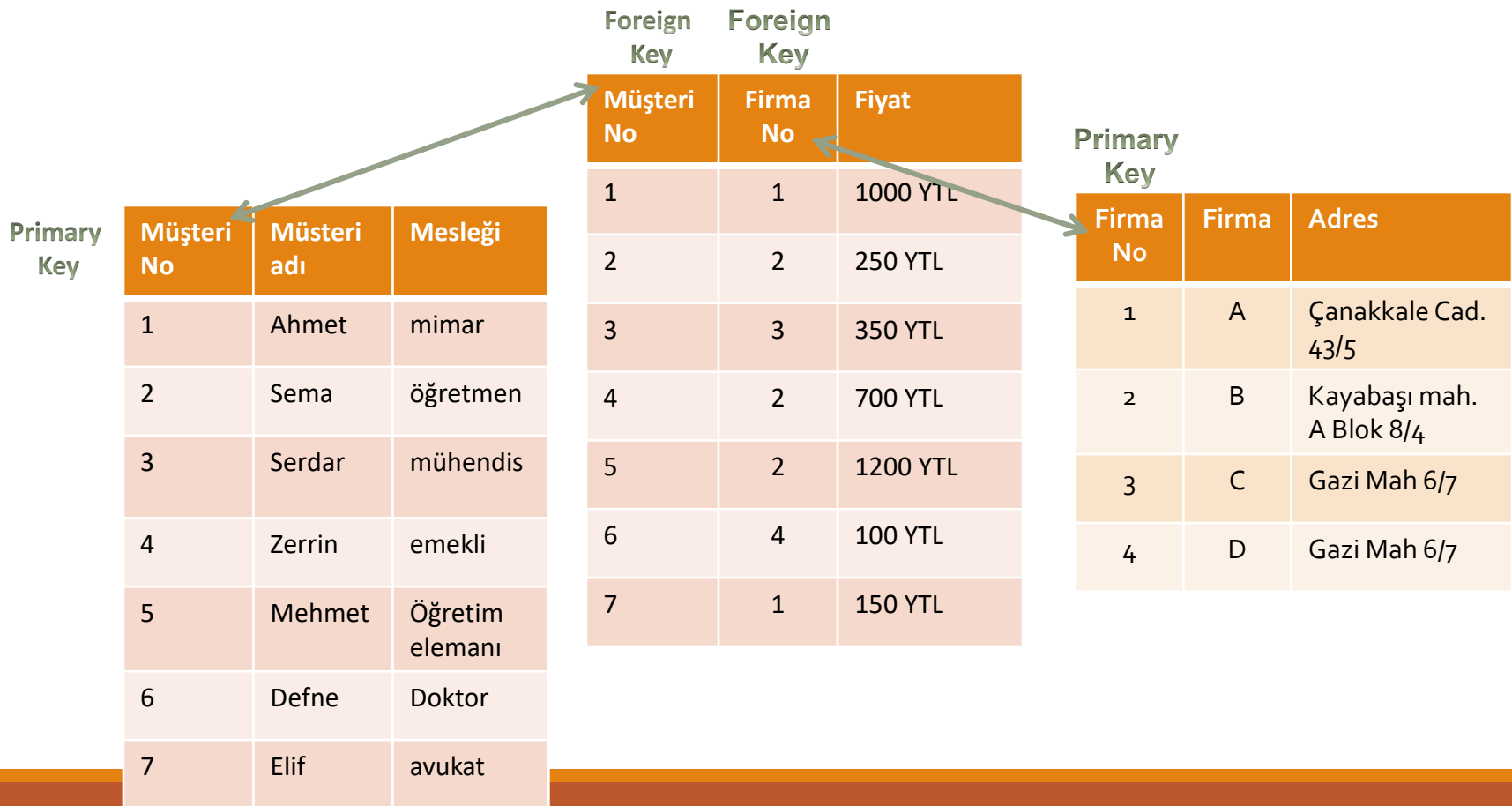
## Relations





# Why we use the database?

## Relations



# Why we use the database?

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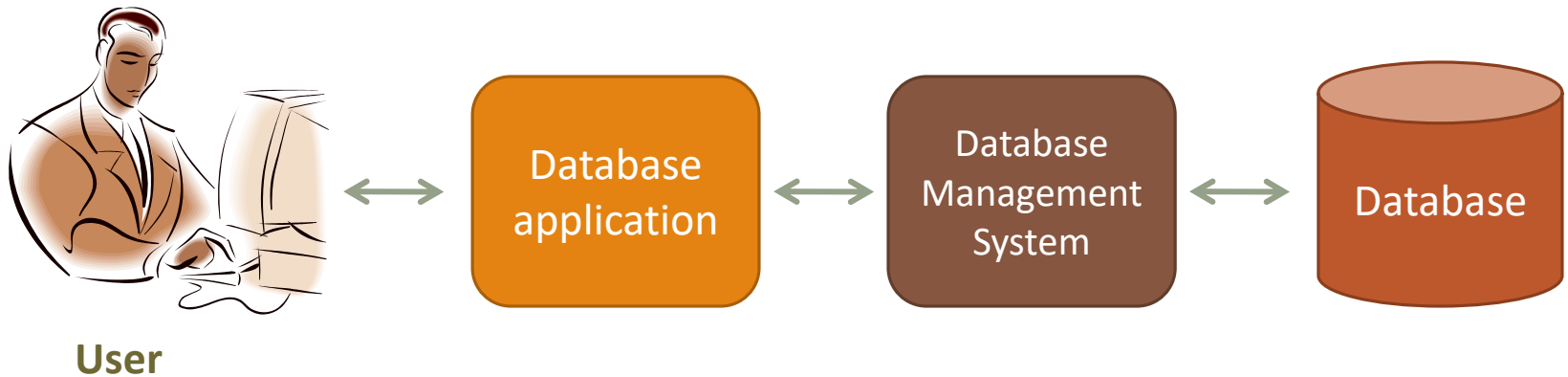
## Joining tables

- So what is done to get the initial holistic list?
- SQL language is used.

# What is database management system?

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Components of the database system;



# What is database management system?

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The user does the following:

- It uses the database to perform its work,
- Adds new data
- Modify existing data,
- deletes data,
- Reads data through queries or reports

# What is database management system?

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## Database Application:

- It is one or more computer programs that provide communication between the database management system and the user.
- Creates queries and reports,
- Receives data from the user or sends the data to the user,

# What is database management system?

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## Database Management System:

- It receives requests from the application and performs them by reading or writing data on database files,
- It reads SQL statements and converts these statements into instructions for the computer's operating system to read or write data on database files.

# What is database management system?

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- Functions of Database Application
- Functions of Database Management System

# What is database management system?

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- Database Application:
  1. Creates and processes forms,
  2. Creates queries and forwards queries,
  3. Creates and operates reports,
  4. Performs application logic,
  5. Controls the application.

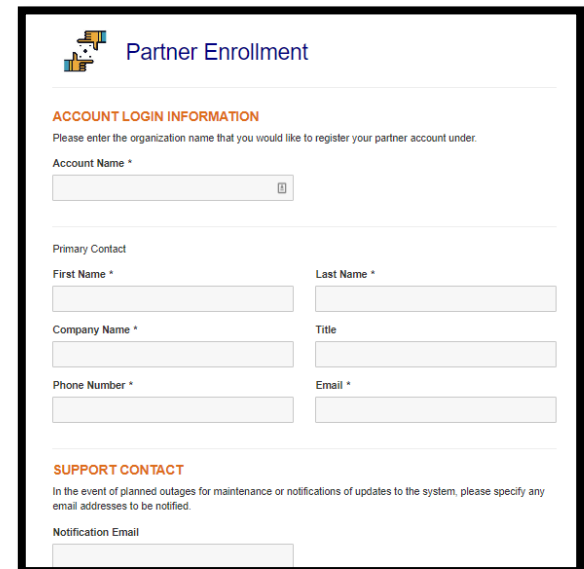


# What is database management system?

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## Database Application:

1. Creates and processes forms, for example, in a web-based application;
  - Creates HTML and other web formats to be displayed on the user's computer,
  - When the user fills out the forms and sends the data back, it sends the DBMS requests for the necessary adjustments.
  - If an error occurs in the process, it displays the necessary message to the user and/or performs the necessary actions.



The screenshot shows a web form titled "Partner Enrollment" with a logo of a bar chart and a person icon. The form is divided into two main sections: "ACCOUNT LOGIN INFORMATION" and "SUPPORT CONTACT".

**ACCOUNT LOGIN INFORMATION**  
Please enter the organization name that you would like to register your partner account under.

Account Name \*

Primary Contact

First Name *	<input type="text"/>	Last Name *	<input type="text"/>
Company Name *	<input type="text"/>	Title	<input type="text"/>
Phone Number *	<input type="text"/>	Email *	<input type="text"/>

**SUPPORT CONTACT**  
In the event of planned outages for maintenance or notifications of updates to the system, please specify any email addresses to be notified.

Notification Email

# What is database management system?

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## Database Application:

1. Creates queries and forwards queries,
  - Generates the query to be transmitted to DBMS,
  - These requests are usually expressed in SQL,
  - When the query is executed, the results are formatted and transmitted to the user,

The screenshot shows a web application titled "SQL Generator". It features a dark blue header with the title in yellow. Below the header, there is a form with several sections:

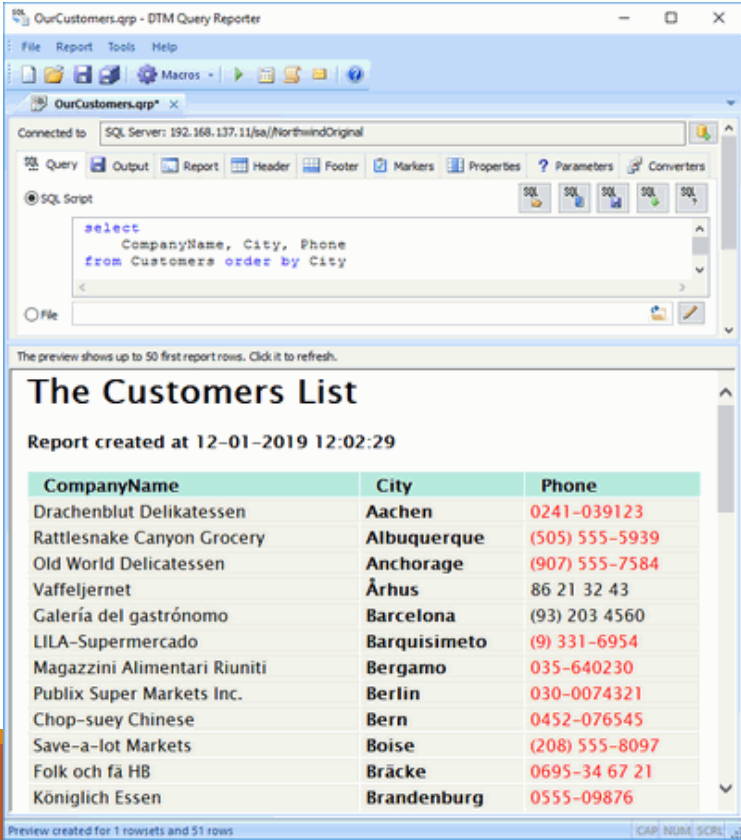
- Please Select a Database:** A text input field containing "album" and a "GO" button. A link below reads "[Click here to view data model!](#)".
- Select a Table Option:** Three radio buttons: "One Table Only" (selected), "Two Tables", and "More Than Two Tables". Below is a list box containing "track" and "album".
- Select a Query Option:** A list of query options with checkboxes: "FUNCTION", "AGGREGATE OPERATION" (checked), "AVERAGE", "COUNTING" (checked), "COUNTING NUMBER IN COLUMN", "COUNTING ROWS" (checked), "NULL VALUE IGNORANCE", and "MAXIMUM".
- Generated Query:** A text area containing the SQL query: "SELECT COUNT (\*) FROM album;". Below this are two buttons: "Generate Query" and "Execute Query".
- Results:** A table at the bottom with one row: 

count
7

# What is database management system?

Database Application:

1. Creates and operates reports,
  - Data is requested from DBMS through queries and query results are presented in the form of reports,



The screenshot displays the 'OurCustomers.qrp - DTM Query Reporter' application window. The window title bar includes standard OS controls. The menu bar contains 'File', 'Report', 'Tools', and 'Help'. Below the menu bar is a toolbar with icons for file operations and macros. The main area shows the connection to 'SQL Server: 192.168.137.11/ta/NorthwindOriginal'. The 'SQL Script' tab is active, showing the following query:

```
select
    CompanyName, City, Phone
from Customers order by City
```

Below the query editor, a preview of the report is shown. The report title is 'The Customers List' and it was created on '12-01-2019 12:02:29'. The report content is a table with three columns: 'CompanyName', 'City', and 'Phone'. The data is sorted by City. The preview shows up to 50 first report rows. The status bar at the bottom indicates 'Preview created for 1 rowsets and 51 rows'.

CompanyName	City	Phone
Drachenblut Delikatessen	Aachen	0241-039123
Rattlesnake Canyon Grocery	Albuquerque	(505) 555-5939
Old World Delicatessen	Anchorage	(907) 555-7584
Vaffeljernet	Århus	86 21 32 43
Galería del gastrónomo	Barcelona	(93) 203 4560
LILA-Supermercado	Barquisimeto	(9) 331-6954
Magazzini Alimentari Riuniti	Bergamo	035-640230
Publix Super Markets Inc.	Berlin	030-0074321
Chop-suey Chinese	Bern	0452-076545
Save-a-lot Markets	Boise	(208) 555-8097
Folk och få HB	Bräcke	0695-34 67 21
Königlich Essen	Brandenburg	0555-09876

# What is database management system?

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## Database Application:

1. Performs application logic,
  - For example, the user made a request for 10 units, but 8 units were found in stock,
  - What happens depends on the logic of the program,
  - It is the task of the application program to implement the appropriate logic.

# What is database management system?

Database Application:

1. Controls the application

# What is database management system?

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- The Database Management System does the following:
  1. Creating the database, creating the tables,
  2. Reading data from the database and updating the data,
  3. Realizing the limitations on data values,
  4. It prevents one user's process from interfering with the other user's process.
  5. Allowing users to take action within the limits of their authority,
  6. Backing up data in the database.

# Database

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- Database is data stores that consist of following related records.
  - Metadata (metadata)
  - index
  - stored procedure
  - trigger
  - data integrity (referential integrity)

# Database

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- Data about the structure of the database is called metadata.
  - Table names
  - column names
  - Properties of tables and columns etc.



# Database

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- Metadata example:

Tabloe no	Table name	Column number	Row number
1	Müşteriler	3	7
2	Firmalar	3	4
3	Satışlar	3	7

Column no	Column name	Data type	Length	Table no
1	id	int	4	1
2	Mus_adi	char	50	1
3	meslegi	char	50	1

# Database

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- Some databases contain application metadata.
- This metadata defines application components such as forms and reports.
- DBMS has several tools to show the structure of the database.

# Database

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- At the same time, there are **indexes** used in databases to improve the performance of the database.
- Indexes are tools that show which records are in which tables.

# Database

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- **Stored procedures** are compiled SQL statements.
- Because they are database objects, they are directly included in the database manager program.
- For example, stored procedures can be created for the purpose of taking a backup of data in a table or remove a backup of data that has passed more than a year.

# Database

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- Stored procedures are codes for doing a specific duty defined in a database.
- These codes are optimized because they are compiled at the same time as they are written, and they are the fastest ready-to-run codes.

# Database

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- A **trigger** is a special type of stored procedure that automatically runs when an event occurs in the database server.
- The events that trigger the triggers on the table are insert, update, delete events.

# Database

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- For example, it is a typical use of triggers to decrease or increase the amount of stock as a result of stock movements.

# Database

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- Since both **triggers** and **stored procedures** are codes on the database, they run on the database server.
- It is one of the powerful components of the Client & Server architecture.
- There are databases in client & server architecture as follows.
  - Oracle, Sybase, MS SQL, Interbase, FireBird etc.



# Database

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- Because they work on the server where the data is located, the data does not go back and forth between the client and the server.
- Therefore minimal data is sent from the server to the client side.

# Database

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In a relational database

- Let's assume that the department information of the person in the PERSONNEL table is kept in the SECTION\_NO variable and
- the name of the department is in the SECTION table.

# Database

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- If the section numbered as 1 is used by any personnel, the record with SECTION\_NO value of 1 from the SECTION table must not be deleted.
- Protecting data integrity by making such controls is called **referential integrity**.

# Database

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- The use of triggers is highly preferred in order to ensure data integrity.

# Database

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There can be 3 types of database systems:

- used by a single person,
- used by small businesses,
- Used by large international companies

# Database

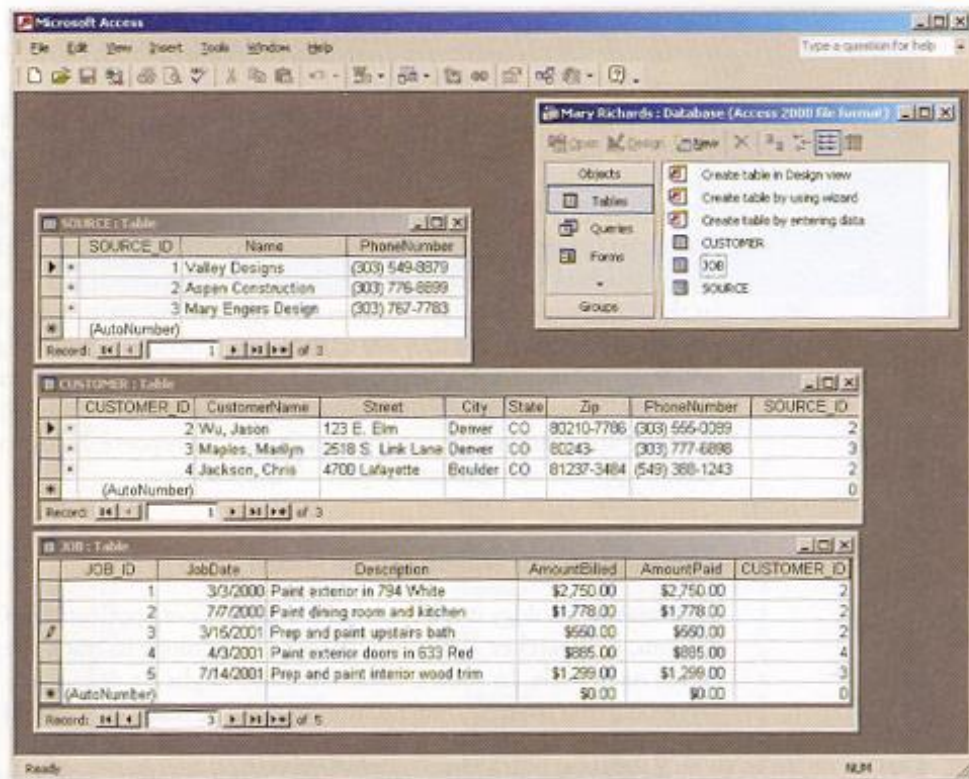
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used by a single person,

- Painter
- Whose house was painted, when and how much?
- What was painted in the painting, what colors and styles were used?
- Who referenced others? Who are the referrals?

# Database Systems

used by a single person,



# Database Systems

used by a single person,

The screenshot shows a database application window titled "CUSTOMER". It contains a form for customer information and a table for job history.

**Customer Information:**

- Customer: Wu, Jason
- Phone: (303) 565-0089
- Street: 123 E. Elm
- City: Denver
- State: CO Zip: 80210-7786

**Referral Source:**

- Referral Source: Aspen Construction
- Phone: (303) 776-8899

**JOB Table:**

JobDate	Description	AmountBilled	AmountPaid
3/3/2000	Paint exterior in 754 White	\$2,750	\$2,750
7/7/2000	Paint dining room and kitchen	\$1,778	\$1,778
3/15/2001	Prep and paint upstairs bath	\$550	\$550
*		\$0	\$0

Record: 1 of 3



# Database Systems

used by a single person,

Microsoft Access - [Customer Job History]

CustomerJob History

CustomerName: Wix, Jason  
PhoneNumber: (303) 555-006

JobDate	Description	AmountBilled	AmountPaid
3/3/2006	Paint exterior in 794 White	\$2,750	\$2,750
7/7/2006	Paint dining room and kitchen	\$1,778	\$1,778
3/15/2007	Prep and paint upstairs bath	\$550	\$550
<b>Total</b>		<b>\$5,078</b>	<b>\$5,078</b>

CustomerName: Mapiel, Marilyn  
PhoneNumber: (303) 777-689

JobDate	Description	AmountBilled	AmountPaid
1/4/2007	Prep and paint interior wood trim	\$1,200	\$1,200
<b>Total</b>		<b>\$1,200</b>	<b>\$1,200</b>

CustomerName: Jackson, Chris  
PhoneNumber: (349) 311-124

JobDate	Description	AmountBilled	AmountPaid
6/3/2007	Paint exterior doors in 023 Red	\$600	\$600
<b>Total</b>		<b>\$600</b>	<b>\$600</b>

**Grand Total**

AmountBilled	7,200
AmountPaid	7,200

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Page: 1 of 1

Ready

Start | Microsoft Excel | Chapter 1 | Book Paint Shop Prj | Mary Richards - Dots... | Customer Job Hist... | 3:58 PM

# Database Systems

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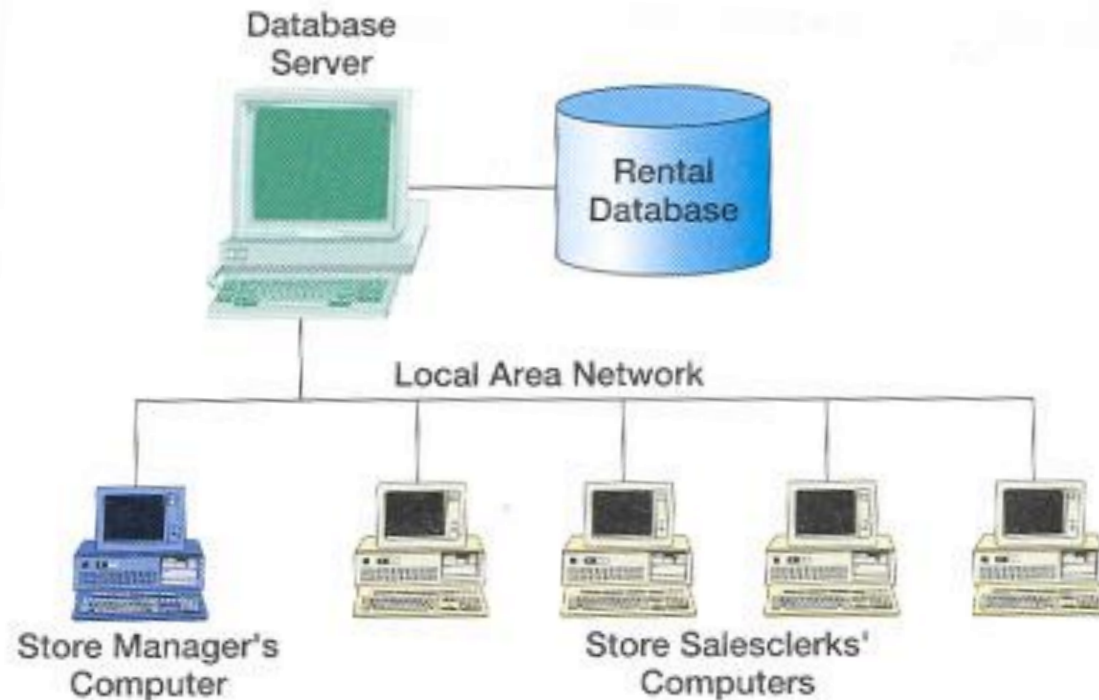
used by small businesses,

- What are the rented musical instruments? How much is it rented?
- Which musical instruments are rented the most?
- Who made the lease? (multi-user database)
- The same instrument cannot be selected by two different dealers at the same time!

# Database Systems

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used by small businesses,



# Database Systems

used by small businesses,

**CUSTOMER** Treble Clef Music – Customer Form

CustomerName: Mary & Fred Jackson  
HomePhone: (703) 443-7788  
WorkPhone: (703) 443-4482  
Street: 1200 Seventeenth Ave  
City: Alexandria  
State: VA Zip: 02234-5567

Children:  
▶ Katherine  
Jaymalina  
\*  
Record: 1 of 1

INVOICES

InvoiceNumber	InvoiceDate	Total
▶ 100387	10/16/2001	\$45
98884	10/16/2000	\$37
* 0		\$0

Record: 1 of 2

# Database Systems

used by small businesses,

**Rental Agreement**

**Treble Clef Music – Rental Agreement Form**

InvoiceNumber: 100087  
InvoiceDate: 10/16/2001

Customer: Mary & Fred Jackson  
WorkPhone: (703) 443-4482  
HomePhone: (703) 443-7788

**Rental Items**

SerialNumber	Category	DateOut	DateReturned	MonthlyFee
478990	B flat clarinet	10/16/2001		\$17.50
556788	Standard violin	10/16/2001		\$27.25
555790	Premium violin			

Total: \$44.75

Record: 1 of 2



# Database Systems

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used by small businesses,

**INSTRUMENT**

### Treble Clef Music – Instrument Data Form

SerialNumber: 478990      MonthlyFee: \$18  
Category: B flat clarinet      Rented?: No

**INVOICES**

InvoiceNumber	InvoiceDate	Total
100067	10/16/2001	\$44.75
*		

Record: 1 of 1

Record: 1 of 3

# Database Systems

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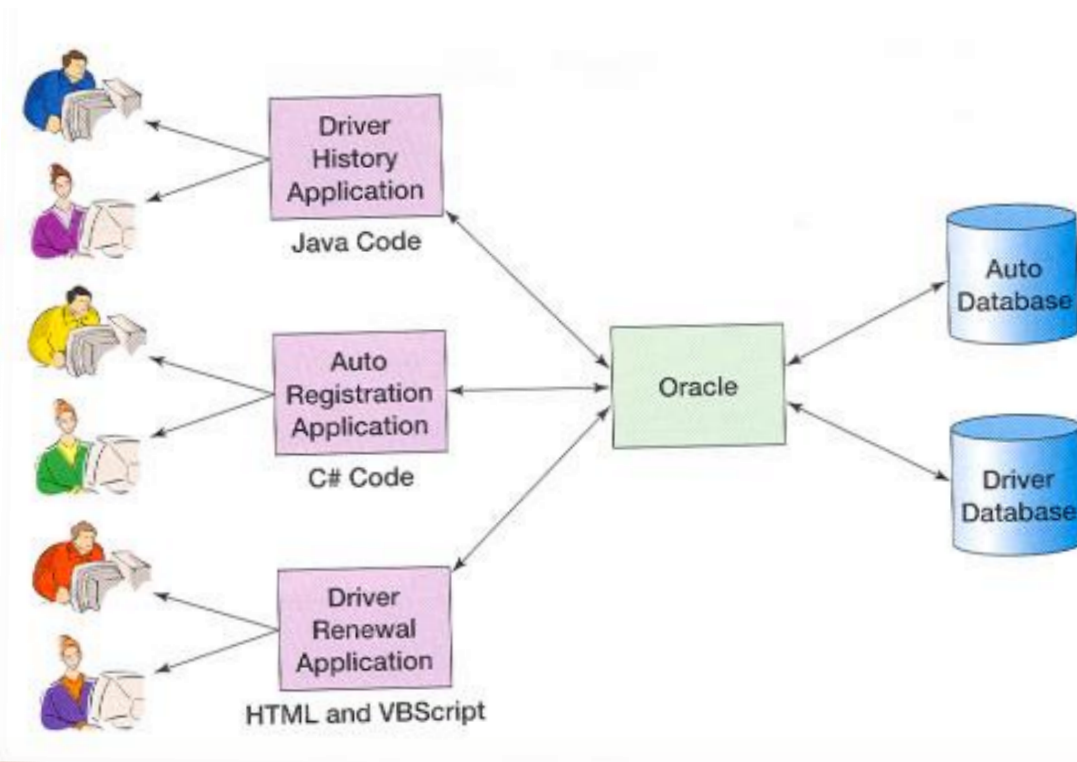
Used by large international companies,

- Driver licensing and auto registration office
- It has 52 different centers
- Accidents of people, traffic violations are kept,
- Is the license renewable, are there any limitations?
- Database is used by 100s of people
  - Licensing and registration staff
  - Those who follow law enforcement
  - Finance department staff
- Reachable 24 hours a day, 7 days a week

# Database Systems

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Used by large international companies,





# References

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Kroenke, D. M. (2006). **Database Processing: Fundamentals, Design, and Implementation**. Pearson Education International. Singapore, Canada, Japan.

<http://www.delphiturkiye.com/trigger.htm>