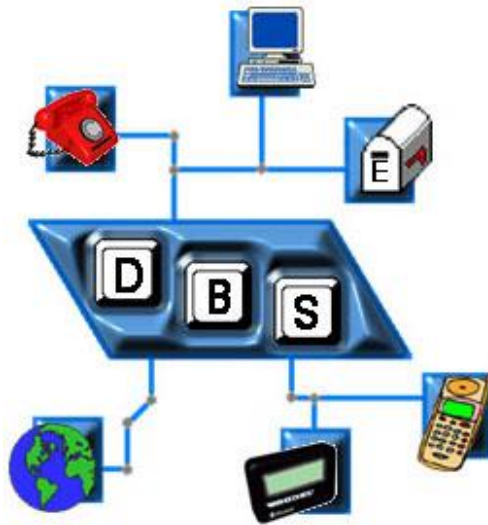


Databases and MS ACCESS



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Database

- A database is an organized collection of structured information, or data, typically stored electronically in a computer system.
- Database examples:
 - Phone book - printed,
 - library,
 - passenger records.



In the computer world, we can call a database almost anything that contains information stored and sorted in a certain way:

- computer file system,
- documents and programs,
- internet newspaper,

paper filing cabinet - predecessor of databases

- the card file allowed the organization of data according to various criteria and the classification of new items,
- any operations with them were performed directly by a person,
- the management of file cabinets was in many aspects like the management of today's databases,
- **this form of database had many disadvantages, which are mostly unacceptable for databases.**



Features and problems of a paper database

- **data redundancy** – one piece of information is stored in several places,
- **data inconsistency** – one piece of information is stored in several places, and if we modify one of them, the others will remain unchanged, because there is no link between them,
- Database processing removes redundancy and ensures consistency and integrity.
- **violation of data integrity** – control of input data,
- **data sharing** – work of several users with information at the same time
- **data security** – the possibility of assigning reserved access to the database
- **data management** – backing up, restoring or rearranging information is very complicated in a paper filing cabinet.

Basic terms


- **Database technology**
is a unified set of concepts, means and techniques used to create information systems.
- **Database**
is a collection of interrelated data that we work with as an integrated unit. There is considerable variability between products and between different database system manufacturers.
- **Database object**
is a named data structure stored in the database (tables, keys, indexes, events, forms, reports, processes, etc.)
- **Database model**
it expresses the way of organizing data in the database, which thus reflects the form of the real world.
- **File**
is a collection of related records stored in the operating system in one common structure

Other basic terms

- **Table, list** – it is a group of recorded data that we can arrange in a table.
- **Field** – data describing the same property of the registered object (table column).
- **Record** – all characteristics of one object (table row)

5 steps of database design

Analysis of the addressed area and data mapping that will be part of the application.




Dividing the data into units (files, tables).



Creating a simple data model.



Adding more detailed characteristics to the data model.



Test data input and model validation.

MS ACCESS

The application is designed to work with databases, we can use it:

- stored data,
- work with data,
- display data,
- automate work with data,
- share data between users...

Options for creating a file

- setting up a database from a template on the computer,
- creating a database from a template on Microsoft Office Online,
- opening an existing database,
- creating an empty database.

File

Ribbon

Desktop

The screenshot shows the Microsoft Access application window. The title bar indicates the file path: "Students : Database- K:\vyucba\ZADANIA PREDMIETY\MI_EN\Students.accdb (Access...)". The ribbon is set to "Home" and includes tabs for "File", "Create", "External Data", "Database Tools", and "Help". The ribbon contains various groups of icons for actions like "View", "Clipboard", "Sort & Filter", "Records", and "Text Formatting".

On the left side, the "Navigation pane" is visible, showing a tree view of "All Access Objects". The "Tables" section is expanded, listing "Accomodation", "Faculty", "Students", and "Subjects". The "Queries" section includes "Comboquery" and "FEM". The "Forms" section lists "Comboform" and "Navigation Form". The "Reports" section shows "Student report".

The main window displays a "Navigation Form" titled "Comboform". The form contains several data entry fields:

Surname	Gaborova
Name	Darina
Faculty_shortcut	FE
Study_program	VPO
Students_Year	3
Accomodation	AB
Subject	Econometrics
Lectures	2
Exercises	2
Subjects_Year	3

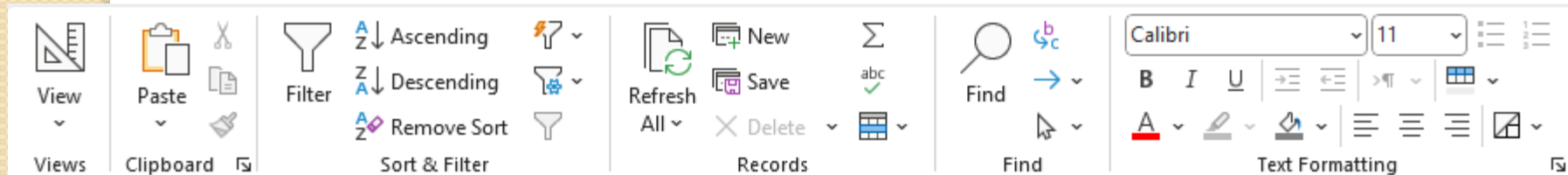
At the bottom of the window, the "Status bar" is visible, showing "Num Lock" and several system icons.

Navigation pane

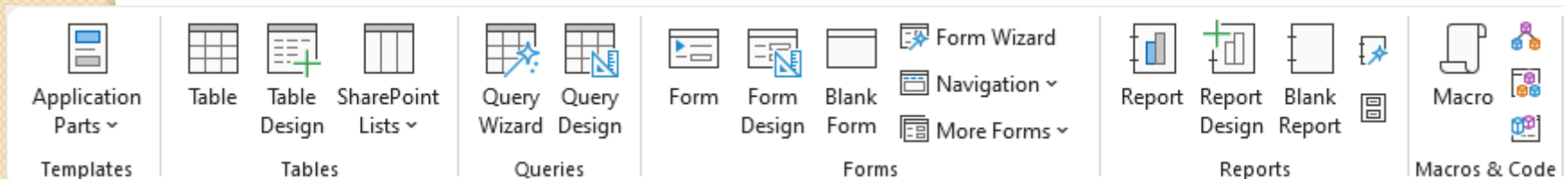
Status bar

Structure of the tabs

- tab **Home** contains items for basic database work such as *views, records, filtering...*

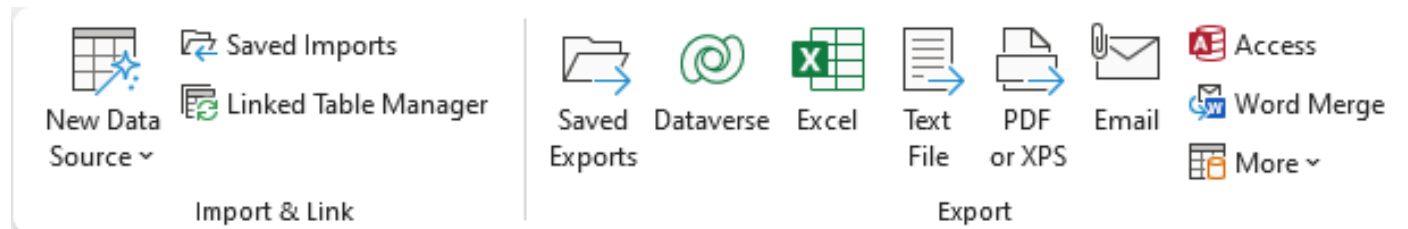


- we implement the creation of new database objects via a tab **Create**, where there are different options in groups to choose from *Tables, Queries, Forms, Reports and Macros&Code*

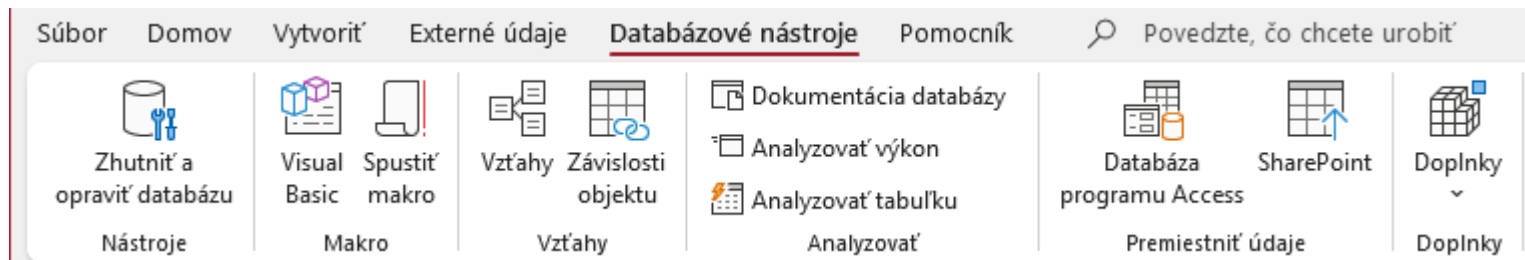


Structure of the tabs

- on the tab **External data** are tools like *import, export, links*



- tab **Database tools** is used for work with *macros, relationships and data analyze*



Database design

Specifying the type of database

Why do we want to establish a database? Is a database solution really suitable for our problem? Is it appropriate to use MS Access? Or we will need a larger amount of data and we will use e.g. SQL server? Is MS Excel not enough for us? What is the function of the database? What kinds of information will be stored in it?

Design of tables

Tables form the basis of the database design, from which everything else is based. When designing tables, it is necessary to follow 2 rules: Each piece of information should be in the database only once. Each table should contain information about one subject.

Determination of data types

It is necessary to think about what information we will enter in the individual fields and in what form we will save them so that we can process them further. Each table should be structured as much as possible, that is, information should be stored in the smallest possible units.

Database design

Definition of relationships

Unlike other programs, Access allows you to manage and search for records in relations, i.e. related records of several tables

Queries, forms, reports

It is basically the creation of a user interface - tools for displaying and inserting data

Through the **forms**, the end user will access any data and manage the information found in the database.

If we want to get printouts from the database or export data somewhere else, we will use **reports**. The report is a summary of the information from the table conveniently arranged so that it can be conveniently printed.

Deleting the form does nothing to the data, it remains intact except if we are deleting the data from the form, not the form as a database file object.

Data types

- **Short text** – it is intended for writing any characters (numbers, letters...) into the table entries.
- **Long text** – is intended for recording detailed text data, according to which it is not possible to sort or filter the data.
- **Number** – is intended for storing numeral values.

Data types

- **Date and time** – is intended for storing date and time data.
- **Currency** – it is used for storing monetary values, but it can also be used for recording any numerical data.
- **AutoNumber** – is specially designed for automatic generation of primary key values.

Data types

- **Yes/No** – is intended for storing logical values.
- **OLE object** – allows you to insert complex data, which can then be worked with using dynamic links with other applications using the OLE (Object Linking and Embedding) standard. It can be e.g. image, Word document or sound.

Data types

- **Hyperlink** – allows you to insert links to external files. The link can contain a URL, intranet or e-mail address, or a file stored on the computer.
- **Attachment** – a new type from version 2010, it is essentially an attachment that we know from electronic mail.
- **Calculated** – calculations by entering an expression composed of the fields of one table.

Inserting data into a table

- After saving the table design, a new item was added in the navigation pane with the name we entered when saving the table.
- We open it by double-clicking.
- Data is divided into columns (fields) and rows (records).
- At the bottom of the open window there is a panel showing the current position, the number of records and buttons for moving through the list
- This view– **Datasheet view.**

Working with data in a table

- manipulation of fields,
- hiding of the fields,
- manipulation of records – sorting, searching, filtering:
 - sorting – ascending or descending,
 - searching – binoculars icon or Ctrl+F,
 - filtering – allows you to select data according to a certain criterion.

Viewing the table - filtering records

- **By filtering the records of the table, we can display only those records that meet certain conditions - the filter.**
- By filtering records, we will not change or delete any data, only records that do not meet the filter conditions will not be displayed
- There are 3 filtering options:
 - 1. Selection filter** – means that the filter condition will be given by the current selection (the data on which the cursor is currently located). We can filter both numeric and non-numeric fields.
 - 2. Filter by Form**– in the displayed table, we enter values or expressions according to which we want to filter
 - 3. Advanced filter** – before applying filter criteria for a specific table field, we must first insert it into the filter grid at the bottom of the design.

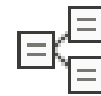
Relationships between tables - relations

- **Primary key** – a field that clearly identifies an entry in the table (e.g. social security number, ID...), mainly prevents data duplication.
- We can set it manually via the context menu of the table when designing it, or the system will set it for us automatically when it is initially saved.

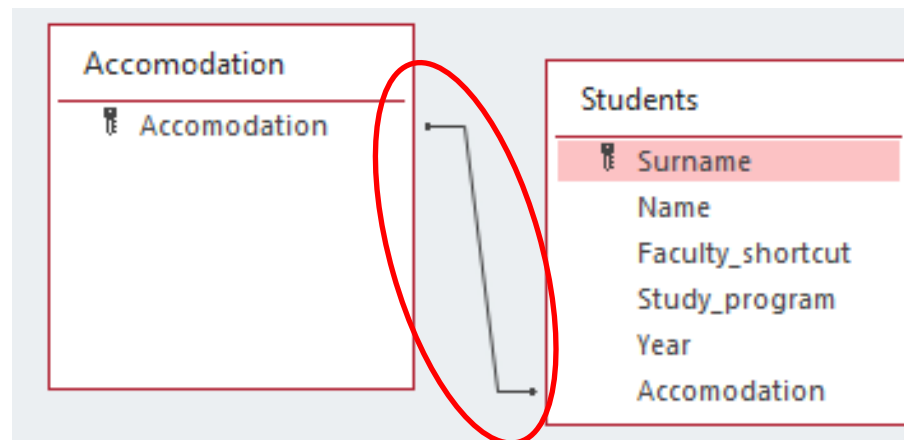


Relationships between tables - relations

- Relationships are created by connecting two tables.
- They are created through the same fields in the tables.
- Database tools - Relationships



Relationships



Types of relationships

- **1:1** – relation when any record in table A corresponds to at most one record in table B.
- **1:N** – any record in table A corresponds to zero or more records in table B, and at the same time any record in table B corresponds to at most one record in table A.

Types of relationships

- **M:N** – to any record in table A corresponds to zero or more records in table B, and at the same time any record in table B corresponds to zero or more records in table A.
- This type of session is less used and is formed using a connection table.

Queries

- The query is used to display data from one or more tables.
- It is also used for mass data changes, selecting records that meet a condition, deleting records, or creating a new table.
- The query is also often used instead of a filter, its advantage is that it can be saved until we get to the filter settings again after canceling it.

Queries

- Tab Create – group Queries
- The easiest way to create a query is to use the **Query Wizard**.
- In the first step, we select the type of query - a simple query.
- Another step – selection of tables and fields from which the query will consist.
- Last step – we choose the name of the query and the option to open the query in the design view.

Query Design view

- Field – the name of the field to display.
- Table – specifies the name of the table from which the field originates.
- Sort – allows you to set the arrangement.
- Show – can hide the selected field or keep it displayed.
- Criteria – contain display conditions.

Criteria

- The most important part of the query, we determine the conditions of what should be displayed in the query.
- For example, choosing a specific city – enter the name of the city in the city field – „Nitra“
- Selection by date of birth –
> 1.1.1960 And <31.12.1970
- Symbols: >, <, =, >=, <=, <>
- Operators: And, Or, Like

Forms

- The main advantage is a clear arrangement, a better and more professional appearance.
- Tab Create – group Forms.
- The easiest way to create a form is to use the **Form Wizard**.

Form creation wizard

- 1. step – selection of tables or queries and fields that the form will consist of.
- 2. step – choosing a form layout.
- 3. step – choosing a form style.
- 4. step – entering the name of the form and completing it.

Reports

- They are not just some kind of form with settings for reading, very often it is a completely different view of the data in the tables.
- Tab Create – group Reports
- The easiest way to create a report is with the **Report Wizard**.

Report creation wizard

- 1. step - selection of tables or queries and fields that the report will consist of.
- 2. step – grouping level selection.
- 3. step – selecting a sort option.
- 4. step – report layout selection.
- 5. step – selection of report style.
- 6. step – entering the name of the report and completing it.

Finishing work with MS Access

- During the creation of individual objects, the system asks if we want to save the given object.
- **ALWAYS** we will give a positive answer when saving.
- Therefore, when we close MS Access, it is no longer necessary to save anything.
- It also supports Import and Export of data.
- The possibility to print individual objects of the database.

Limitations of MS ACCESS

- The maximum size of the database file is **2 GB**.
- A maximum of **255** users can work with one database at a same time.
- Security limits - approaches of different users.
- Access is not available for MacOS users.

Is Microsoft Access Dying?



Another DS – Oracle Database

- A relational database management system (RDBMS) from Oracle Corporation.
- The system is based on a relational database in which users (or application client interfaces) can directly access data objects through structured query language (SQL).

Another DS– Microsoft SQL

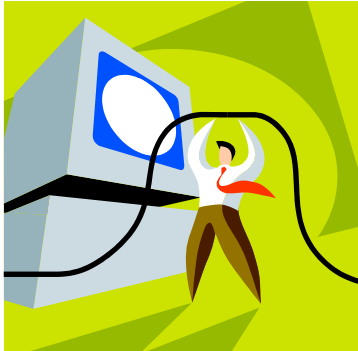
- A relational database and analysis system for e-commerce, business and data warehouse solutions developed by Microsoft.
- The primary task is to store and retrieve data that is created as a request from other applications.
- It is built on Structured Query Language = SQL, which is a programming language used to manage databases and data queries.

Another DS – IBM DB/2

- DB2 is an IBM relational database that is available in several versions or license agreements.
- By configuring a feature-reduced version, IBM allows customers not to pay for selected features they do not need.
- Sample editions include Express, Workgroup and Enterprise Editions.



Big Data



**Thank you for
your attention!**