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Mechanism for Migrating Data in Relational Databases

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Abstract: *In this paper, we will describe mechanisms for data migration to relation databases, which can be found on the market today. Database practical use in teaching at the Faculty of Education in Bijeljina is on courses Informatics (for the first year of study) and Internet programming (in third year of studies). On these two courses, the students meet with relational databases and based on the communication of lecturers to students determining that there is about 80% of them first-time encounters with this subject matter. Relation Database Management System-RDBMS that will be used on concrete examples is Microsoft Access and MySQL. The aim of this research paper is to provide a software mechanism to students for migration data in MySQL Database with usage on previous knowledge about Access-a database. We will describe methods for migration of data from Access-a into MySQL databases. For practical example we will use, MS Access 2010 in combination with graphical interface, MySQL Workbench 6.3 CE.*

Key words: *Access; MySQL; RDBMS; Workbench; Export*

1. INTRODUCTION

Database, is a collection of related data organized in such manner way to allow easily access, manage, and maintenance by side of authorized users. Throughout the history of mankind, the data were stored through images and sculptures, while with the appearance of letters the data began to be stored in books. With the use of computers, data began to be stored initially in files that were stored on floppy disks, tapes, hard disk computers, etc.

With the growing need for organization business and the amount of data to be processed as well as the reduction of time parameters related to easier and faster retrieval of big sets of data, the inevitable technological advancement was the transition from files to an organized collection of related data-Database.

Edgar F. Codd set up basic rules for Relational databases that are available on market today, [1]. Those are 12 rules that the Code proposed for that purpose and he had defined what it minimum takes to have one RDBMS. According to Stonebraker et al. in [2], "Relational databases were created for business data processing needs during the time when interfaces and hardware were different. Despite some changes, no RDBMS has been completely redesigned since that time."

In accordance with that claim, we come to the conclusion that the application solutions that work on relational databases are stable. Especially if we look from the points of view of possible changes in the technologies approach and the usage databases that are not relational. The general DBMS functions are:

1. Recovery databases from lost of data
2. Managing parallel execution of transactions
3. Protection of data

Main functionality of RDBMS as connection between users on one side and database on the other we can see in "Figure 1". A graphical interface known as the Application Programming Interface -API, which is used to develop applications, is in most cases integrated in the functionality of the RDBMS.
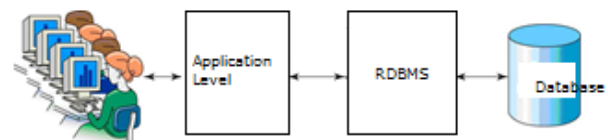

Figure 1. *Main components of RDBMS-a*

Some of the most famous RDBMS are: MySQL, Oracle, Microsoft SQL Server, Microsoft Access, SQLite, Sybase Adaptive Server Enterprise, and so on.

This work will address the two RDBMS which are studied in subjects Informatics and Internet programming in the Faculty of education in

Bijeljina, and they are Microsoft Access and MySQL, respectively.

Some of the similarities and differences of the two systems are listed in Table 1.

Table 1. *Microsoft Access and MySQL comparison*

	Microsoft Access	MySQL
Description	Combines the back-end RDBMS with a GUI frontend for the manipulation of data and queries	A widely used open source RDBMS
Manufacturer	Microsoft	Oracle
ACID transactions	No	Yes
Operating systems	Windows	FreeBSD, Linux, OS X, Solaris, Windows
Supported programming languages	C, C#, C++, Delphi, Java VBA, Visual Basic.NET	Ada, C, C#, C++, D, Delphi, Haskell, Java, Perl, PHP, Python, Ruby
The license	Commercial	Open Source
Ranking (Points)	131.95	1228.87

The final ranking of these two databases, which is shown in Table 1. based on [3], indicates that the MySQL database is for cca. nine times more grade on scale than Microsoft Access. This result is expected when we take into account the fact that most users like to use open source solutions that are free.

2. METHODOLOGY

The main goal of this paper is to provide mechanisms for data migration to relation databases in our case from Access to MySQL. Simulation of data migration in two scenarios will also be performed without the use of software and with the use of third party software. This two scenario were carried out from the reason that is practical part of the course in the field of Internet programming at the Pedagogical Faculty in Bijeljina. From the practice and introductory interviews with the generations of students before the school year 2018, it was noted by the lecturers that 80% of students who attend lectures in the course of Internet programming only at the faculty meet for the first time with some complex RDBMS. Within the Informatics course, students also encounter MS Access with other programs that are part of the MS Office package. The access objects that are being studied by students are: Tables, Forms, Queries and Reports. Objects of the macro type and modules are not studied in this course.

Later, this knowledge from Access is upgraded by learning MySQL within the Internet Programming course topic.

3. EXPORT OF ACCESS DATA IN MYSQL

Microsoft Access can be used to exchange data with database on MySQL. This option provides functionality how to start filling up and update the database. If we have existing data in the Access database or table in Excel, it can be read in Microsoft Access and exported to a database on the MySQL server. The most used methods to migration data from Access to MySQL is direct (which do not require the use of additional software) and indirect (when additional software is required). In this paper, two direct and one indirect method will be described. For both methods, the main precondition is the previous installation of the Open Database Connectivity-ODBC interface.

3.1 ODBC standard

ODBC is a widely-used Application Programming Interface API, for access to the database interface, [4]. This standard allows the use of databases in distributed system environments such as MS Access, Oracle, MySQL etc. ODBC provides the specificity of access to a particular database and allows developers to develop module without the need to enter into the basics of database operation.

The next step is to show how to connect the MySQL database and the MS Access software package. For both methods (direct and indirect), the ODBC driver must be installed on the computer. To connect MySQL databases and MS Access, we must configure ODBC through system setup within the control panel [5].

The procedure consists of the following steps:

1) First, we need to configure the source data for the MySQL database, [6]. To do this, ODBC connector must be installed, as shown in "Fig. 2".
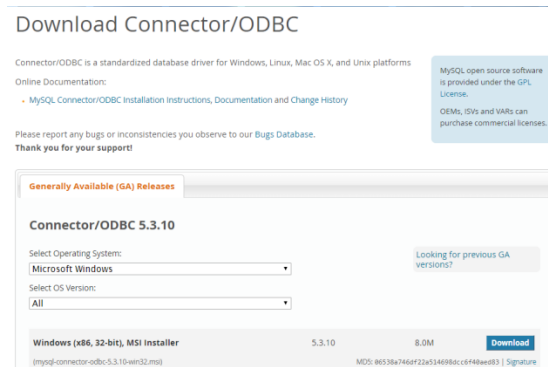

Figure 2. *ODBC connector*

2) Once the connector is installed, MySQL connection is created by step as show in "Fig. 3". The Data Sources (ODBC) option is selected first in the menu: "Control Panel \ All Control Panel

Items \ Administrative Tools". After that, a new driver is added to the administrator ODBC window (in "Fig. 3" is the MySQL ODBC 5.3 unicode driver).
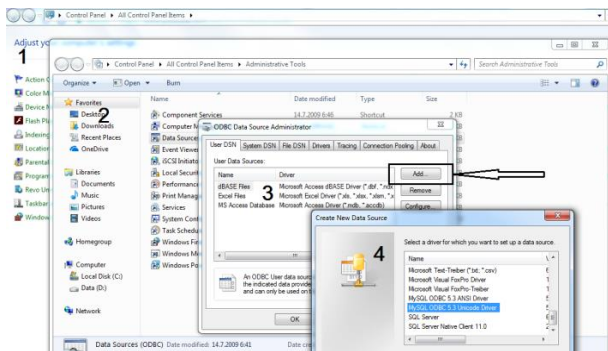

Figure 3. *Adding a MySQL ODBC driver*

3.2 Export data from Access to MySQL without using third-party software

There are two methods for this kind of export data: these are without and with active connection between databases. First, we will describe the method without creating an active connection. This method in MySQL only characterizes the export of data from one database to another, after which the active link between them is lost. More precisely data change in Access after export will not reflect on the database in MySQL. After the driver is successfully added, the setting of the connection as show in "Fig. 4" is performed. An arbitrary connection name is selected in our case. The user, password and database are entered with data that must match with data in MySQL Workbench, and for our case we have chosen the database to which should be exported from the Access table.
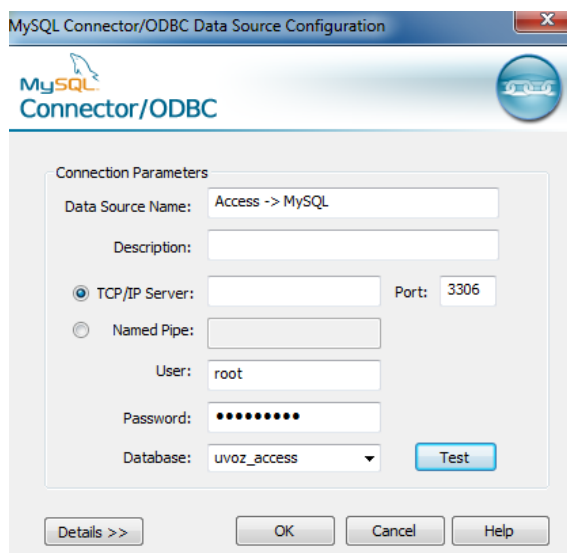

Figure 4. *Creating a connection*

When the connection is successfully created, we start to export data from the Access database. In Access it must be selected all the tables that we want to export to MySQL and then choose the menu as show in "Fig. 5".
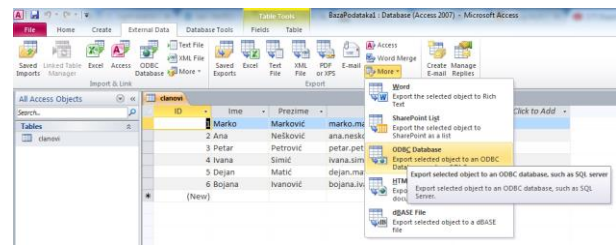

Figure 5. *Export table from Access*

After this step, a new window appears on desktop, where we enter the name of the table on the MySQL server. The last step is select of connection from which a table should be imported. This step for our example is shown in "Fig. 6".
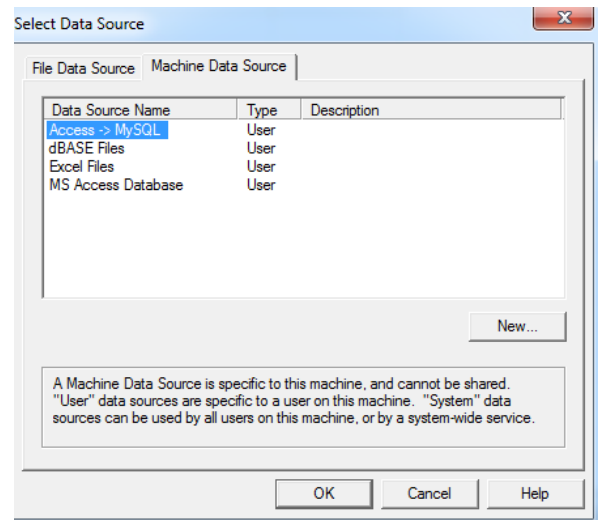

Figure 6. *Select connection for import*

The Access table has now been successfully imported to the MySQL server as seen in "Fig. 7".
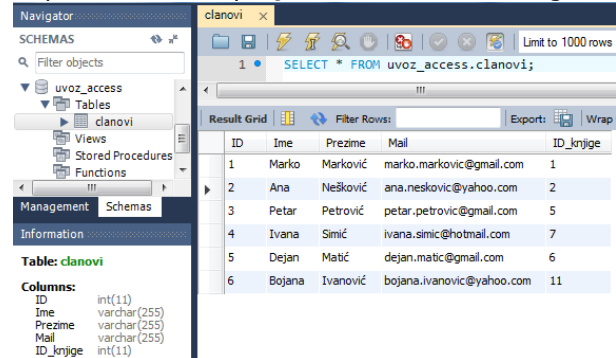

Figure 7. *Table exported in MySQL Server*

With another method, the active link between the database after export is retained i.e. Any changes in the MS Access database will reflect the same change in MySQL.

MS Access can also be used as a front-end to MySQL in connecting tables in MS Access database with tables that already exist on the MYSQL base. When we run query on the table in Access, ODBC is used to query the MySQL database.

The first step in process of connecting is to open the Access database that we want to link to MySQL. In the "External data" menu you need to select the "ODBC Database". The option "Link to

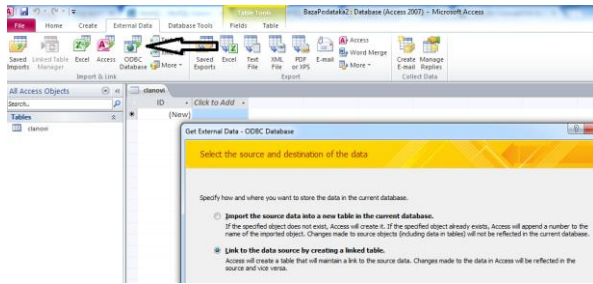the data source by creating a linked table" is selected as in "Fig. 8".

Figure 8. *Connecting the ODBC databases*

After first step, a list of all data sources for the installed ODBC driver in our computer is displayed, as shown in "Fig. 6". We should select "Machine data source".

If the database for connection to MS Access requires a password and user name in this second step user will be prompted to enter the appropriate data. MS Access is connected to the MySQL server and shows a list of tables that can be linked. In our case, we connect the database with the table "members" as show in "Fig. 9".
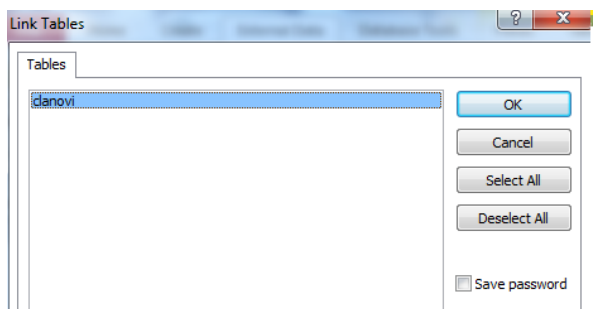

Figure 9. *List of tables for connecting*

If no tables are shown in this step, this may be because of incorrect ODBC driver setup. If the database in Access already has a table with the same name as the one it is connected to, Access will add a number to the name of the new associated table. Also, if Access was unable to determine the primary key for the table automatically, it will ask to select the column that will be set up for primary key. The tables in Access and MySQL are now successfully linked.

Since the Access database already contained table members, the name of the new table has been changed, or added to the already existing table as show in "Fig. 10".

Figure 10. *Connecting tables*

The advantage of this method in relation to the above-described way is to create a link that is always active. Any update of the data in Access will also reflect on the corresponding tables in MySQL.

If we required active connection, this method will be used. However, for the teaching process that applies to practical teaching in course Internet Programming, it is not necessary to use an active link between the databases. The main purpose of all methods described in this paper is to allow the students to usage workload of MySQL tables with a lot of records in it.

Other instructions, such as Select, Update, Insert, Drop, Delete etc. will be build up directly from MySQL.

3.3 Export data from MS Access to MySQL using third software

Another scenario for the migration of the MS Access database described in this paper implies the use of a free "**Bullzip MS Access to MySQL**" program, [7]. When a program starts, a wizard is launched to make it easier the process of transferring data from MS Access to MySQL.

As with the previous method of transferring the database (described in 3.1.), it is understood that ODBC driver on the computer is installed. Since the ODBC driver only supports Windows, it automatically means that, this way of migration MS Access database to MySQL can be used on the Windows operating system. This method is similar to the previously described method when no active link between the databases is created.

Below are the steps that need to be taken to successfully migration the database from MS Access to MySQL.

1) The first step is to prepare data for export. The name of the database that is exported to the MySQL server is selected. If access code is used for database access, the user name should also be specified in this step. This step is described in "Fig. 11". We need to set up a username and password to access to the MySQL server. In this step, the name of the database destination is also entered.

It is precondition that a database has already been created under the same name on the MySQL server. Through a few simple steps, tables from the export base are selected.
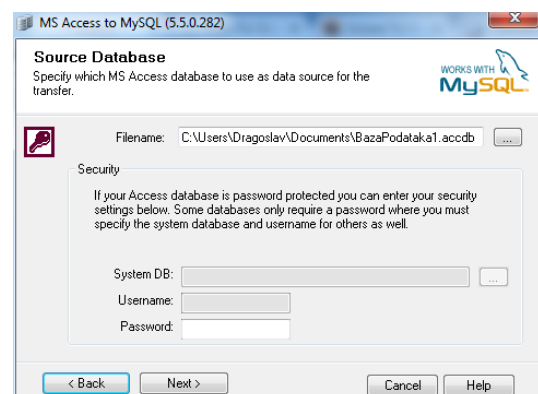

Figure 11. *Export Database Selection*

2) The next step is to set up the destination base. This step is shown in "Fig. 12".
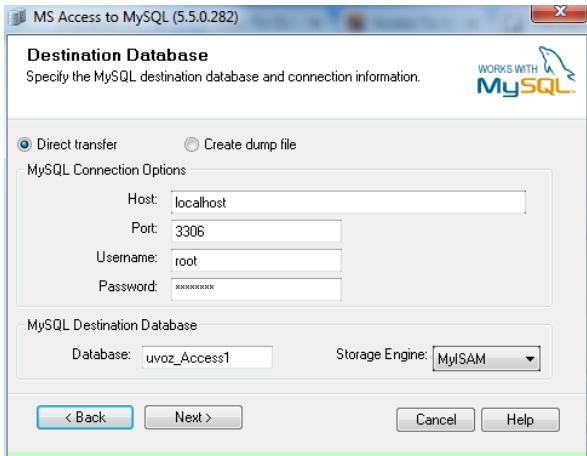

Figure 12. *Adjusting the destination database*

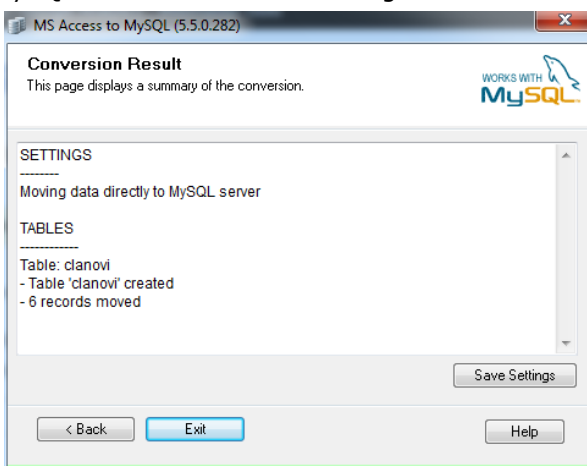The database migration results from Access to the MySQL server can be seen in "Figure 13".

Figure 13. *Migration result*

As a result, we have successfully completed the Mechanism for Migrating Data in MySQL database.

4. CONCLUSION

In this paper, we have presented mechanisms for data migration of relation databases and how we can be use software tools to connect MS Access and MySQL databases. We came to the conclusion that for students previous knowledge gained in previous years of study about relational databases can applies in the final years of the study process.

We show direct and indirect methods for connection two databases. In direct method we show that it is not require for users to use of third party software for that process. Opposite of that when we use indirect method it implies the installation of the software "Access to MySQL". We also detail the two types of direct method depending on whether or not we need on-line link between two databases. However, for the teaching process applied in the practical lessons for Internet Programming course we have shown that students do not have to use the active link between the databases. A good understanding of the basics of data migration in relational databases can attract students to improve their knowledge about database administration through future development of graduate papers and works through projects.

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