



DBTech VET



DBTech VET* WP2: Development Final Report

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1. Introduction

According to the project plan the tangible outcomes include the course module on SQL transactions with content materials in Web and downloadable virtual database lab for hands-on exercises, training course material for teachers on pedagogy and use of the course module. All materials will be available in Web in English and in national languages of the project partners, and available for translations to other languages.

SQL transactions has been an important topic of courses on Data Access Technologies at Haaga-Helia UAS for years, and it was selected as the topic of the first DBTech Pro workshop in 2003 at ATEI Thessaloniki developed and presented by Kari Silpiö. Quite early it was noticed how differently from each other and from the SQL standard the DBMS products behave. These differences are not widely known by teachers and not even by ICT professionals who often are familiar with only some products.

Since then a tutorial in SQL transaction programming was developed at Haaga-Helia UAS in Finnish by Martti Laiho and Mika Wendelius from BDB Oy. Porting the developed hands-on exercises between member institutions faced the challenge of different DBMS products and technical infra-structures. The virtual machine technologies, Microsoft Virtual PC, VMware, and Sun's VirtualBox provided solution for shareable infra-structures between the institutions. Many partners had selected VMware for internal use, but based on the experience of prof. Dr. Georgios Evangelidis at University of Macedonia (UoM) in Thessaloniki, the **VirtualBox** was selected as the general sharable VM platform with the free Debian Linux as the operating system, and a 32bit Debian 5 based virtual laboratory **DebianDB** was built by Mr Taito Halonen at Haaga-Helia UAS as thesis work for the DBTech EXT project 2010 using the English GNOME desktop, including the installing, licensing and administration documents. The free DBMS editions which the DBMS vendors were releasing to market as low-end editions of the commercial products used in the ICT industry, provided tools for experimenting with real DBMS products, such as **Oracle XE**, **DB2 Express-C**, **PostgreSQL** and **MySQL**.

The previous tutorials on SQL transactions and the free virtual database laboratory provided the innovation bases to be transferred to training of VET and HE teachers and use as teaching module on SQL transactions of the DBTech VET Teachers project.

2. The SQL Transactions handbook and Teacher Guide

The series of SQL transaction experiments were tested by Haaga-Helia students on Martti Laiho's DB2 courses with good acceptance by students.

Then the series of extensive SQL transaction experiments were adopted by Martti Laiho as scripts for all DBMS products in DebianDB, and on SQL Server Express on Windows, so that a learner could use what ever product in the VM or a DBMS available. A generic tutorial in English was compiled by Martti Laiho based on the early Finnish tutorial, including the interesting DBMS behavior findings in the experiments.

Even if the virtual laboratory with the hands-on scripts was made available to partners before the kick-off meeting in Málaga, no comments was received. However, at the Málaga workshop (see the WP3 report) it turned out that MySQL is the most popular DBMS among the VET institutions, and we should focus on that. The MySQL exercises were asked to be included in the tutorial text, and the form of the tutorial was changed into a "student guide", later renamed as "**SQL Transactions handbook**" which was rewritten by Martti Laiho, Prof. Dr. Dimitris Dervos, and Kari Silpiö. The pictures in the handbook were extended into a slide set which the instructors of the course module can use in classroom presentations.

Exercises using **Microsoft SQL Server** with the results were included in Appendix 1, so that the learner can see how to run the tests and also compare the results with corresponding results from SQL Server.

Since no applications are written in SQL language only, in Appendix 2 the basic transaction example of a bank transfer was implemented in Java program to demonstrate use of SQL and SQL transactions using the JDBC API of Java. The purpose of appendix 2 is also to “market” the possible next project / handbook on database APIs.

Appendix 3 on transactions as units of recovery with the separate slide set on Rollbacks and basics of transaction internals prepares learners to understand transactions from point of view of database administration.

The handbook in English was published on the Summit in Sept 2013 at Haaga-Helia UAS, and made available as PDF file on www.dbtechnet.org pages. Since then some updates have been included in the handbook.

For instructors a **teacher guide** was written by Martti Laiho and prof. Dr. Dimitris Dervos, pointing out the important topics of the handbook. The purpose is to update the teacher guide according to experiments on use of the handbook.

The handbook and the teacher guide have then been translated by partners into their national languages, and the translations are publicly available on the new portal at <http://150.214.214.5/DBTechVETProd> developed by prof. Dr. Ismael Delgado at University of Málaga (UMA).

3. The Virtual Database Laboratory DebianDB

The leading software development platforms are Oracle’s Java on any operating system platform and Microsoft’s .NET (“dot net”) on Windows. An open source group has ported .NET to Linux as Mono system including its Java like programming language C#. The port to Debian 5 had problems which were fixed in Debian 6, and since the advanced Pyrrho DBMS developed by prof. Dr. Malcolm Crowe from University of the West of Scotland has been written in C#, we upgraded DebianDB to Debian 6 level. Pyrrho DBMS has special **optimistic concurrency control mechanism** for transactions, which we now can offer for to be experimented in real life to learners instead of “paperware” in textbooks.

The whole collection of the developed transaction exercise scripts have now been stored in the /home/student/Transactions directory to allow easy copy/paste experimenting with the DBMS products, and to help learners to start experimenting with available DBMS products Martti Laiho has written the “Quick Start to the DebianDB Database Laboratory” tutorial in English, which is stored as PDF file on the desktop inside the DebianDB. The tutorial explains the first steps in use of the DBMS products and how to keep the DebianDB updated according to the update services provided at www.Debian.org. The Quick Start to the DebianDB has been translated by partners to local languages.

The “open virtual appliance” OVA file for installing DebianDB version 6 is available for free downloads at www.dbtechnet.org/download/DebianDBVM06.zip and also the portal at UMA. In terms of transaction programming an important upgrade was MySQL version 5.6 which included the “GET DIAGNOSTICS” command implementation of the SQL standard, and included in the transaction scripts of MySQL for the Summit 2013 where the DebianDB version 6 was distributed to participants on DBTechNet USB sticks.

For sustainability some updates to DebianDB has been installed lately in DebianDB 6, but in terms of DBMS products the version is frozen, since the used 32bit virtual machine is the limitation for installing the latest Oracle XE and DB2 Express-C versions. Therefore, outside the current DBTech VET Teachers project , a new 64bit virtual database laboratory based on Debian 8 is under development among DBTechNet at UoM to replace DebianDB 6 in future.