WEB-ORIENTED APPLICATIONS OF DATABASES USED IN ELECTRICAL DOMAIN

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This paper presents some experiments that demonstrate the scenario of the Leonardo da Vinci VirtualElectroLab project, distance experiments using Java technologies for accessing the laboratories' resources in an asynchronous mechanism. Another application of databases determines the normalized forms of a relation that has a number of attributes. Using these dependencies, the application determines the first, second and third normalized form of the relation. In a typical distributed system built for allowing web-experiments on real equipment, the database is found on the server level. The server (be it an API or a Web Service) will interact with the database as information support. Here the normalization is important for eliminating redundancies and thus increasing the simplicity and reliability of the systems.

Keywords: web-experiments, Java, databases, normalization

1. INTRODUCTION

Meeting the growing need to have a stronger contact with the classroom and the laboratory, come the virtual classrooms - managed by teachers, the forums, the online testing methods for acquired knowledge and many other tools. The online laboratory and practical work part were less developed, disadvantaging the distance learners.

In this way, the e-learning trend is guided by the emergence of more and more e-learning centers, which offer on-line laboratory facilities. These can be virtual or remote. The virtual ones simulate the functionality of a real laboratory and send the simulated experimental data to the user. The remote ones have real equipment as backend, on which the measurements take place.

The remote laboratories present a high interest for the ones that learn, because they have the possibility to experiment on real equipment from home or from work, using equipment located into a university laboratory for example. This facility is important in understanding the processes from the practical point of view. The equipment, often expensive from the laboratories will become accessible to the wide public.

In the Leonardo da Vinci VirtualElectroLab project we have implemented virtual and remote laboratory experiments for using as e-learning material. These laboratories provide functionality just like normal laboratories, but the students access the resources via a web-browser, from anywhere on the Internet. In this paper

we present the architecture of these laboratories and the functionality, as well as some of the achieved results.

2. SYSTEM ARCHITECTURE

The architecture of the system is distributed over five application levels as can be seen from the scenario presented in fig. 1.

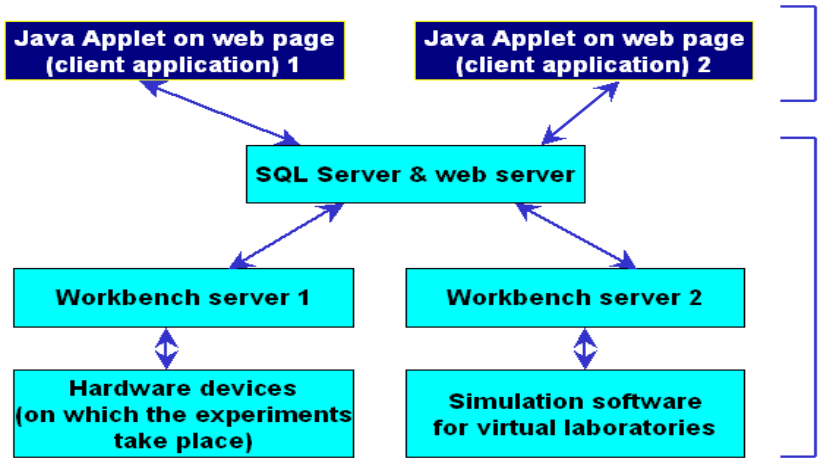

Fig. 1. Architecture of the virtual and remote laboratories system

The base level (hardware devices or simulation software) represents the actual laboratory resources. These are measuring stands, electronically driven engines, simulation software for databases etc.

The workbench servers are applications developed for communicating with the equipment on one side and with the system on the other side. The workbench servers scan the database periodically to check if there are new requests posted. The new requests are fetched and the workbench servers automatically execute the experiments in order to get the experimental data requested. After the experiment is done, the results are uploaded into the database.

The database, together with the web-service is the core of the system. The database server manages the laboratories, the requests and the experimental results for the laboratories. Web-Service, together with the web server represents the interface of the database application with the web-applications that the user accesses via the web-browser. Because security reasons, it is dangerous to allow a web application such as a Java applet to directly access the database, so instead of doing so, we created this supplemental level of application which is the public side of the server. The database is mapped internally into the laboratory network and the user applications access the system through the Web-Service.

The applications developed on the top level are Java Applets and they provide the functionality of the system online. These Java applets are accessed by students. They can place requests for measurements or experimental data, and can view the status of the requests, previous requests posted, results for a particular request (if the request was solved).

3. IMPLEMENTED RESULTS: DATABASE NORMALIZATION LABORATORY

This application determines the normalized forms of a relation that has a number of attributes. Using these dependencies, the application determines the first, second and third normalized form of the relation.

The normalization is important for eliminating redundancies and thus increasing the simplicity and reliability of the database systems.

In the fig. 2. is shown an example of a normalized database:

Fig. 2. Example of a normalized database

In fig. 3. we present the interface of the database normalization laboratory.

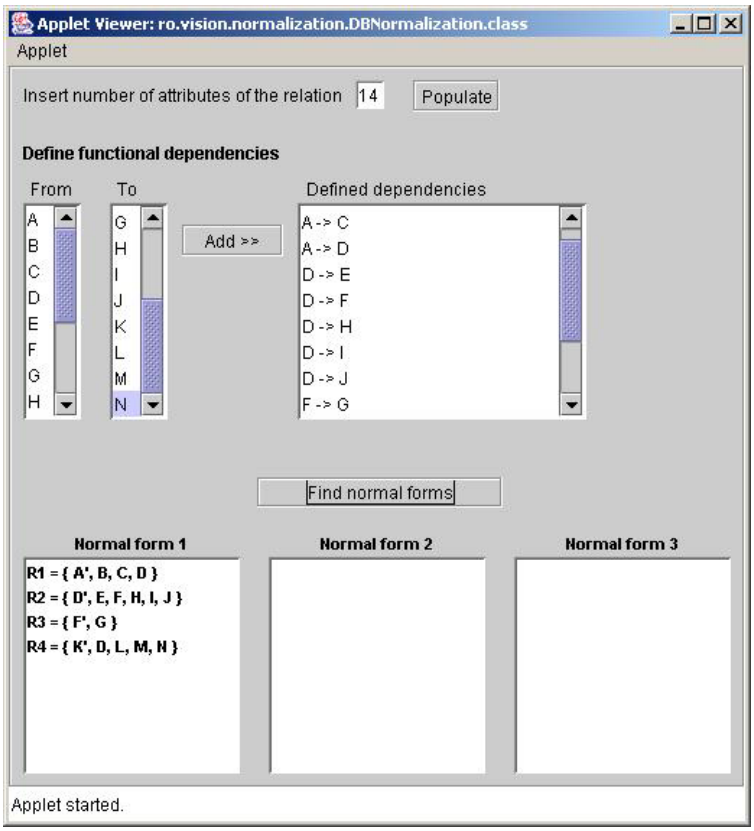

Fig. 3. The web interface of the database normalization laboratory

The user enters the number of attributes of the relation and the dependencies between the attributes. After finishing, the user clicks the find normal forms button and the application shows the results.

We have a relation with a number of attributes for which we want to determine the first, the second and the third normal form. For this, the user needs to enter the number of attributes of the relation and the dependencies between the attributes. In our case the dependencies between attributes should be valid. Using these dependencies, the application determines the first, the second and the third form of the relation.

First time the user chooses the number of attributes *n* of the relation. Pressing the button *Populate*, the lists *From* and *To* are populated with a number of elements equal to the number of attributes chosen by user. The elements from these lists are the first *n* letters of the alphabet. For defining dependencies of the relation the user should use just simple dependencies (one to one). The application doesn't validate the data input, so the user should be the one who assures the correctitude of the dependencies inserted (it shouldn't appear cycles between dependencies and the primary key should be formed by just one single attribute).

If the user has inserted a wrong data, he must go back at the action that makes the completion of the lists *From* and *To* by pressing the button *Populate*. This will erase all dependencies inserted before.

After the user has finished the insertion of dependencies, all three normal forms are computed when the user presses the button Find normal forms.

The normal forms obtained are inserted into three lists (a list for every normal form). The attributes, which are followed by an apostrophe character, are included into the primary key of that table.

4. CONCLUSIONS

In the e-learning domain it is important to have virtual and remote laboratories as source for learning. In this project we have implemented several laboratories for web-deployment and distance learning.

The presented laboratory helps students to understand the process of database normalization. They can experiment using this simulator various database configurations and see the results in real-time.

5. REFERENCES

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