# Demo: Mobile Database Administrator-MDBA

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## ABSTRACT

Increasingly advances in mobile computing are allowing development of the applications for ubiquitous computing environment. Ubiquitous computing represents the concepts of computing everywhere, making computing and communication essentially transparent for users. This paper presents the MDBA (Mobile Data Base Administrator), a context-aware tool for remote data base administration that is executed in mobile devices. The MDBA enables database administrators (DBAs) to perform their tasks by automatically identifying databases and the wireless communication structure of a given ubiquitous computational environment. Therefore, the MDBA tool provides database administration services anywhere and anytime. Furthermore, the MDBA enables DBAs to manage databases residing in mobile hosts or fixed hosts.

## Keywords

Ubiquitous Computing, Database Administration, Context-Aware

## 1. INTRODUCTION

Several database management systems (DBMSs) manufacturers provide efficient administration tools, when executed in a computer with fixed address in a network. However, these tools become inefficient when any problem happens in the databases (DBs) and the DBA is out of the company, but the problem has to be solved immediately. A solution for this problem is to allow remote administration of the DBs through mobile computational and pervasive computation technology support.

This paper presents a context-aware tool for remote data base administration that is executed in mobile devices. The main goal of this tool, denoted Mobile Database Administrator (MDBA), is to allow DBAs, independently of their physical location, to perform a database administration task in a ubiquitous computing environment through a mobile devices like: handhelds (Palm, iPaq, Personal Digital assistant-PDA), cell phones or notebooks. The tool is sensible to the location (or context), recognizing, for

example, the available DBMS in computational environment (MySql, Oracle, SQL Server, etc.) and the wireless communication infrastructure (Bluetooth, Wi-Fi or cell phone network) of the environment where the mobile device is located. With this information, the tool can be configured to establish a connection through the environment's available communication infrastructure.

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## 2. MDBA REQUIREMENTS

The MDBA is a remote database administration tool which has the following properties: (i) Flexibility to support functionalities from different DBMSs and allow connectivity with different wireless access technologies, like Bluetooth, Wi-Fi, and GPRS; (ii) Adaptability to reduce the frequency of interruptions during the tool's execution when context changes occur (e.g., vertical handoff); (iii) Portability to allow its execution in PDAs and in cell phones as well.

Those properties provide the necessary support for the execution of administration tasks for several heterogeneous database systems (installed in a fixed network or mobile one) and access to them, avoiding the use of a specific tool for each DBMS and making possible remote database administration possible through any kind of PDA (or mobile phones). Finally, those properties support dynamically reconfiguration of the connectivity of the wireless communication structure's parameters when vertical handoffs occur.

## 3. MDBA ARCHITECTURE

The MDBA architecture comprises two main modules: Client and Coordinator. The client module, installed in a mobile device, provides an interface of the application to the database administrator and performs the connectivity of the mobile device, with the fixed network, through a wireless communication structure available in the equipment. The coordinator module manages the requests from mobile devices, performs the sending of information about modifications of the computational devices for the mobile devices connected to the fixed network and

performs the communication with database systems from the computational environment.

Figure 1 presents the MDBA architecture. The client module has two layers: the MDBA engine layer and the MDBA connection. The MDBA engine layer consists of a remote application installed in the mobile device and executed on Java Virtual Machine (JVM). The application is a graphic interface containing functionalities of database systems' administration that are made available according to the selection of the DBMS by the DBA. The graphic interface implementation is structured according to the context-oriented programming, which allows, at runtime, to process parts of selected codes. This part of the code is called Stub. In other words, only the stub corresponding to the functionalities of the selected DBS has to be incorporated into the application structure at runtime.
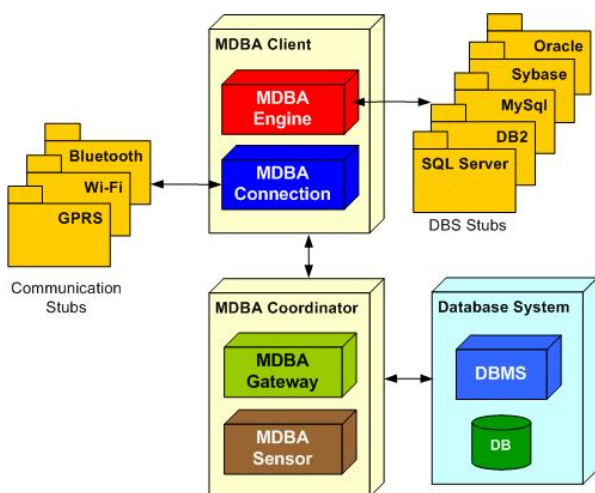


**Fig. 1 – MDBA Architecture**

The MDBA connection layer is responsible for the communication between the client module and the coordinator. This layer also consists of a context-aware application, executed under JVM. The MDBA connection sends requisitions from MDBA engine to coordinator module, to pass it to the database server of the computational environment and return the result of these requisitions to MDBA engine. The MDBA connection also uses a context-aware approach to execute parts of the code when establishing the connectivity with the coordinator. This is because a mobile device can support many wireless communication structures and migrate from one technology to another during the execution of the application (vertical handoff). Thus, the MDBA guarantees a dynamically reconfiguration of the wireless communication structure's parameters.

The coordinator module comprises two layers: MDBA gateway and MDBA sensor, both implemented in Java. The MDBA gateway layer is responsible for sending requisitions from the MDBA engine to a given DBS. This requisition is sent by the MDBA connection layer and it is passed to the database Server.

The MDBA sensor layer has the functionality of acquiring information from the computational environment. This information is obtained through programs installed in a web Server that searches the computational environment and passes them to a specific layer (MDBA engine or connection layers) through the MDBA gateway.

## 4. MDBA TOOL

A prototype was developed for mobile computational environments that have a wireless interface of the WLAN kind, a fixed unity containing different database systems, and a mobile unity connected to the wireless interface by an access point (base station). To illustrate the MDBA tool, the figure 2 presents the MDBA prototype that was developed.



**Fig. 2 – MDBA Prototype**

The following technologies were used to implement this prototype: J2ME (Java Micro Edition), Servlets, SQL Server 2000, MySql, J2ME Wireless Toolkit, Apache Tomcat 4.0, and Palm OS Emulator.

The J2ME platform was chosen because it provides a bigger number of mobile devices compatible with the proposed tool. The application and the connectivity on the client side were developed in J2ME, one of the Java technology's specifications that Sun Microsystems developed for mobile devices. The connectivity application on the server side was developed using the concept of Servlet. Likewise the client connectivity and the MDBA, it was developed using the Java. The software Apache Tomcat 4.0 was the web server chosen because it is the server recommended by Sun Microsystems to execute Servlets. In order to simulate the administration of different databases systems, the DBMSs SQL Server and MySql were used.

The MDBA tool presents the following functionalities: i) execution of commands DDL (data definition language) and DML (data manipulation language), through QBE (Query By Example) strategy or typing DDL or DML expressions from SQL 99; ii) information about connected users and processes; iii) creation, removal and modification of objects: databases' instances, tables, columns and indexes; iv) creation and execution of stored procedures, triggers, visions; and v) start and Stop of DB server.

In order to illustrate the use of the MDBA tool, consider that a DBA carrying a mobile device (cell phone or handheld) comes to a wireless communication network (Wi-Fi, Bluetooth, GPRS) area. When the execution of the MDBA tool is started, an initial screen with a list of available DBMSs in the mobile computational environment will be presented (in which the DBA

is located). The DBA should select, then, one of the listed DBMSs. After a DBMS is selected, the DBA (user) identification and authentication screen is displayed. After filling out data, the administrator can perform any operation on the indicated DB.

The solution presented in this work proposes facility and rapidity when executing tasks of a DBA in a computational environment that has several DBSs. Of course, such a feature contributes for the raise of productivity of a DBA and minimizes time for used by a DBA to connect in fixed computers using traditional administration tools. Another advantage of the MDBA is to be implemented in J2ME. Recall that the J2ME platform allows an application to be executed in any mobile device which has a JVM, without the need to rewrite it for each device (Figure 2 shows the MDBA being executed in two different mobile devices, in a cell phone and in a PDA).

## 5. CONCLUSION

This paper has described a context sensitive tool, denoted Mobile Data Base Administration (MDBA), whose key goal is to allow remote database administration through mobile devices considering the aspect of the diversity of existing DBMS and wireless communication networks' structures.

Using the implemented prototype, one may observe that a DBA is able to execute any database administration command. Keeping DBMS always working with performance (adequate to the needs specified by users) anytime and anywhere and in a safe and immediate form is a key issue in modern enterprise.

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