



## Chapter XVII

# MAMDAS: A Mobile Agent-Based Secure Mobile Data Access System Framework

Yu Jiao, Pennsylvania State University, USA

Ali R. Hurson, Pennsylvania State University, USA

### ABSTRACT

*Creating a global information-sharing environment in the presence of autonomy and heterogeneity of data sources is a difficult task. When adding mobility and wireless media to this mix, the constraints on bandwidth, connectivity, and resources worsen the problem. Our past research in global information-sharing systems resulted in the design, implementation, and prototype of a search engine, the summary-schemas model, which supports imprecise global accesses to the data sources while preserving local autonomy. We extended the scope of our search engine by incorporating mobile agent technology to alleviate many problems associated with wireless communication. We designed and prototyped a mobile agent-based secure mobile data access system (MAMDAS) framework for information retrieval in large, distributed, and heterogeneous databases. In order to address the mounting concerns for information security, we also proposed a security architecture for MAMDAS. As shown by our experimental study, MAMDAS demonstrates good performance, scalability, portability, and robustness.*

## INTRODUCTION

Database systems play important roles in information storing and sharing. They are widely used in business, military, and research fields. However, since they have been developed, evolved, and applied in isolation over a relatively long period of time, the inevitable heterogeneity and autonomy become unavoidable characteristics of any information-sharing environment. Moreover, for many practical and performance purposes, the creation of databases is usually close to the application domains. Consequently, information resources are distributed in nature. This distribution of information worsens the problem of global information sharing.

To overcome the obstacles brought by the local database heterogeneity, two possible solutions have been studied in the literature:

- Redesign the existing databases to form a homogeneous information-sharing system, or
- Develop a global system on top of the heterogeneous local databases to provide a uniform information access method (a multidatabase system).

The first solution is not economically feasible due to its high cost; hence, the second approach (multidatabases) is recognized as a more practical solution (Sheth & Larson, 1990). Within the scope of multidatabases, the summary-schemas model (SSM) proposed by Bright, Hurson, and Pakzad (1994) is a solution that utilizes a hierarchical meta-data in which a parent node maintains an abstract form of its children's data semantics, namely, a summary schema. The hierarchical structure and the automated schema abstraction significantly improve the robustness and provide dynamic expansion capability to the system. By using an online thesaurus, the SSM also supports imprecise queries.

As mobile communication technology advances and the cost and functionality of mobile devices improves, more and more users desire and sometimes demand anytime, anywhere access to information sources. The flexibility of such mobile data access systems (MDASs) comes at the expense of system complexity caused by technological limitations (i.e., low network bandwidth, unreliable connectivity, and limited resources).

The mobile agent-based distributed system design paradigm can alleviate some of these limitations. When mobile agents are introduced into the system, mobile users only need to maintain the network connectivity during the agent submission and retraction. Therefore, the use of mobile agents alleviates constraints such as connectivity, bandwidth, energy, and so forth.

We have designed and prototyped a novel MDAS framework, called MAMDAS — a mobile agent-based secure mobile data access system framework. This framework adopts SSM as its underlying multidatabase organization model. The design of MAMDAS intends to address two major issues: achieving high performance and supporting mobility. In this chapter, we focus on the performance issues. Studies addressing the second issue can be found in Jiao and Hurson (2004b).

The use of mobile agents alleviates many problems associated with mobile computing. However, it also has brought upon new challenges in ensuring information security. In order to address this problem, we propose a security architecture for MAMDAS that can protect the hosts, agents, and communication channels.

26 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: [www.igi-global.com/chapter/mamadas-mobile-agent-based-secure/4399](http://www.igi-global.com/chapter/mamadas-mobile-agent-based-secure/4399)

## Related Content

---

### Intrusion Detection System for IoE-Based Medical Networks

Parul Lakhota, Rinky Dwivedi, Deepak Kumar Sharma and Nonita Sharma (2023). *Journal of Database Management* (pp. 1-18).

[www.irma-international.org/article/intrusion-detection-system-for-ioe-based-medical-networks/321465](http://www.irma-international.org/article/intrusion-detection-system-for-ioe-based-medical-networks/321465)

### Reverse Engineering from an XML Document into an Extended DTD Graph

Herbert Shiu and Joseph Fong (2008). *Journal of Database Management* (pp. 62-80).

[www.irma-international.org/article/reverse-engineering-xml-document-into/3395](http://www.irma-international.org/article/reverse-engineering-xml-document-into/3395)

### Online Data Mining

Héctor Oscar Nigro and Sandra Elizabeth González Císaro (2005). *Encyclopedia of Database Technologies and Applications* (pp. 427-432).

[www.irma-international.org/chapter/online-data-mining/11184](http://www.irma-international.org/chapter/online-data-mining/11184)

### Towards Flexible Specification, Composition and Coordination of Workflow Activities

Ling Liu and Calton Pu (2003). *Advanced Topics in Database Research, Volume 2* (pp. 162-190).

[www.irma-international.org/chapter/towards-flexible-specification-composition-coordination/4345](http://www.irma-international.org/chapter/towards-flexible-specification-composition-coordination/4345)

### Issues in Mobile Electronic Commerce

Asuman Dogac and Arif Tumer (2002). *Journal of Database Management* (pp. 36-42).

[www.irma-international.org/article/issues-mobile-electronic-commerce/3275](http://www.irma-international.org/article/issues-mobile-electronic-commerce/3275)