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## The Study on Device Application Development and Data Synchronization

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### Abstract

This paper provides a brief background on mobile device application, Sybase Unwired Platform, related components and terminologies. The research on replication-based data synchronization is investigated. With Sybase Unwired Platform, we implement mobile device application development and deployment. The experimental results demonstrate the process and performance on data synchronization.

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*Keywords:* Sybase Unwired Platform; Mobile Device Application; Data Synchronization

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### 1. Introduction

The influx of powerful smartphones and innovative applications is driving widespread consumption of mobile technology, making return on investment in mobile IT much more transparent for companies [1]. Today, mobile computing has become mainstream. Mobile devices are more powerful, functional, and essential to business than ever before. Of course, they will continue to evolve and get better and more indispensable [2]. So there is a growing desire of telecommunication operators to increase income by offering value-added services to customers in addition to traditional voice and data communication [3]. The frontlines of business have arguably become the most dynamic, productive and mission-critical parts of many organizations.

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With the exponential growth of personally owned and corporate-liable mobile devices entering the enterprise, businesses are seeking a comprehensive and integrated platform to simplify the development, deployment and security of their mobile application landscapes across a widening array of device types.

Sybase Unwired Platform (SUP) is a mobile enterprise architecture designed for application development and deployment, which enables enterprise developers to simply and quickly build applications that connect business data to mobile workers on any device, at any time [4]. It provides a set of comprehensive services that allow customers to mobilize appropriate data and business processes for enterprises using virtually any mobile device [5]. Businesses can typically experience a lower total cost of ownership (TCO) and higher return on investment (ROI).

For improving local response speed, data synchronization is also becoming more and more important. Synchronization improves response time and retrieval rate for data request because request is processed on a local server rather than a wide area network. Also, local processing offloads work from a central database server so that competition for processor time is decreased.

## 2. Sybase Unwired Platform

Sybase Unwired Platform addresses the needs of both mobile and Web developers by providing a comprehensive, standards-based environment across various device platforms. It includes the ability to: connect to your structured and unstructured data sources; develop, package, and deploy mobile business objects; develop mobile clients; manage provisioning of mobile clients and devices. Sybase Unwired Platform architecture is shown in figure 1.

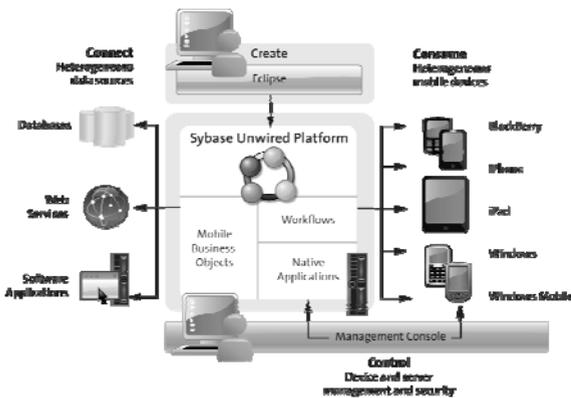


Fig. 1. SUP system architecture

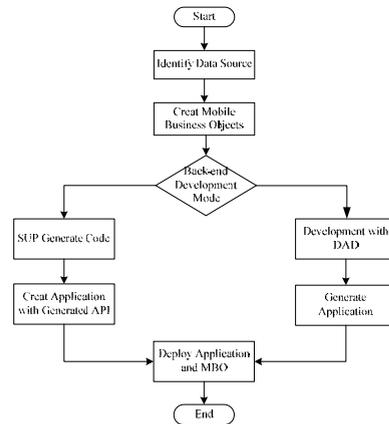


Fig. 2. Bottom-up development method

- Sybase Unwired Server

Unwired Server allows management of deployed mobile device application packages, coordinates data synchronization with enterprise information systems, and secures and monitors the mobility environment in which it operates. From Unwired Server, users can package and deploy one or more applications to mobile devices as well.

- **Mobile Devices**

Including Windows Mobile, Windows 32 (laptops/ tablets), iPhone, BlackBerry, and so on. Nowadays, a lot of effort is being spent on improving speed for data exchange. The efficient and effective method is to implant embedded database in mobile devices, effectively relieving the pressure for unwired server.

- **Sybase Unwired Workspace**

As an Eclipse-based development tool designed for mobile device application development and deployment, Unwired Workspace provides an extensive set of tools to simplify connection with back-end systems, and seamless integration with Eclipse. Both data organization from variety of data sources and code generation for mobile device applications could be fulfilled by this component.

There are two development approaches supported by Workspace, bottom-up and top-down. Bottom-up development method is undertaken in this paper. The development process is shown as figure 2.

- **Sybase Control Center**

Sybase Control Center offers a single comprehensive Web administration console to configure and manage Unwired Server and its components [6]. It contains an integrated set of managements and configuration for servers, server logs, subscription and mobile device application deployment. Multiple administrators could assess different administrable components from a single access point.

- **Enterprise Information Systems**

Users can create and manage multiple mobile device applications that securely connect a variety of back-end data sources (Databases, Web Services and SAP servers) to all major device types via Sybase Unwired Platform, which easily integrates with existing enterprise infrastructure, business processes and enterprise applications, provides unified interfaces for application development and deployment across various device platforms, simplifying and accelerating the creation of business process mobilization and integration without the need for development resources [7].

### **3. Replication-based data synchronization**

Data synchronization is to make device application's data updated with the contents of the Unwired Server cache (which is also called the consolidated database, or CDB) [8].

Replication-based data exchange and synchronization from traditional back-end systems to multiple mobile devices are achieved by graphical modeling of Mobile Business Objects (MBOs). An MBO is defined as a set of data retrieved from back-end systems, which contains both concrete abstract interface-level details and implementation-level details [8], such as the information sent from back-end systems to clients, the methods on data delete, create and update, and so on. It is corresponded with binding data source at any time, the use of which abstracts the low-level synchronization details from mobile application.

During data synchronization from back-end systems to devices, mobilization of data involves retrieving data from various back-end systems and storing it in a cache from which it can be downloaded to devices on demand [9].

Replication-based synchronization (RBS) data are packaged as MBOs that use a replication paradigm to synchronize data and propagate transactions between a device and Unwired Server. Data can be synchronized through a server-initiated push notification transmitted at defined intervals. When MBO data in the CDB changes:

(1) Notifications are sent at a set interval, ended when the client acknowledges it has received notification.

(2) Unwired Server determines when individual devices need to be notified of changes and can override device application settings and synchronize the device application with the contents of the CDB.

On the other hand, synchronization is also required to reconcile differences and bring each device into coherence with the working copy of the EIS data maintained in the consolidated database (CDB), before writing device updates back to the EIS. The synchronization flow is shown as figure 3.

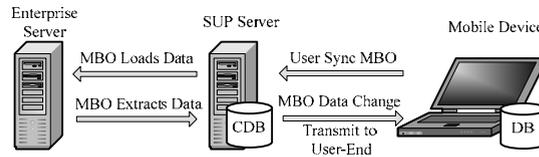


Fig. 3. Data Synchronization Flow

**4. Synchronization Process and Realization**

In this paper, we set up development environment based on Sybase Unwired Platform 2.0 and Blackberry JDE 6.0.0, choose bottom-up approach to explore mobile device application development. The device application design flow is shown in figure 4.

Here, the back-end data source is a database from ASA, so displayed form for MBO will be a data table (suppose customer table). Browse this MBO in BlackBerry simulator, modify MBO data and submit update to Unwired Server. Then data synchronization can be done.

In BlackBerry simulator, we focus on the record of id = 101. In this record, city = Rutherford, states = NJ. Modify values for city and states as Xian and SX respectively, and then sync data. When submit results to Unwired Server, BlackBerry simulator will display the process of data synchronization. After done, check the records in ASA data source, the values of city and state are updated as the desired results. See figure 5.

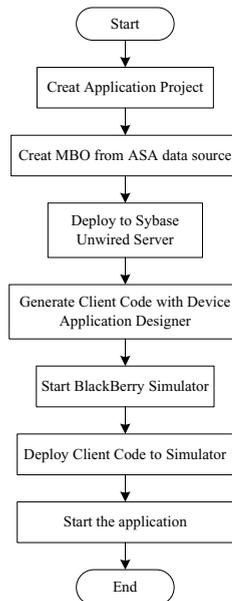


Fig. 4. Device Application Design Flow

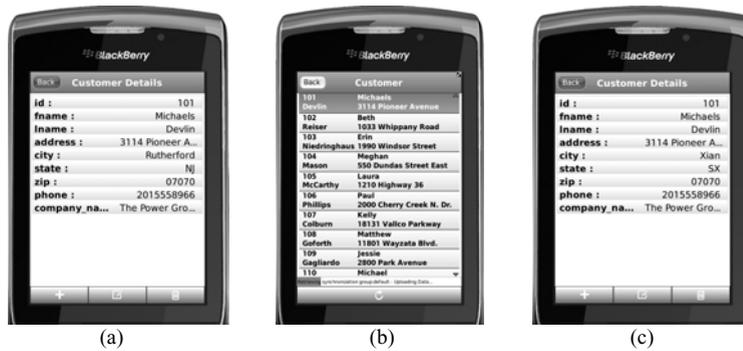


Fig. 5. Data synchronization process: (a) Data before updating; (b) Synchronization process; (c) Data after updating

## 5. Conclusion

Sybase Unwired Platform provides an integrated solution for mobilizing the enterprise. Regardless of any mobile devices, almost all enterprise data and business processes can be mobilized by it, fulfilling the target of "Design once, deploy to Multiple Device".

This paper briefly introduces prospect and benefit for mobile device application development, outlines Sybase Unwired Platform system architecture and relevant concepts. A comprehensive study of Sybase mobile application development and RBS data synchronization has been presented and investigated in this paper. We have illustrated the approach for mobile device application development and deployment. The experimental results shown in figure 5 verify the proposed method.

It is proven that regardless of industry or size, a mobile enterprise is a fertile field for business innovation, competitive growth and profitability. The pervasiveness of mobility and impact on consumers to businesses make it one of the most profound transformations in IT history.

## References

- [1] PR Newswire, "SAP and Sybase Step Closer to Reaching 1 Billion People With Release of Next-Generation Sybase® Unwired Platform," unpublished
- [2] Sybase, Sybase Unwired Platform-A White paper from sybase, Dublin: Sybase, 2010
- [3] Y. Kawahara, H. Kurasawa, and H. Morikawa, "Providing user context for mobile and social networking applications," *Pervasive and Mobile Computing* 6, 2010, pp.324-341
- [4] <http://www.sybase.com/products/mobileenterprise/sybaseunwiredplatform>
- [5] [http://en.wikipedia.org/wiki/Sybase\\_unwired\\_platform](http://en.wikipedia.org/wiki/Sybase_unwired_platform)
- [6] Sybase, "Sybase Control Center for Sybase Unwired Platform," Sybase Unwired Platform 2.0, pp.1-2, 2011
- [7] Nan Wang, "Sybase Unwired Platform product introduction," unpublished
- [8] Sybase, "Sybase Unwired WorkSpace – Mobile Business Object Development," Sybase Unwired Platform 2.0, pp.19-24, April 2011
- [9] <http://infocenter.sybase.com/help/index.jsp>