GREENTREE MOBILE: AN ANALYSIS

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Whilst there are many mobile ERP systems on the market, few of these can claim the advantages of being integrated end to end solutions using a single technology. Greentree's Jade-based mobile ERP solution is unique in leveraging Compact Jade to provide mobile ERP services that are fully integrated with the server and data layers of the system using Jade as a common technical platform. This approach makes deployment of a mobile solution easier than ever before. Unlike many mobile ERP systems, which are predominantly thin client architectures, Greentree Mobile can be deployed as either a thin client or smart client solution, giving the flexibility to support any role in the mobile workforce. In this white paper we provide an overview of some key benefits of Greentree Mobile, including its flexible communication architecture, user friendly UI design, and easy deployment and update processes.

Introduction

With the widespread penetration of software rich devices such as the iPhone, Blackberry and Windows Mobile Smartphones, functionally rich resident software can be created for mobile clients, while data communications infrastructure continues to improve at an impressive rate. Recent market research has noted a correlation between degrees of enterprise mobility and organisational performance, making this a major issue for corporate I.T. [1] Mobile solution vendors are now faced with challenging questions about how enterprise applications can best address the special concerns of mobility, such as bandwidth, storage, physical constraints and data synchronisation, to leverage both the power of the local device and pervasive high speed connectivity.

Mobile data services

Mobile data services fall into two general camps; those that are offered for corporate internal use (Business-To-Employee) and those that are offered to external users (Business-To-Business and Business-To-Customer) [2]. However, most mobile enterprise is primarily targeted at the corporate internal market. In addition to there being these major market sectors, Basole identifies 6 stages of enterprise mobility users [3]. Some of these are the more obvious potential users (e.g. 'road warrior') but there are other equally important types, such as 'site wanderer', examples of which include 'IT troubleshooter' and 'warehouse inventory worker'. One important feature of site wanderers is that they are likely to be able to connect via a wireless LAN rather than need to use a GPRS connection, while road warriors will be out of LAN range and require different solutions. Greentree Mobile's dual deployment options of thin or smart client mean that this solution can work for any mobile role.

Many examples of mobile data services tend to focus on the requirements of the larger enterprise, but it is also important that small to medium enterprises (SMEs) are able to participate in the mobile data service space, since they are more likely to be able to rapidly generate growth and new jobs than larger organisations [4]. In the past, the barriers to entry for mobile data services have often been too high for SMEs, but this situation is rapidly changing. Increasing affordability of powerful devices and falling data costs have converged to provide new opportunities for mid sized organisations, such that the payback period for such solutions has dropped to less than 8 months, with a typical ROI of over 400% [5]. With this kind of return, Greentree Mobile is a solution that is a realistic investment for the SME market.

Mobile ERP systems

Mobile ERP is a key enabler of the second phase of ERP implementation, which enables organisations to achieve its full capabilities and benefits, such that "Mobile ERP is arguably one of the biggest opportunity areas today" [6]. Previous mobile ERP implementations have employed various technologies, but in many cases have focused only on thin client solutions, using HTTP connectivity and/or messaging

[7, 8, 9.] Other systems have offered services through both thin and smart clients. However these have typically suffered from having many layers of complexity in making the distinction between thin and smart client, by having to use very different technologies for these clients [10]. Such complexity impacts on both the initial deployment and subsequent updates to the software. Greentree Mobile's flexible architecture, enabling both thin and smart client systems on a single integrated technology platform, therefore provides a unique value proposition in Mobile ERP deployment, supporting different types of client without compromising ease or flexibility of deployment.

Aungst and Wilson [11] outlined a number of important issues for organisations adopting wireless solutions. These included the flexibility of the software architecture, the overhead of administration and maintenance, and overall integration of the mobile system with the main ERP platform. Against these criteria, Greentree Mobile provides some major competitive advantages, with its multiple client architecture, easy deployment and integration with the main Greentree platform. They also acknowledge that the Windows CE platform used by Greentree Mobile is a compelling choice for this type of system.

Greentree Mobile Overview

The Jade-based Greentree software product was first launched in 1998 as an accounting software package. Further modules were subsequently developed so that by 2002 the product encompassed financials, distribution, job cost, customer relationship management and service management. The product has continued to develop towards providing a complete business management tool, which now includes supply chain management, payroll, manufacturing, web applications, and point of sale. Against this background, the mobile system discussed in this white paper can be seen as a natural extension to a continually evolving product suite. Greentree Mobile comprises a number of applets that fall within four areas of application; warehouse, sales, field service and cross functional (e.g. alerts and approvals). Some of these have already been developed and some are planned for future release. Future plans also include some utility functions (Table 1.)

	Warehouse	Sales	Field Service	Cross Functional	Utilities
Current	Adjustments Location Transfers Item & Balance Enquiry Item Count Sales Order Picking	Customer & Order Status Enquiry Sales Orders	Quotes Job Management Timesheet Entry Inventory Issue	Alerts & Approvals	Barcode Scanning Signatures
Planned	Purchase Order Receipting Goods Despatch	Invoice Entry Contacts Leads	Purchase Order Entry Service Requests Asset Management	Appointments and Follow ups Communications Help	Printing Camera GPS

Table 1. Current and planned applets in Greentree Mobile

The release of Compact Jade in 2007 [12] provided the opportunity to extend the Greentree product line into the mobile space. Prior to the development of Compact Jade, the barrier to entry for mobile ERP had been high. Many of the available mobile solution architectures involved high levels of complexity and the mapping together of many disparate technologies, with multiple brittle interfaces that were easy to break. From the customer perspective, therefore, undertaking a mobile solution was difficult and expensive. By leveraging Compact Jade, Greentree Mobile could be built on a single technology, which had the benefits of having a single development environment, toolset and provider and a single deployment model. Using a single technology end to end – the 'power of one' – means that issues such as maintenance and deployment become much more manageable and economic. With Compact Jade, there is no difference in the code base running on different types of client, and no need to work with multiple forms of markup, messaging formats, or different language flavours on client and server. This promotes seamless deployment and reduces the amount of knowledge required from partners and customers.

Thin or smart client? It's up to you!

Different mobile users have different requirements of a mobile ERP system, and a single client type will not meet all of these requirements. Greentree delivers mobile ERP that can be installed either as an online multi user thin client or as an offline single user smart client, depending on the context of the mobile user. Generally, a

user in a particular role would choose to install either the thin or smart client solution, depending on the requirements and context of their business, and each one is a separate installation. However it is possible that some users (e.g. sales) might have a use for both types of client at different times, depending on where they are and which task they are performing. Figure 1 summarizes the various mobile deployment options; offline smart clients synchronising via the Greentree Mobile communication service, managing their own local data stores and operating on either a WAN or a LAN, or online thin clients connecting to either a remote or local application server (TCP/IP over WiFi LANs or GPRS WANs.)

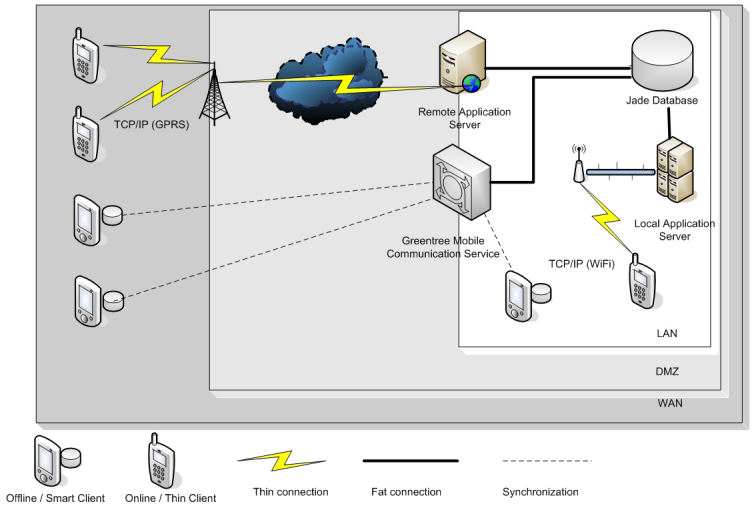

Figure 1. Greentree Mobile Deployment Options

Mobile device support and requirements

The Greentree Mobile solution is targeted at Windows based mobile devices. Currently supported platforms include Pocket PC 2003 SE and Windows Mobile 5.0 or 6.1 for Pocket PC (including the Mobile Phone edition). The Smartphone version can be used for thin-client deployment. Some other tested platforms include some non embedded devices running Windows CE version 4.2 and above, and some flavors of Windows Mobile 6.0.

Beneath the operating system level, Compact Jade is based on ARM V4 processors (or better), for example the Intel Xscale (PXA), Samsung SCxxxx etc. Processor speed requirements vary slightly between online and offline mode. In online mode 400Mhz+ is required, but the recommended minimum is 600Mhz+. In offline mode, 600Mhz+ is a requirement.

Memory requirements for the mobile client vary between online and offline mode. In online mode, the total memory requirement is very small, around 4Mb. In offline mode, the local Jade database and communications manager run locally, so the memory requirements are significantly higher. Bearing in mind the other requirements of the device, and other applications and drivers that may be loaded, Greentree recommends 64MB RAM for online systems and 128MB of RAM for offline systems. Table 2 summarises the memory requirements of Greentree Mobile deployments.

Greentree System	Client Binaries and ini file	Empty mobile database and Communications Manager	User Data	Overall Minimum
Online mode (thin client)	~ 4 Mb	N/A	N/A	64 Mb
Offline mode (smart client)	~ 66 Mb	~ 32 Mb	~ 2-3 Mb	128 Mb

Table 2. Memory requirements in Greentree Mobile online and offline deployments

Data synchronisation

One of the major features of Greentree Mobile is the data synchronisation available in offline mode. The data management policy was developed in conjunction with the

development of Compact Jade itself, since prior to Greentree Mobile a commercial mobile data management system had not been developed. Previous products based on Compact Jade by other Jade users had deployed only a thin client architecture, without local data management on the mobile device.

Greentree Mobile uses an efficient proprietary format for client server data communication enabling large volumes of data to be transmitted at low cost. Transaction management is tailored for different connection modes. Offline mode is based on distributed optimistic locking. In this situation, where the likelihood of conflict is small and the consequences of overwriting data are acceptable, a 'last commit wins' policy is applied [13]. In practice, database access is filtered to a particular user in a role that in many cases will be isolated from other data access roles. For example a field sales representative will be working with data for the customers that they are seeing, while other representatives will be visiting other customers. Therefore, there is limited overlap in terms of data access and an optimistic locking policy is practical. It should be noted that this kind of transaction management is specific to the offline version of Greentree Mobile. In a thin client solution a pessimistic locking policy can be used. For example, in a warehouse inventory system, where wireless LANs are common because of the limited range requirements and low cost of such solutions, a thin client would be an appropriate solution, and the picking lists on the mobile device can be locked by the user when items are picked.

The mobile GUI

The Greentree user interface has been specially redesigned for the unique form factor of mobile devices, with its mind shift from the use of a mouse and full keyboard to the small or virtual keyboard of a PDA. Designing a mobile GUI has special requirements over and above UI design for the desktop [14]. Consistency is an important factor, in particular when users may switch between desktop and mobile versions of the same applications. In this respect, the use of a mobile Windows platform provides considerable benefits, with consistent OS features in both the desktop and mobile systems. However controls have been reengineered and refactored from their desktop versions to enhance their usability on a mobile device. Some examples of controls tailored to the mobile context are the use of toggles, hyperlinks rather than buttons, and the streamlining of the general screen design. Labels have been abbreviated or rephrased, and simple icons provide ease of navigation along the bottom of the screen (Figure 2, left). Ultimately the screen display provides the fundamentals of what the user in the field will need. Another important heuristic is to design for "Top-Down" Interaction, with multiple levels preferred over scrolling. Hyperlinks play an important role here in allowing the user to drill down into hierarchal workflows (Figure 2).

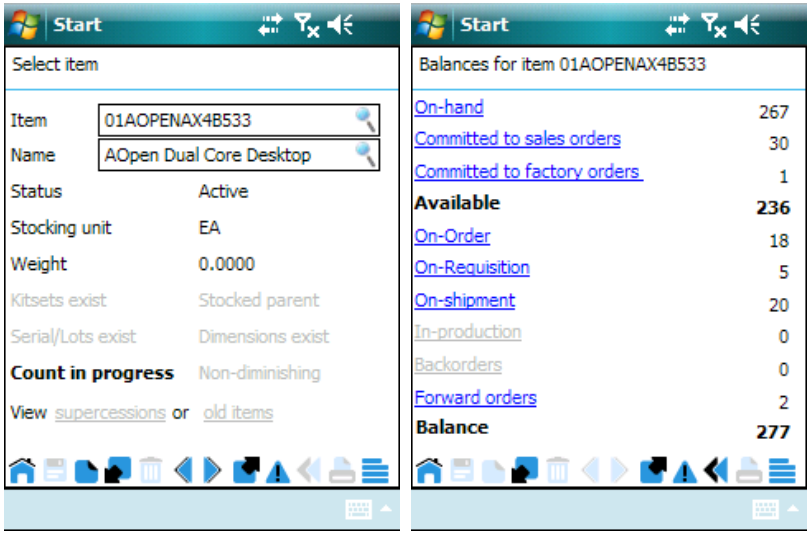

Figure 2. Abbreviated elements and icons in the mobile screen display

Deployment, Updates and Licensing

Deployment of the mobile system is managed by the mobile connection manager, which runs on the mobile client. This is responsible for both initial deployment and for brokering the Greentree application, and ensuring that the locally installed

binaries and system files are synchronized with those on the server. On the server side, the connection manager is responsible for maintaining the necessary settings for mobile clients, while the 'Packman' system is used for packaging software updates. It is responsible for registering Jade (the mobile Greentree system requires Compact Jade registration) and Greentree application details, and enabling the installation of updated Greentree packages. Although the system uses a common code base for both mobile and standard deployments, mobile Unicode packages need to be identified within the Packman system for deployment, so these Unicode packages have special markers for targeting mobile systems (packfiles/scripts). Figure 3 shows a flowchart of the mobile deployment update process. Figure 3. The Greentree Mobile deployment update process.

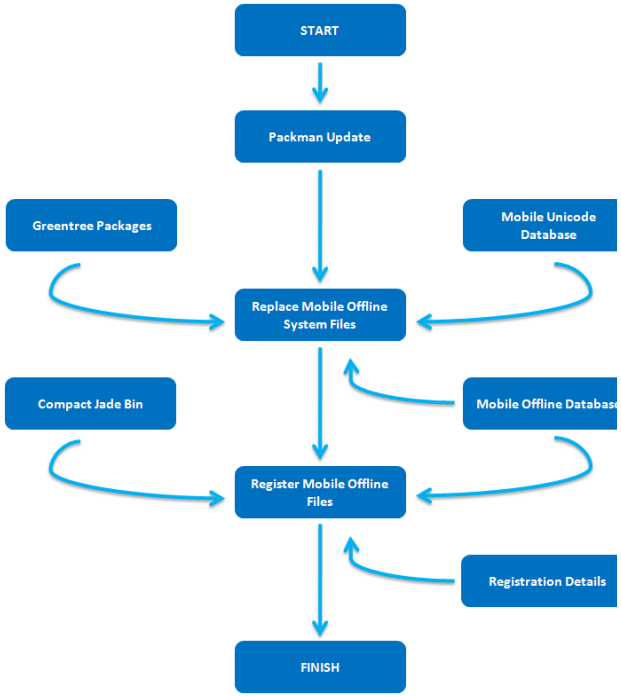

Figure 3. The Greentree Mobile deployment update process

Greentree's deployment model is intended to enable simple deployments whilst allowing constant updates to the product. At any time, there is one version of Greentree; today's. Packman provides the ability to update a mobile system by providing the most recent set of packages, while the communications manager synchronises updates to the mobile application files, and can bring down a new (empty) copy of the database whenever the client chooses to move up to the current version.

Greentree's software distribution model is based on the use of licence keys to enable or disable application components that will always be present, but may not be accessible to the current licensed user. In a system distribution, all of the applications are downloaded, with the license key controlling availability. This very low granularity in deployment has multiple advantages. It makes it very easy to change the available applications by simply providing an updated license key. Since the applications are already present, no additional downloads are required. Another advantage of this approach is that the already installed components can be made available on a temporary basis to enable trial usage of these parts of the software. Again, only an updated key is required.

Overall, the Greentree deployment process makes it easy for the customer to manage their deployment, update and evaluation strategies without any need for complex install/uninstall processes, giving the organisation both control and flexibility to their mobile ERP deployments.

Conclusion

Greentree Mobile provides a powerful platform for enterprise mobility. During the development process, Greentree have worked closely with the supporting technology vendor (Jade) to jointly develop new strategies. The ability to work closely with the technology vendor has been of major benefit in the development of this product, made possible by working on a single technology platform from end to end. Although in some ways Greentree have come late to the mobile market, being dependent on the development of Compact Jade before they could build

their own systems, they have had the advantage of being able to learn from others' experience of mobile ERP deployments, and avoid their complexity and brittle interfaces. Implemented customer solutions already include technologies such as integrated barcode scanners and processing physical signatures on touch screens. As the product suite develops, further technologies such as GPS will be added to the mobile toolkit, in conjunction with continuing development of the Compact Jade platform.

Greentree Mobile provides a full range of mobile ERP services via an integrated technology platform that provides efficient deployment, flexibility for different mobile worker roles, and a highly usable UI delivered on enterprise quality mobile devices. For the small to medium enterprise that has not previously been able to been able to reap the rewards of increasing mobility, Greentree Mobile presents a new opportunity to integrate the organisation's ERP, support their worker roles regardless of location, and benefit from all the efficiencies and return on investment that a mobile solution can bring.

About the author

David Parsons is a Senior Lecturer in Information Technology at Massey University, Auckland, and a Knowledge Engineer for Software Education Associates. He holds a Masters' degree in Electronics and Computer Science and a PhD in Information Technology. He has wide experience in both academia and industry, and has published many books and articles on various aspects of software development.

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