Mobile approach, trends and technologies in modern information systems

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Abstract: Mobile technology is a buzzword of present time. Mobile devices are possessed and used by almost everybody in advanced countries. But almost at he same time anybody makes use of only tiny amount of capabilities they can offer. The contribution is focused on up-to-date possibilities of using potential of mobile devices. We will concentrate on the possibilities and tools applicable in the process of creating mobile software applications and ways of integration of mobile clients into information systems.

Key-Words: Mobile technology, mobile device, mobile approach, web service, Java ME, Symbian, Windows Mobile, BlackBerry.

1 Introduction

Rapid development in the area of information and communication technologies resulted in pushing ahead mobile devices (called smart phones) with their own operating system and rich collection of functions which combine and join potentialities of former pocket computers (PDA) and those of mobile phones. Many users own smart phone not knowing about its wide capabilities and possibilities to use it. Latest worldwide statistical investigations concerning mobile phones and their popularity [1] show substantial decrease of popularity of the classical PDA which has not built-in telephone module. The sales of PDAs fell down by 42 per cent to only 3 millions of pieces in the period of last year. Opposite trend is reached in the field of selling smart phones. There were sold 118 millions of smart phones which means increase of sale by 60 per cent during last year. In such a way smart phones became the most rapidly growing segment of the market of mobile phones in spite of the fact that total of smart phones sold is only ten per cent (one tenth) of all of sold phones. Most smart phones were sold in Asia-Pacific region followed by European market. North America succeeded in selling 10 million more clever mobile devices in the year 2007 in comparison with previous year.

2 Areas of using mobile device

2.1 Smart phones market

Leading company in the smart phone market is Nokia Company that sold 60.5 million devices last year and its market share is 52.9 per cent. Canadian Company Research in Motion (RIM) achieved an upturn in the sale of their own BlackBerry communicators by 121.2 per cent last year [1], which means 4,046,860 of sold devices and 11.4 per cent market share. The third most successful company was Apple, that sold 2,320,840 pieces of iPhone devices which is 6.5 per cent of market share, together with Motorola that succeed in increasing the sale by 57.3 per cent in the period of one year. All the rest producers realize market share 22.7 per cent, i.e. 8,050,920 of sold devices and increase by 28.6 per cent during last year.

As to operating systems the most popular is Symbian implemented in 65per cent of devices, followed by Microsoft with its Windows Mobile, used in 12 per cent of devices. The third most frequently used is RIM's BlackBerry system running in 11 per cent of devices followed by Apple with iPhone having 7 per cent and Linux with its 5 per cent devices. The last mentioned one is favourite operating system mainly in Asia but its share in the rest of the world is tiny and can be ignored so far. The market share of Linux based operating systems may increase after some new Linux based operating systems will be introduced. Let us mention for example Access Linux Platform (APL) which is the product of developers of former PalmSource, Linux Palm OS, or Android of the Google company.

There should be mentioned some interesting facts about Apple products. Apple reached the third place in the world market [2], in spite of the fact that a iPhone is so far sold in only a few markets and can be obtained from several contract operators only. At the end of the year 2007 Apple mastered 28 per cent of North American market where it holds the second place after RIM with its 41 per cent of market share. Apple in such way has overtaken other producers using Windows Mobile as

operating system for their devices. Apple is less successful in European market where it holds the fifth place after Nokia, RIM, HTC and Motorola. iPhone is still not sold in Asia.

Czech market can offer sufficiently rich selection of smart mobile devices. There are three mobile service providers: O2, T-Mobile and Vodafone at present. All of them offer Nokia apparatuses, mainly N95, N73, E90, E65 and E51 with Symbian operating system. Providers O2 a T-Mobile bid in addition to it devices and services of RIM BlackBerry (8800, 8310, 8300, 8100), the third of them Vodafone prepares the same offer. There can be also bought devices of HTC (S710, Touch Cruise, TyTN II) having MS Windows Mobile 6.0 operating system

2.2 Current use of mobile devices

Though there is wide selection of mobile smart devices and there is rich potential of their meaningful and interesting use, the present state of their use is restricted to basic preinstalled applications of the mobile platform. Here is the list of the mostly used capabilities of mobile devices:

- **basic telecommunication functions** – they include mainly voice services, text oriented SMS and multimedia oriented (MMS) that are accessible also using the common mobile phones and services offered by telecommunication providers,
- **email client** – enabling access to (POP3, IMAP4) protocols through data services of provider and possibly the synchronization of accounts in wired mode with the aim of subsequent off-line use,
- **organizing tools** – access to the diary, contacts. There is again possibility of wired mode, but at present state is used off-line synchronization with server accounts typically,
- **elaborating documents** – most commonly restricted to reading documents and only exceptionally modification of some parts of them,
- **web client** – used typically for accessing news portals and rarely for the access to firm business portals and systems,
- **entertainment functions** – which include playing games, running of audio and video files, making snapshots and recording video clips with possibility of sending them through on-line email service,
- **navigation functions** – in case of better equipped devices with GPS.

At present even the above mentioned functions are used in larger scale mainly by enthusiasts of modern technologies. We plan wider investigation focused on finding out real state of using mobile devices in the Czech Republic and other selected European countries.

2.3 Possibilities of advanced use

Mobile device is much more efficient and useful device, that is supposed or apprehended by many users. It can offer wide possibility of access to business information systems although it has rather restricted display and representation capability. Principle areas include:

- **online access to selected modules of information systems**– this has wide use in the area of CRM, remote monitoring and managing of the firm/business processes, applications for pro B2B, B2C (ordering systems, marketing support …), online business data collection, etc.
- **mobile server** – it enables the use of mobile device for providing on line service just in the field at any place (implementation of a container of web services by the mobile device),
- **full integration of mobile device with groupware technologies** – mobile device has the role of one out of many clients used for connection to internal company communication server (this will for example include full integration of services mentioned in 2.2 with MS Exchange, IBM Lotus Domino, Novell GroupWise, etc.). In such a way mobile device serves as unique mobile communicator,
- **integration of navigation/localization services with other functions of devices** – that includes collection of data depending on the position, planning and supervision of routes (for example full support of goods distribution, location dependent CRM search, etc.).

Services of mobile devices and mobile approach may be used in various layers of organization structure of the company. They can influence structure and effectiveness of many business processes. These aspects will be of prime interests of our future research.

3 Tools

The area of application development for mobile device undergoes equally rapid development as does the development of relevant hardware platforms. At the beginning almost every producer developed its own row of development tools for his platform based on possibilities of operating system of the device. Principle tools were based on the programming languages C, C++ (for platforms like Palm OS, Psion/Symbian, Windows CE, Pocket PC) and Visual Basic (Windows CE/ Pocket PC). Coming of mobile Java resulted in spreading virtual machines for various platforms and in this way there was enabled developing of software solutions portable among various types of mobile operating systems. At present there can not be imagined any mobile phone or PDA without possibility to install Java virtual machine.

Platforms based on Windows CE (i.e. Pocket PC a Windows Mobile) are suitable for developing applications in special edition of MS .NET Framework designated Compact Edition. Its portability and spread to other platforms is but problematic. In the following parts of the article there will be briefly introduced selected software platforms, their features and mainly their possibility and capability to be used as mobile distant clients of information system.

3.1 Java Mobile Edition

Basic tool for Java mobile applications development is Sun Java Wireless Toolkit [3], at present in version 2.5.2. This development toolkit consists of basic libraries and more or less comfortable utilities. Java libraries are substantially reduced in comparison with standard edition. The compilation Java application can be achieved by standard Java compiler and the main purpose of delivered utilities is to check the usability of the code the in mobile device and adding metadata necessary for running the application.

3.1.1 Development tools

Sun Netbeans IDE with module (plug-in) Mobility belongs to the most widely used integrated development environments. Starting from version 5.0 it has been very well elaborated and compact tool. It is accompanied by visual screen designer and it offers also a generator for client proxies for web services. Other usable tool seems to be Eclipse IDE with Eclipse ME plug-in. This environment is but less comfortable (offered services, complicated configuration) in comparison with Netbeans environment.

3.1.2 Connection to IS

Until recently the most widely used way of connecting mobile client to information system was making use of TCP/IP sockets. Even this way was not enabled by all mobile devices. This possibility was standardized in MIDP 2.0 Java profile. A row of older devices supported only connection through HTTP. Some specified application protocols had to be tunnelled via this protocol. Further step on the way leading towards making use of some universal and reusable method were specialized collections of classes that implemented XML parser and a simple subset of the protocol SOAP on the mobile client side. KSOAP is one example of such a library.

Present trends allow mobile device to connect directly to the web service via extension library built-in directly in the mobile device. This extension to Java ME is specified by the document JSR-172 – WSA (Web Services API) [4]. A row of newer mobile devices is equipped with this interface.

Though WSA does not offer the complete set of features described by WS-* standards, it is the easiest way of connecting to information systems. The main advantage of this solution is the fact, that web service implemented on the firm side need not be in most cases adopted specially for the purpose of connecting mobile device. Subsequently such a service and access to it strictly follow the regulations and requirements of SOA.

3.2 Windows Mobile

The main stream of the development of the platform of mobile operating systems of Microsoft is perceptible from previous text. In the period of Windows CE all applications were developed as native applications for specified processor. There was used either compiler of C language or interpret of Visual Basic language for mobile platform. At present there is mainly used .Net Compact Framework that runs the code inside a virtual machine as the managed code. This model is similar to the mobile Java architecture.

3.2.1 Development tools

eMbedded Microsoft Visual C++ and eMbedded Visual Basic belonged to development environments used in the past. These environments were replaced by integrated environments MS Visual Studio 2003, 2005 and at present 2008 after the coming of .NET. There is not necessary to consider any other tools for this platform. Visual Studio allows to develop the application into both native or manager code, either for PDA or smart phones.

3.2.2 Connection to IS

Possibilities of connection to remote information system are similar to those of mobile Java. There is again offered the scale of protocols and program classes (from TCP/IP protocols, sockets, to web services). Microsoft product called System Center Mobile Device Manager (former I.O.N.A.) [5] seems to be most suitable mean for effective implementation of mobile approach in the business. It enables to communicate with local firm network via encrypted channel and is partially inspired by RIM Blackberry services mentioned later in this article. It enables central administration, application distribution as well as the possibility to delegate rights for applications etc.

3.3 RIM BlackBerry solution

Terminals of Canadian company Research in Motion belongs to the traditional mobile devices. This solution gained the largest popularity mainly in North America but recently it spreads in Europe including the Czech Republic being offered by local telecommunication providers. The mark Blackberry in fact denotes the whole family of services (Enterprise Server, Mobile Data Services, etc.), devices and tools and the main

advantage is achieved in integrated use of all parts of solution. RIM BlackBerry solution is the complex solution for establishing mobile communication in the scope of larger firm. This solution also widely uses so called push technologies that enable to inform mobile device about new events on the server side of information system. BlackBerry solution integrates services for managing e-mail, contacts and planning which is synchronized in real time with dedicated server system (MS Exchange, IBM Lotus Domino, Novell Groupwise). Mobile device has the role of virtual terminal in the internal firm network and also makes use its address space. Secure channel is provided as a part of special service bought from telecommunication provider. Devices are centrally administered in a similar way as it is established by MS System Center Mobile Device Manager solution.

3.3.1   Development tools

BlackBerry Java Development Environment [6] is the basic development tool. It is based on Java ME, but enriched by a row of signed functions enabling to make full use of mobile device potential. So applications developed for Java ME can run on Blackbery devices and at the same time they can use the advantage of secure data transfer. BlackBerry MDS Studio [7] offers another possibility for mobile software development. It is integrated development environment based on the core of Eclipse. It offers comfortable way of creation of web service clients using the philosophy of Rapid Application Development (RAD). There is widely used Java script as programming language. Promising emerging alternative to the web services may be support of database sources. Connectors to MS SQL Server and Oracle appeared recently.

BlackBerry plug-in is devoted to developers working with MS Visual Studio and enables to integrate web services development with the development of mobile clients of them for BlackBerry.

3.3.2   Connection to IS

Two last mentioned development tools are specialized mainly for the firm information system access. The preparation itself consists either in the creation of access to data sources in database or in the development or establishing access to existing web services. The solution is based on assumption that mobile device has the role of terminal of internal network and consequently there is not necessity to solve the problem of securing of the transmission channel.

3.4   Symbian (UIQ)

Symbian operating system is proprietary operating system developed for administration of mobile devices, mainly smart phones. (Symbian is also name of the company that developed the system). The predecessor of this operating system was EPOC system for Psion computers. Users can enrich operating system by native applications shaped for it. This applications but are dependent on the version of operating system. Symbian has its advantages and disadvantages. The main disadvantage is just mentioned problem of compatibility of applications developed for older versions of operating system with the new ones. Another problem is threat of virus infiltration. At present Symbian operating system is used in mobile phones of Nokia, Motorola a SonyEricsson companies.

S60, S80, S90 a UIQ are present versions or platforms of this operating system . There exists already the third generations of S60 platform at present. Version S80 is shaped for by touch operated devices and traditionally is able to cope with WiFi connection or MS Office documents. S90 is specific version developed mainly for Nokia 7710 communicator.

 There is also possible to encounter platform UIQ, that supports touch displays and is used with Motorola and SonyEricsson devices. UIQ can be considered as graphical superstructure of standard Symbian or S60 platform. The main difference between S60 and UIQ is in the fact, that S60 system is intended for keyboard operation and UIQ for by touch display operation.

3.4.1   Development tools

This platform disposes rich standardized application interface. It enables development of native applications in C/C++, access to all capabilities and data of the phone, access to communication interfaces (IrDA, BlueTooth, serial port). The developer can use SDK provided by producer. The platform traditionally supports Java (firstly PersonalJava 3.0, JVM and JavaPhone 1.0 API, in the year 2003 it was changed to pJava and JavaPhone to Java ME). There can be used several environments for development [8], using mainly C/C++ and Java languages. Carbide.c++ Environment is specialized for C++ application development in and it is based on the favourite Eclipse environment. It is not recommended for large scale projects. CodeWarrior also enables to create native C/C++ applications. The development process is effective thanks to a number of integrated components but is often criticized as user unfriendly and unsuitable for beginners. Visual Studio .NET IDE enables to create applications for many mobile devices including pocket computers Pocket PC. VistaMax IDE 2.0 for UIQ version 3.0 is the representative of the best elaborated IDEs supporting rapid application (RAD) and mutual exchange with Carbide Express a CodeWarrior formats.

3.4.2 Connection to IS

Symbian operating system can offer protocols of TCP/IP family, mainly HTTP, POP3 a SMTP for the remote connection to the information systems. Architecture of Symbian comprises so called COMMS Infrastructure [9], which is part of operating system including the framework for network system services and internet access. This part of operating system includes CommDb interface for work with communication protocols using IAP, ISP, GPRS, modem, proxy and WAP. Another important part of operating system is called NifMan and it enables functions for basic communication wit the network, for example making connections IAP, ISP, routing, etc. The third part is a Socket Client comprising client support for EPOC sockets, TCP/IP protocol and IrDA sockets. TCP/IP accessible via RSocket, DNS accessible via RHostResolver interface and Generic Agent, which ensures dial-up connection to ISP are typical tools for use in the process of creating client - server application.

4 Conclusion

Mobile device that use its own operating system and enables connection to data services of providers has already sufficient equipment for the implementation of the remote access to selected parts of information systems. At present all platforms offer mobile Java with MIDP 2.0 profile at least, often with a number of useful extensions. In addition to it producers of mobile operating systems usually offer development kit (SDK) enabling application development in native code of the platform or offer their own virtual machines enabling running of operating systems and applications on various platforms. Web services and accompanying technologies can offer a large potential for access to them in the mobile devices. These technologies do not usually implement complete collection of WS extensions but are sufficient in most cases.

The essential problem of the mobile access to firm data so far is the safety factor. This problem includes security of the transmission channel, security of data in connected or disconnected mobile device and last but not least central administration of user settings, rights and ways of accessing mobile applications. Wider use of mobile devices is unthinkable without implementation of suitable safety policy and regulations. RIM company has been offering comprehensible solution based on BlackBerry services for a long time. Microsoft is starting to offer integrated solution thanks to its product System Center Mobile Device Manager. These solutions do not belong and in near future will not belong to the cheapest ones and so wider implementation of such technologies is expected mainly for the medium size and larger companies.

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