OMNIPRESENT EPORTFOLIO ACTIVITY ENABLED BY A MOBILE APPELET AND SYNCHRONISATION SERVICE

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Abstract

In this paper the author describes issues regarding practical considerations and implementation issues associated with utilising mobile technology for ePortfolios. An alternative to purely Web-based mobile ePortfolio service provision is discussed where ePortfolio data can be harvested without being connected to the Internet.

A user can add harvested data to their Web-based portfolio when the user deems convenient, enabling ePortfolio activity to occur anywhere at anytime. GPRS and 3G services that provide mobile Internet access can also be avoided to reduce the cost of using mobile ePortfolio solutions. This is achieved through synchronisation of data gathered on a mobile device with a Web-based ePortfolio service by means of a desktop PC service bridge. A prototype implementation, Mobifolio, is presented and future developments described.

Introduction

Network based computing services are pervading through the growing widespread connectivity of mobile devices to the Internet. Desktop-based tasks and activities can now be enabled and accessed on the move with new technologies bringing computing services closer to users.

EPortfolio services can now be brought closer to and made more available to users through the use of mobile technology. The mobile web in particular will gain significance over the next few years in the wake of the ever growing 3G network market, and the dot mobi domain being released this year placing particular emphasis on mobile-web development. Short Message and Multimedia Message Services (SMS/MMS) are also already widely used for interfacing with Internet based services. Therefore enabling mobile ePortfolio services should be straight forward. However, many mobile Internet services (such as moblogging) make some assumptions that may stifle and discourage the user experience. Consider the following:

- In Web-based mobile services, it is assumed that Internet connectivity will always be present. Internet based services are easily accessible from a desktop PC where connectivity is for the most part guaranteed. However, from a mobile device accessing the Internet is expensive through GPRS and 3G services as the user is charged for the amount of data traffic. Users will not always want to bear this additional cost, and connectivity to the service is reliant on phone network availability.

- Like mobile Internet access, SMS/MMS services depend on phone network availability. Also these services are limited in functional scope due to the inherent nature of text and multimedia messaging as the only interactive component. SMS/MMS services also push cost onto the end user, and only provide limited media and interaction. For many organisations, setting up an SMS/MMS service infrastructure might also infeasible.

Exceptions to the abovementioned may include devices with WiFi connectivity, such as certain models of personal digital assistant (PDA). Such devices are a minority in the consumer mobile market and are often only used by business professionals and the technologically savvy.

To overcome these problems associated with the high cost of using and dependence on availability of mobile phone networks, researchers from the Centre for Advanced Computing and Emerging Technologies (ACET Centre) at the University of Reading have looked at how a mobile phone can be used in a highly disconnected state for ePortfolio activity.
Pervading ePortfolio Activity

A user can be provided with the facility to add to their portfolio without the need for an Internet connection. Here we consider ePortfolio activity as being any task that adds to a portfolio – in particular blogging and harvesting media. These activities do not necessarily require access to read and review the current state of a portfolio and can therefore be carried out without any communication with an ePortfolio service.

For example, a person may wish to write their blog as situations unfold, or may have a passing reflection on some experience that they wish to record there and then. Someone may wish to take a photo of a piece of work they have produced or record a musical performance of theirs to showcase in their portfolio. By providing software that allows persistence of ePortfolio data whilst on the move, synchronisation with Web or PC based services can occur when a users’ preferred mode of connectivity is available.

This kind of service may be desirable as it enables users to record experiences and thoughts whilst away from a computer and even away from Internet access. This method allows for circumventing the use of GPRS or 3G phone network services making ePortfolio activity more economical for users who do not require instant access to and instant feedback from services.

Mobifolio

The Mobifolio project is developing a media harvesting applet leveraging technologies that can enable ePortfolio media to be saved and managed on a mobile device. A desktop application can be used to act as a bridge between the applet and Web-based ePortfolio services for synchronisation as illustrated in figure 1.

![Illustration of ePortfolio service bridging using a desktop PC.]

Enabling Technologies

The main operating systems that software can openly be developed on mobile platforms are Symbian OS, Windows Pocket PC Edition, and Palm OS. These operating systems tend to be included on higher-end mobile phones and smartphones. However, many mobile phones are shipped with the ability to run Java 2 Platform Micro Edition (J2ME) [1] software allowing for a broader possible target for mobile ePortfolio software. The Mobifolio mobile applet is based on J2ME technologies.
In order to cater for different hardware specifications of mobile phone, the *Mobifolio* applet has been designed to utilise different modes of connectivity between phone and desktop PC. Types of connection available on mobile phones include the following (illustrated in figure 2):

- **Direct cable** – Most mobile phones allow for direct serial or USB connections to a desktop PC. Cable connections first became commonplace for maintenance purposes, such as inspecting software setups and backing up data.
- **IrDA interfaces** [2] – Infrared technology has been provided on mobile phones for a number of years, initially enabling connections between laptops and phone to utilise mobile phones as a wireless modems. Phone to phone communication is also possible through IrDA interfaces.
- **Bluetooth** [3] – Short-range wireless connectivity (~10 metres) is possible by using Bluetooth technology between many devices including mobile phones to desktops, and also for connecting PC peripherals like printers, headsets and mice.

![Figure 2. Multiple modes of direct mobile to desktop connectivity](image)

J2ME provides specifications and APIs for handling each mode of connectivity through the Generic Connection Framework [4] and all modes will be catered for. When deploying the applet on a mobile phone, the software will dynamically determine what connectivity hardware is available and will allow the user to choose which mode to use for connecting to a desktop PC.

For the desktop synchronisation service, Java technology is again used. Java 2 Platform Standard Edition (J2SE) [6] allows programs written in the Java language to run on different operating systems. Java software is written and compiled once and can then be deployed onto varying operating systems such as Microsoft Windows, Linux, and Apple Mac OS. This is to again attempt to target a wide as possible market whilst significantly reducing development time and effort. J2SE provides similar specifications and APIs as J2ME, along with more advanced libraries for the more capable hardware available on desktop machines.

To allow the desktop service to communicate with Web-based ePortfolio services, ePortfolio functionality is to be exposed through using XML-RPC [7] or SOAP [8], both of which allow client software to execute service commands in Web software. Analysis of current Web-based ePortfolio software must be carried out to determine whether client software can utilise existing remote interfaces or whether these interfaces must be developed.

**Current State of Prototype**

A prototype of the *Mobifolio* software has been developed and tested to validate the proof-of-concept of bridging an ePortfolio service between mobile and desktop PC to Web. A simple J2ME application, shown in figure 3, was created to allow a user to persist textual blog data. The application can search for Bluetooth devices that provide the ePortfolio synchronisation service. The J2SE synchronisation service application, the test graphical interface of which is also shown in figure 3, has been developed...
utilising the Avetana JSR-82 implementation [9] that enables Bluetooth applications to be developed on desktop machines. The synchronisation service runs a Bluetooth server that allows the mobile application to connect and upload all of the blog data that is stored in the mobile applet.

An analysis of one open-source ePortfolio software, Elgg [10], found that an XML-RPC interface allows for client software to post data into an ePortfolio. Elgg enables blog and file posting by implementing a number of commonly used blogging service APIs such as the Blogger, MetaWeblog, MoveableType, and LiveJournal APIs. The synchronisation service application utilises Apache XML-RPC [11] to execute MetaWeblog [12] and Blogger [13] procedures exposed by Elgg for posting blog items.

**Ongoing Development**

At the time of authoring this paper, *Mobifolio* is limited in its functionality and much more work is required and in progress. In order to provide richer ePortfolio activity the following features are to be implemented:

- **Multimedia harvesting**: The Java Mobile Media API (MMAPI) [14] is being used to enable access to mobile phone media gathering capabilities. MMAPI enabled phones allow for mobile applets to use, where available, built in cameras and audio recording facilities. EPortfolios commonly incorporate a range of media including still pictures, video, and audio recordings. Recorded media files are much larger than pure textual data, and would therefore be more exhaustive on a mobile phone’s bandwidth usage – further adding weight to the need for a more economical solution for mobile ePortfolio service provision, such as the one presented here.

- **Richer text support**: Weblog authors commonly incorporate extra formatting into their posts through using HTML tags for presentation and linking to other resources. With *Mobifolio*, it is proposed to include facilities to format posts without using HTML, but through using a simplified and tailored form of WikiText [15]. The synchronisation service can then use these formatting instructions to appropriately render posts for a particular ePortfolio service. A form of WikiText has been chosen over HTML, because WikiText uses significantly fewer formatting tags and therefore may be easier to read on a mobile phone screen during the authoring process.

In terms of interconnectivity, the facilities provided have to be more complete. This includes connectivity on the mobile-end, desktop synchronisation service, and possibly the Web software interface. Work is being carried out to fulfil:

- **Complete connectivity**: The Mobifolio prototype currently only implements Bluetooth as a transport mechanism between phone and desktop. To target a fuller potential user-base, support for IrDA and direct cable synchronisation will also be implemented.
- **Multiple ePortfolio interoperability:** Mobifolio has been shown to be able to operate with one ePortfolio system, Elgg, and has been architected to easily plug in mappings for others. An analysis of other open-source systems, such as Open Source Portfolio (OSP) [16] and dotFOLIO [17], will be carried out to determine whether they are suitable for accessing with client software (in this case the synchronisation software), and if not, work will begin on developing suitable interfaces.

### Summary

This paper discusses issues regarding mobile ePortfolio activities. The author considers how to enable a user to add to their portfolio without the necessity of a direct connection to the Internet from a mobile device. This enables a person to carry out ePortfolio activity in the absence of the Web-based service that they may be using. By exploiting underused technology that is present in many mobile phones, synchronisation with Web-based services need not rely on mobile phone Internet services such as GPRS and 3G Internet. Mobile phones can also be utilised as media gathering devices potentially enhancing ePortfolio experience.

The Mobifolio prototype has been described and has shown that the concept of service bridging between mobile phone and Web-based ePortfolio software can work, where blog data can be synchronised through Bluetooth to a desktop PC, and then in-turn through XML-RPC to the Web-based Elgg ePortfolio software. Once Mobifolio has been further developed to include multimedia harvesting and more comprehensive connectivity facilities, a study is planned to validate whether such software is desirable and useful in users’ ePortfolio activities.

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