Mobil4D Platform: A Mobile Learning Opportunity and Support for Nursing Education

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Abstract: *In this paper we report the current developments around the Mobi4D platform. Mobi4D is a communication services delivery platform based on the JAIN SLEE compliant and certified Mobicents Application Server. It provides agnostic access to services; an abstraction between the end user access device, content providers and the underlying telecommunication networks and protocols. This paper will also discuss Mobi4D from the viewpoint of opportunities it presents for Mobile Learning Research and Development explorations using it as proof of concept. Demos of some of the pilot services being developed on Mobi4D will also be presented showing how such platform can help address challenges faced in nursing education through using mobile communication.*

Keywords: Mobi4D, Mobile Learning, Nursing Education, a few, keywords, here.

1. Introduction

The use of computers in education has been focused on supporting learning in formal settings, such as the classroom or computer laboratory. However, one of the major advantages of e-learning is the characteristics of both time and location independence (Costabile & Lanzilotto, 2006). Therefore one can argue that the use of mobile devices like smartphones, cellular phones etc. can expand learning more, freeing users from been tied to a particular location. This however, is regarded as mobile learning which is the combination of e-learning and mobile computing (Holzinger et al, 2005). It provides opportunities to learn in different ways while exploring a physical environment both outdoor (e.g. Hospital and home) and indoor (e.g. classroom) (Rogers et al, 2005). Current Mobile Technology, particularly, wireless frequently referred to as third generation (3G) provide an unprecedented opportunity for inexpensive and beneficial computing for learners (Wagner, 2005). This means that mobile technology has been proven to have the potential to offer many different levels of engagement (Wagner, 2005), (Hill & Roldan, 2005)

However, Wagner (2005) then asks why, with the continuing expansion of wireless networks and improved capacity portable electronic devices, this mobility have not been adequately applied to learning effectively? Keegan (2002, 2005) however, provided an answer to this, arguing that the future of education is wireless and that there has never been a technology that has penetrated the world with the depth and rapidity of mobile technology. Most mobile applications simply use mobile devices to deliver the same content in the same way that is currently provided by more traditional e-learning (Bernhaupt et al, 2007). One of the confronts of a mobile technology developer and researcher is the ability to understand what content should be delivered by smaller devices and how this content should be adapted to a specific learners' group (Costabile & Lanzilotto, 2006).

To be able to make the most of the positive characteristics of mobile learning technologies for learning, new teaching and learning techniques have to be defined (Berri et al, 2006). This is because Kukulska-Hulme (2005) argues that the most considerable attributes of mobile technologies is the ability to offer support for learning that is more situated, experiential, and conceptualize within specific domains and also to support the creation and use of up-to-date and reliable content. The aim of this paper is to focus on supporting nursing education through the Mobile for Development (Mobi4D) platform by using Mobicents. Mobi4D platform creates an opportunity for ordinary phone

users to take advantage of the cell phone as a crucial ICT tool for empowerment and development in various sectors such as education, health, government and business. It enables a standards framework-based approach to creating mobile services via re-usable, scalable and integrated components and approaches, utilising the various functionalities of cell phones.

2. Technology Description

Mobi4D is a communication services delivery platform based on Mobicents. Mobicents, part of the JBoss Communication Platform, is a next-generation service delivery platform enabling the delivery of converged, network-agnostic services and applications (Deruelle, 2009). Mobicents enables the composition of Service Logic Execution Environment (SLEE) which defines a telecommunication service execution environment that defines low latency and high throughput required for telecommunication application (Deruelle, 2009). It is also a composition of Java API for Intelligent Networks Service Logic Execution Environment (JSLEE or JAIN-SLEE) which is the Java implementation of SLEE (Sun & Tucker, 2004). One of the goals of JAIN SLEE specifications is to define standard component architecture for building distributed object-oriented communications applications using the Java programming language.

Mobi4D is an open source mobile and telephony technology platform that is based on mobicents technology. The rationale behind the development of Mobi4D is to take the advantage of the ICT evolution and pervasiveness of the powerful digital device (i.e. cell phones etc.) in Africa where the "Digital Divide" is now the "Digital Difference" (Botha, 2009; Botha & Gregory, 2009). The first phase of the platform development was aimed at providing a various services by developing Resource Adaptors (RAs) for popular mobile services such as Short Message Service (SMS), Unstructured Supplementary Service Data (USSD) as well as Instant Messaging (IM). There is also support for Hypertext Transfer Protocol (HTTP). These access channels allow the end user to access functionality of the platform and its services from any of them.

Figure 1 shows the conceptual framework and its components.

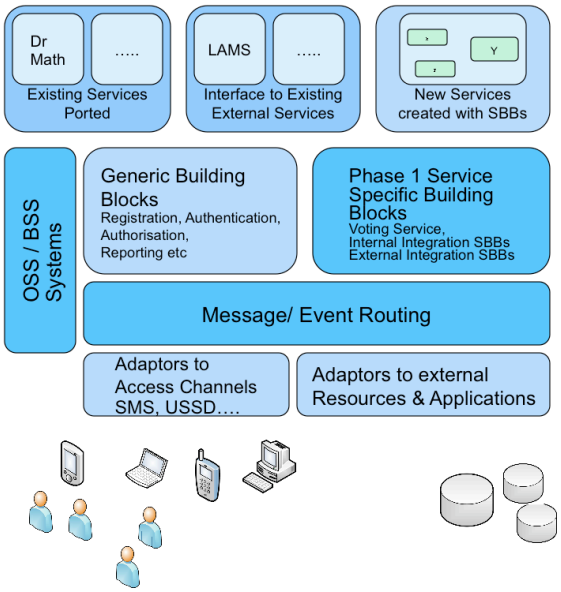

Figure 1: conceptual Mobi4d service delivery platform architecture

Figure 2 below presents the simplified block diagram of the platform.

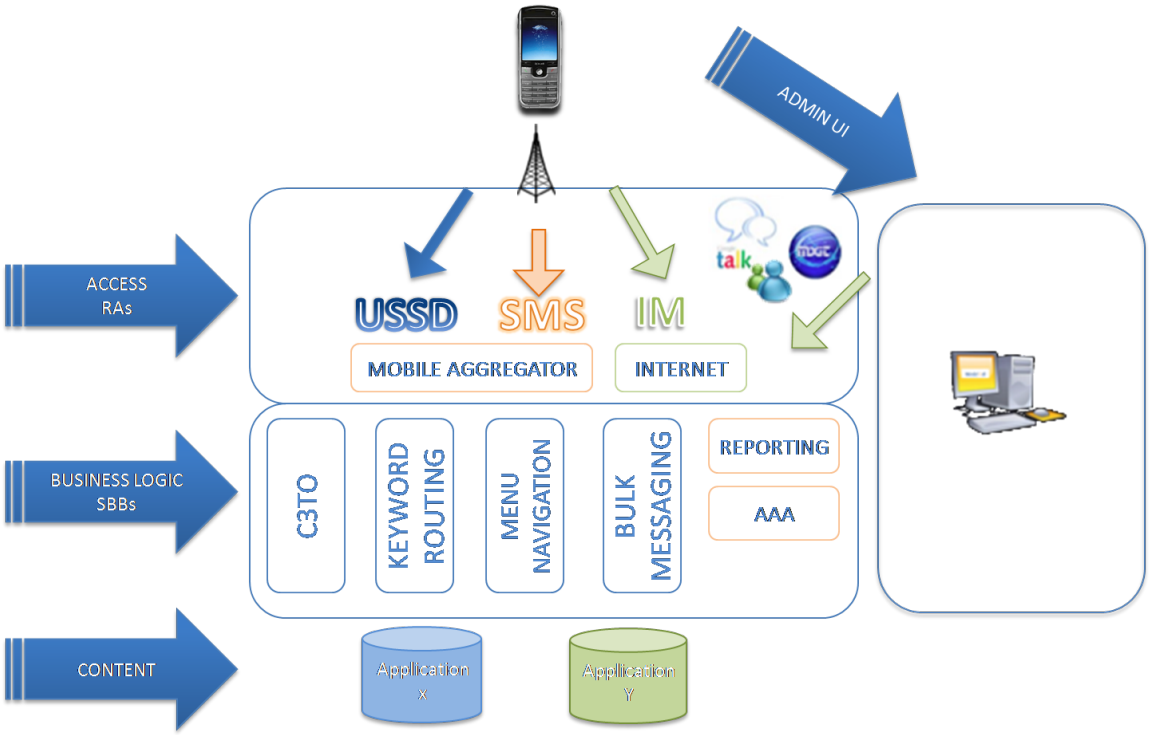

Figure 2: Mobi4D Simplified block diagram

Building on the conceptual platform depicted in Figure 2, the desired service delivery platform was envisaged to be network protocol agnostic. This implies that a request coming into the platform could come from any network, using any protocol. The Resource Adaptor (RA) layer adapts this external protocol into a format understandable by the platform. The resource in this case could be a protocol stack that represents the network from which a request came; it could also be an interface into external application servers through an Application Programme Interface (API).

The **first layer (Access RAs)** is that of Resource Adaptors which connects to both the internal network (through SLEE) and the external networks (resources).
The **second layer (Business Logic SBBs)** constitutes SBBs that contain some business logic that allows them to act as resource adaptor clients/consumers. Beyond these RA client SBBs is a **third layer (logical division within the Business Logic SBBs)** ; a class of SBBs that are *completely independent of the underlying resources*. These SBBs contain the necessary business logic to provide services regardless of from which RAs the request came in. In fact they communicate with RA-client-SBBs and not the RAs. An example of a third layer SBB is a look-up service building block.

The purpose of the second layer SBBs is to channel the requests to their destined service providers (3rd Layer SBBs). By doing this the 3rd layer SBBs are completely independent of the underlying networks (whether a request came in via HTTP, SMPP, XMPP, SIP, etc) and it is this design principle that makes it possible for Mobi4D to provide network and device agnostic access to services.

Current State of Mobi4D Platform: Phase 1

The first phase of the platform development was aimed at providing a sufficient proof of concept by developing Resource Adaptors (RAs) for popular mobile services such as Short Message Service (SMS), Unstructured Supplementary Service Data (USSD) as well as Extensible Messaging and Presence Protocol (XMPP) used in Instant Messaging (IM). Currently the SMS, USSD and IM RAs and their respective SBBs are fully functional, a Simple Short Message Interface (SSMI) RA has been developed which connects these components to a mobile network aggregator, this aggregator acts as a gateway for sending and receiving SMS and USSDs.

For the IM/chat service, a Libpurple and XMPP RAs have been developed. Along with the SBBs, these RAs enable an instance of the SBB to connect to multiple IM services providers such as MXit and GoogleTalk, using accounts for each of these IMs. This means that an end-user is able to "chat" with the platform through different IM accounts by adding the relevant service, utilising the Mobi4D IM service, as one of his/her contacts.

The Keyword SBB was developed to provide an easy-to-configure keyword lookup service; the look up service is envisaged to allow its owner to define how keyword request responses are to be rendered back to the end user. This Keyword SBB provides text-based user-system interaction as well as lookup services for other SBBs within the platform.

In addition, the Authentication, Authorization and Accounting module (AAA) access control module has also been partially developed; does not include accounting and charging. The current module uses OpenLDAP; an open source Lightweight Directory Access Protocol (LDAP) as its directory server. An LDAP RA has been developed with an API client to enable the platform to communicate, through the LDAP RA with the OpenLDAP directory server to perform authentication and authorization of service users. This implementation use group concept of LDAP directory service and defines service access groups and add user objects to these groups signalling that these users have privileges to access the services. When a request comes in from within Mobi4D components to authorize service access, a request message is sent detailing the user and the service for which the user requests access. If this user is a member of this service's Service Access Group, then access is granted otherwise access is denied. This functionality will be further enhanced with the introduction of the Diameter AAA protocol (Calhoun *et al*, 2003). Sets of Diameter applications/interfaces resource adaptors are being investigated to understand how they can be implemented within the platform to complement the current LDAP-based implementation and introduce support for accounting and charging for services hosted within or accessed through Mobi4D platform.

At its current stage, the platform hosts a service called Call Centre Chatter /Tutoring Online (C3TO) which links primary and secondary pupils to tutors in mathematics and it currently has over 6000 pupils and over 100 tutors (Butgereit and Botha, 2010). This service alone provides a clear indication of how educational services can be made available to a growing number of mobile phone users, a number supported by statistics as being as high as 97% among South African youth (Kreutzer, 2008, 2009).

Also, a Libpurple RA has been developed, along with its SBB; this RA allows an instance of the SBB to connect to multiple IM services providers such as MXit and GoogleTalk. This means that a user is able to chat to people in his/her buddy lists from one central IM – the Mobi4D IM service.

A reconfigurable Keyword lookup service is also available and it provides an easy-to-configure keyword lookup service; the lookup service allows a potential customer or its owner to define how keyword request responses are to be rendered back to the end user. The response can either be a pre-typed message or it can be as sophisticated as a redirection of a user to the content provider. The

Weather service, developed as a means to demonstrate the network agnostics of the platform, makes use of the Keyword service to lookup weather information contents, serving as a broker for the requestor of the weather information. With the network agnostics, it is now possible to send a keyword "Weather" from an IM application, via SMS, USSD and even through web browser (using HTTP) to access the weather information.

3. Mobi4D Opportunities and Implementation for Mobile Learning to Support Nursing Students

A configurable Keyword service which was discussed in the previous section allows the owner or customer who has content such as nursing training and support materials (ebooks, videos, etc) to define a "service access keyword", similar to the "Weather" keyword, will direct the service users to his or her content. In this case, the Mobi4D provides a delivery platform for the nursing education, allowing users to access it from IM clients, SMS, USSD or HTTP. However, this is not only useful to the Nursing Educational practitioners alone. This means that it is also helpful for those healthcare givers who are mobile, who usually work from their clients' homes; they can access material relating to nursing practices through their mobile phones while at work in their clients' location(s).

4. Conclusions

Mobi4d presents numerous opportunities for providing mobile services or supporting mobility in existing services. As this paper described, the nursing education sector can also benefit from such mobile services, this is particularly useful for those health care givers who are based at clients' sites, such as old age homes and so forth. Having access to health support information is critical for their line of work. Through access channels such as text messaging (SMS), USSD and instant messaging, these health care givers can have access to variety of sources from anywhere and at any time. A mobile service delivery platform such as the Mobi4D makes this possible.

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