# Enabling Mobile Collaborative Learning through Multichannel Interactions

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# Enabling Mobile Collaborative Learning through Multichannel Interactions

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*Abstract*— **The work presented here shows an architecture to integrate multiple communication channels for a simple communication tool: a weblog. The motivation for this work is to enable learners to access learning services regardless of their situation. Indeed, in some cases the access to these services is quite hard because people are on the move or don't easily have access to an Internet connection. This article presents the different elements that fit into the architecture which lay the path for a richer mutichannel learning environment based on Service Oriented Architecture.**

*Index Terms*— **M-learning applications, mobile blog, multichannel learning services, VoiceXML interactions.**

## I. INTRODUCTION

Computer Supported Collaborative Work has been a matter of research for a long time as well has its use in the learning domain with Computer Supported Collaborative Learning. One of the usual practices is to use project based learning as a mean to learn a subject matter as well as project management know-how. The project work can be supported by software systems like the Fle3 environment [1]. However, these kinds of environments are Internet-based and cannot support students and tutors when they are away from an Internet connection. On the other hand, mobile technologies have made progresses and almost every student possesses a mobile phone and probably soon a smartphone with enhanced capabilities. This has permitted the development of the mobile learning field of research which tries to enable the use of mobile technologies for learning activities [2].

This article presents the architecture we have designed to enable multichannel interaction with a collaboration system. In the first section, we present a possible scenario to show the capabilities of the system and collaboration features. The second section presents our solution to integrate the different channels. In the third section, we review existing related work. In the conclusion, we present the on-going experimentation and the future experimentations to assess the proposed system as well as the future developments.

## II. SCENARIO

In this scenario, a blog is used as a communication mean to enable students to share material and information in the course of a project. Students are supposed to post project related documents, summaries of the face to face meetings both between themselves and with the tutor, keep track of the meeting dates and status of the project. For this, the blog is organised with predefined categories: documents, meeting minutes, etc. Tutors can also post contributions to the project blog and especially add comments to the students' contributions considering for example the project management or the respect of the guidelines. All these interactions will mostly happen through traditional web interfaces. However, this is not always so easy because for instance of the difficult access to the Internet during internship periods. Having access to another interaction channel may also just be a convenient alternative to the traditional web. Based on such situation, one can then support the following scenario:

Cathy works on her second semester project about the preparation of an art exposition. She has just finished writing letters to possible supporters of the event. Being a milestone in the project, Cathy wants the project manager and the other students to know about it. Since she is at home and does not have an Internet connection, she picks up her phone and calls the voice server. After having identified herself with the server, she chooses to post a contribution and then she chooses the category "project management" among the ones proposed by the server. Upon a prompt from the voice server, she records the fact that the letters are ready to send. The server confirms that the contribution has been posted on the blog and Cathy hangs up. While posting the contribution, the system also sends a notification to the project manager by mail and to the tutor by SMS according to their preferences. Mark, the tutor receives the SMS while commuting. Because he thinks the project may be late, he is eager to know what project management news has been posted. He calls the voice server and identifies himself. He chooses to listen to the new contribution under the project management category. Having heard that the letters are ready to send, he decides to make a comment to this contribution to tell the students that they have to make a phone contact one week after the letters are sent. The following day, Cathy uses a computer at the university to upload the letters in the documents category. She discovers that Mike has posted a comment on her contribution and takes note of his advice.

This scenario relies on the capacity of the system to handle multiple channels to interact with the users so as to

enhance the collaboration. In the sequel, we will give the details of the architecture we have set up to support this.

### III.  ARCHITECTURE

Our objective is to permit the use of different channels to interact with services that support learning activities and collaboration. Towards this end, we have concentrated our effort in this first step in the introduction of the channels for a sample service which is a blog. In the next section we will present the current architecture which will be used for the first experimentations.

#### A.  The Mobile Blog

Fig. 1 presents the global architecture of the mobile platform. The interactive voice server is the entry point for the voice interaction it is based on the App-Line product and relies on the VoiceXML standard [3] to define the vocal interactions. Voice interactions as well as SMS/MMS and traditional web are handled by an intermediation server that will provide ad hoc user interactions to the services.

##### 1)  Interacting with the Blog

Blog servers offer a variety of APIs to interact with them. Historically, these APIs are: Blogger, MetaWeblog 0[4] and Atom [5]. MetaWeblog is an evolution of the Blogger API which is now deprecated. It is based on XML-RPC.  Atom is the rising standard for web publishing and uses REST 0[6] rather than XML-RPC or SOAP. Since MetaWeblog is still the most represented API at the moment, we concentrated on this despite the potential of Atom. The MetaWeblog API offers the following functions to the clients:

- user authentication;
- editing, adding and removing posts;
- retrieving recent posts;
- retrieving user related information and her/his owned blogs;
- retrieving existing categories for posting;
- editing the presentation template for a given blog;
- uploading binary files (sound, photos, video, etc).

Based on this API, we can integrate the blog software as a service in a larger system and we have the opportunity to develop ad hoc clients corresponding to the channels we would like to introduce.

##### 2)  Voice Interaction Design

The voice interaction application is a java web application based on servlet and JSP pages but the language used for the design of the user interaction is VoiceXML. Based on the interactions with the user, the web application then interacts with the blog server. Fig. 2 presents an excerpt from a JSP page containing a form to post a comment to a given post. The comment is recorded by the voice server. It is then replayed to the user before being submitted.
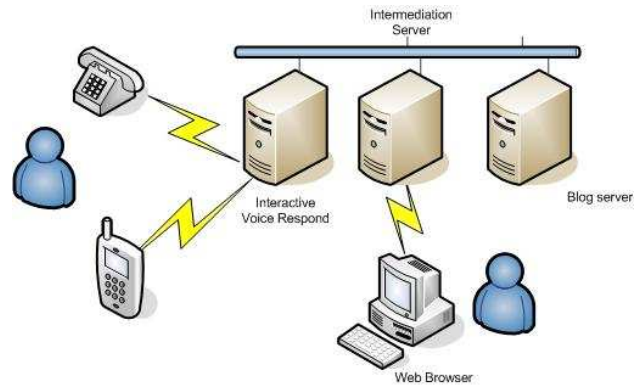


**Fig. 1: Global architecture for the mobile blog**

The submission activates a servlet (*AddCommentServlet*) which will retrieve the sound file on the voice server and interact with the blog server to upload the file as a comment to the previously selected blog entry.

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE vxml PUBLIC "-//APP-LINE// DTD VXML//EN"
                 "http://www.w3.org/TR/voicexml20/vxml.dtd">
<vxml xmlns="http://www.w3.org/2001/vxml" version="2.0"
      xml:lang="fr-FR">

  <form id="record_message">

    <record name="monMessage" beep="true" finalsilence="3s"
            dtmfterm="true" type="audio/x-wav">
      <prompt>
       Enregistrement de votre commentaire.
       Parlez après le bip .
      </prompt>

      <filled>
        <prompt>
          Vous avez dit :
        </prompt>
        <prompt bargein="false">
          <audio expr="monMessage"/>
        </prompt>
      </filled>
    </record>
     ...

    <submit next="/AddCommentServlet" namelist="monMessage"
          method="post" enctype="multipart/form-data" />
     ...
  </form>
</vxml>
```
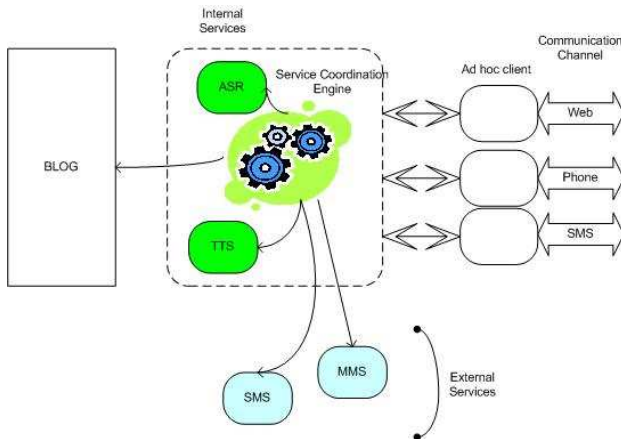
**Fig. 2: VoiceXML interaction to record a comment to a blog post**

##### 3)  Channels and Services Integration

The integration of the different channels and services to support collaboration are done through an integration layer in the spirit of the Service Oriented Architecture. Fig. 3 presents the services that are already integrated to support the interaction with the blog server either to publish material or to get notifications of modifications of the blog. Depending on the channel and the type of interaction (post an entry, make a comment, etc) a different process may be started that will orchestrate the needed services. These processes are modeled using the BPEL4WS language [7].

**Fig. 3: Channels and services integration**

Here is a sample process following the submission of a contribution through the voice server:

- After the recorded contribution has been validated by the user, the sound file is sent to an Automatic Speech Recognition (ASR) service to convert it to text.

- The corresponding text file is posted to the weblog using the XML-RPC API.

- For the registered people a notification is sent either by email or using an external web service to send SMS.

## IV. RELATED WORK

The use of blogs to support learning can be found in some works. However they are usually individual and used as a mean for the student to reflect on their practices or on a subject matter [8][9]. Mobility is usually not considered with the notable exception of the Ramble project that aimed at offering a mobile access to the blog [10]. However, in this work mobility is only supported in the sense that blog post can be authored offline on a PDA and published later on when an Internet connection is available. \cite{Balasundaram:2007} present a question-answering learning scenario based on SMS which is an interesting alternative to traditional web based tests. However, this is an ad hoc solution and the focus is not on the diversity of interaction channels to a classical software system.

Outside of the learning field, one can find other works on mobile blogs like [12] [13]. The former proposes to enrich a photo blog by the use of external services that for example enhance the photo quality or try to recognise what is on the photo so as to annotate automatically with keywords or with related information the blog post. The latter combines SMS/MMS, WAP and Instant Messaging to post to a blog, to get a notification of new material posted or to retrieve the blog content. These two works have similarities with ours, one because it combines different services to provide new features, the other because it offers multiple channels to interact with the blog.

## V. CONCLUSION

In this article, we have presented the architecture we have set up to combine different channels to interact with a blog server : Web, SMS/MMS and voice. The goal is to provide enhanced access to the blog in the scope of project based learning activities. Different features are offered by the system by the orchestration of different services like Automatic Speech Recognition, Text to Speech, SMS notification, etc. In the future, the blog itself will become a service among others as we integrate new services such as a shared calendar that will offer a richer environment for project management and collaboration. In the meantime, we have to assess the proposed architecture through experimentations. A first experimentation is running that involves student during internship. The blog is used as a mean of communication and supervision by the tutor. There is no strong collaboration in this case, but the experiment will assess the robustness of the system and its usability. We will also start to see in which context the different channels are used. Based on this experiment, a second experimentation will be launched on projects within different diploma at the licence and master level in different disciplines. This second experience will be more focused on the enhancement of the collaboration.

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