CreativeNotes: A Collaborative Tool for SMEs running under the WEBINOS Project Platform

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ABSTRACT

Thanks to the innovative platform implemented in WEBINOS project, a new range of Service Front Ends (SFEs) can be implemented to facilitate the communication and interaction among different devices. Of the different application domains addressed by WEBINOS, in this paper, the mobile domain has been selected to present an innovative application able to provide SMEs (Small & Medium Enterprises) with powerful and simple tools to help them run their business and to facilitate the creation and sharing of knowledge as a very important factor in start-ups companies. CreativeNotes is an application designed to fulfil the mentioned purposes and in this paper its architecture and how it is integrated with the WEBINOS platform is showed, as an example of the innovative capabilities provided by WEBINOS for the design of applications.

INTRODUCTION

WEBINOS project is an EU-funded project aiming to define and deliver an Open Source Platform and software components for the Future Internet in the form of web runtime extensions, to enable web applications and services to be used and shared consistently and securely over a broad spectrum of converged and connected devices, including mobile, PC, home media (TV) and in-car units.

By promoting a "single service for every device" vision, WEBINOS will move the existing baseline of web development from installed applications to services, running consistently across a wide range of connected devices, ensuring that the technologies for describing, negotiating, securing, utilizing device functionalities and adapting to context are fit to purpose.

One of the main focuses for Telefónica R&D in WEBINOS project is to provide SMEs with innovative tools to help them to work more efficiently. This motivation is aligned

with the interests of different business units at Telefónica for SMEs and several initiatives which have been already launched such as Wayra [1] and Amérigo [2].

Thanks to the benefits provided by WEBINOS platform enabling web applications and services to be used and shared consistently and securely over a broad spectrum of converged and connected devices, Telefónica R&D is being developing an innovative collaboration tool to be used by SMEs.

WEBINOS platform provides developers with integrated and powerful tools and interfaces to create applications able to work in different contexts of use. It is therefore easy to devise a huge range of possible use cases suitable to use this platform, such as:

- A new vision of social networks interaction, i.e., collaboratively writing of "tweets" with the help of a large TV screen as visualization device and using two or more mobile phones or tabs as input devices to enter the data through them.
- Integrating mobile phone to control the home entertainment, i.e. using the mobile phone to replace the TV remote control, providing different functionalities such as channel selection.
- Device-to-device communication, i.e. using the geolocation capabilities of devices with built-in GPS to provide another device (such as a camera) with that information.

The paper is structured as follows: firstly a brief summary of the field of Computer Support for Cooperative Working (CSCW) is presented, after that, WEBINOS architecture characteristics are addressed and then, CreativeNotes specific application domain is introduced to finally present the conclusions.

FRAMEWORK

The field of Computer Support for Cooperative Working (CSCW) deals with the use of computers to support the cooperation of group of different users. The term was coined by Irene Greif and Paul Cashman in 1984 and two years later, Greif published "Computer-Supported Cooperative Work: A book of readings" [3] where most of the papers described the research led by Douglas Engelbart

(best known for inventing the mouse) between 1963 and 1984 regarding the building of high-performance teams through technology (e.g. desktop and video conferencing).

Currently, CSCW is a multi-disciplinary research field which includes sociology, organizational science, psychology, and computer science. Further details about CSCW could be found in [4, 5].

In Table 1, a representation of different collaboration technologies and products are organized into three categories: communication, sharing of information, and coordination. Some examples of the existing possibilities supporting each collaboration mean are given.

	Real-time	Asynchronous
Communication	Video conferencing Instant messaging	Email Social networking
Information Sharing	Whiteboards Meeting facilitation	Document repositories Wikis
Coordination	Session management Location tracking	Workflow management Calendar scheduling

Table 1: Collaboration dimensions.

There are some evidences that workers can benefit from the use of technology to enhance their creative processes [6]. For example, letting designers to join effectively words and images, and thus show visual representations of the relationships among designers, images, and words [7]. Furthermore, companies in general (and overall SMEs) are hold to adapt and solve problems creatively in order to sustain their existence and grow [8].

Considering this framework, the innovative application called CreativeNotes has been defined, mainly targeted to encourage the innovation and the sharing of ideas and knowledge within different communities to have a real impact in people's daily life.

In this sense, several needs have been identified in many business sectors, mainly in companies like SMEs that usually have more limited resources, although in some of them, mainly start-ups, creativity is presented every day, in spite of them not having the more adequate tools to share knowledge among creators, using sometimes traditional ways of information sharing instead of taking advantage of the different innovations present in the digital world.

Besides WEBINOS platform provides developers with excellent tools that make it possible an easy interaction among different mobile devices that can be simultaneously used by different users and even using different modalities depending on the context, i.e. voice, text, video, photos, etc.

It is very important to take into account the context and that SFEs can perform an adaptation to the context of use in order to create successful applications.

WEBINOS ARCHITECTURE

WEBINOS architecture (see Figure 1) is based on the concept of personal zones. A personal zone includes all the devices associated to a specific user and it provides a framework for managing all these devices, together with the services able to run on them.

To enable external access to personal zones as well as managing communications, WEBINOS implements a Personal Zone Hub (PZH). The rest of the devices have a Web Runtime (WRT), e.g. a browser, intended to present the applications, and a Personal Zone Proxy (PZP) that might be connected to the PZH to offer specific local services to the rest of components of the personal area.

The interaction between devices is implemented through a common *discovery service* and an *event system*. The *discovery service* is in charge of finding the services offered by remote devices, and once they have been identified, accessing them through specific APIs. The *event system* is used for solving the different communication needs among the applications. An application could either publish its own events or subscribe to a type of event published by others.

WEBINOS APIs can be categorized as follows (see [9] for further details regarding APIs specification):

- WEBINOS base and generic objects/interfaces: for example, the WEBINOS core module that defines a common interface which all WEBINOS APIs can be accessed through.

- APIs for service discovery and remote access: APIs allowing applications to discover other devices and services/applications on other devices and on network servers.

- Hardware resources APIs: APIs to access information and functionality relating to specific device hardware such as GPS, camera, microphone, sensors, etc.

- Application data APIs: application capabilities such as contact items, calendar information, messages, files, etc.

- Communication APIs: APIs allowing applications to communicate with other applications in the same or another device.

- Application execution APIs: in order to let WEBINOS applications to launch other WEBINOS and native applications.

- User profile and context APIs: APIs allowing applications access to user profile data and user context.

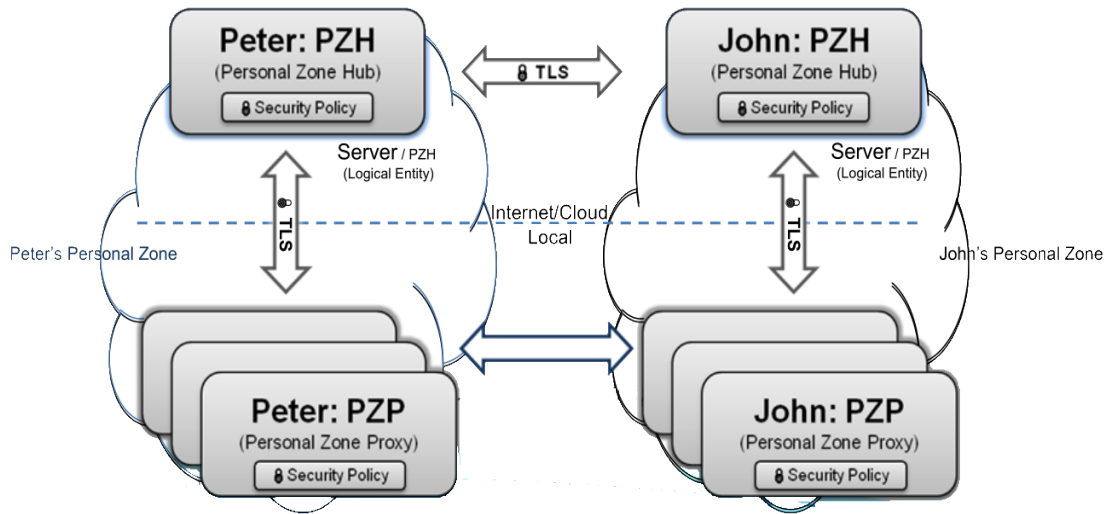Security and privacy APIs: APIs related to the security model for WEBINOS.

Figure 1: WEBINOS architecture overview

CREATIVENOTES APPLICATION
In this section, after giving a description of CreativeNotes application, highlighting the important benefits obtained thanks to the use of WEBINOS platform, a more detailed application workflow is provided illustrating how this application works.

General Description
CreativeNotes has been designed taking advantage of several features of WEBINOS platform, namely:

- WEBINOS apps are implemented using the most modern web technology (e.g. HTML5 or Javascript), taking advantage of all the interactive capabilities offered by these technologies. Besides, the User Interfaces (UIs) developed using WEBINOS are written in standard languages such as HTML5, making it possible an easy migration to another environments if needed.

- WEBINOS extends the capabilities offered by traditional Web technologies. In this sense, WEBINOS allows the developers to access to services offered by the devices such as the browsing of own personal files. On the contrary, this flexibility would not be allowed using HTML5 due to its security policies.

- "A single service for every device" vision. UIs are implemented once, and they are able to run on several different devices. This vision is extremely

useful nowadays, because of the great amount of existing heterogeneous devices.

- WEBINOS platform offers interesting security features including a policy of access control for APIs, multi-level authentication modelling and encrypted communication channels. These features are actually quite useful for the creation of different layers of allowed people & devices able to access several different personal services (e.g. different teams involved in a creativity/brainstorming process could access to the services related with a specific creation process).

- Furthermore, WEBINOS API is intended to support the information collection from the users' perspective (e.g. the temperature to that some food is being boiled, the anxiety level experienced from the participants in an evaluation session, etc.). Thanks to the incorporation of user's perspective, application designed will have a much higher acceptance degree among their users.

Application Workflow
The basic scenario of CreativeNotes consists of a session of creativity or brainstorming where several participants are involved. The participants would have mobile devices (e.g. tablets or smart phones) in order to create individually contents through several input modalities such as voice, photos or videos. Besides the different devices used by the

different users involved in the creation process, there will be a large main screen where certain contents can be sent and it will be used for sharing ideas among the participants. This main screen would be present in the creation lab and it is not needed that all participants were physically present there, on the contrary, some of them would contribute remotely to the brainstorming process, but their contributions and ideas will be displayed in the main screen.

In this scenario, special attention should be paid to the information sharing, the event handling and the privacy management. The workflow supporting this scenario would be the following:

The information sharing will be supported by a *web server* which will be in charge of storing the contents provided by the different participants. Once a note is sent to the server, it will inform to the *content creator* about the resource location (i.e. a URL).

Then, using the event handling mechanisms implemented in the WEBINOS platform, the creator will let the other participants know about the new provided *content* and its *location*. At this point, it would be very important that the content creator could have the possibility to manage the *privacy profile* to be applied. For example, according to a specific profile, the access to the notifications sent can be restricted to only some specific users or group of users.

In the Figure 2 a workflow about a simple case of note sharing is represented, showing the different components and their interactions in the process.
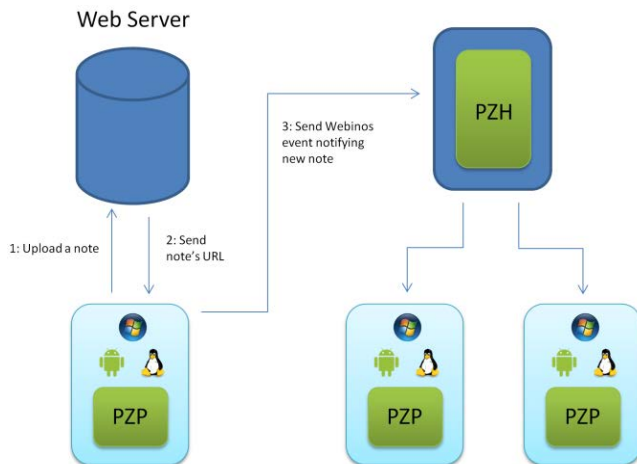
Figure 2: Workflow diagram of notes sharing

The workflow would be:

- Firstly, the PZP (Personal Zone Proxy) uploads a note into the Web Server

- After that, the web server sends back to the PZP a URL for the note previously uploaded.
- An event is sent to the PZH (Personal Zone Hub)
- The PZH will inform another participants about the just created content

CONCLUSIONS

An innovative application running under the WEBINOS platform has been created to enhance collaborative working and information sharing.

This application is able to run in different mobile devices and in the ultimate touch-screen tablets, following the principle of "a single service for every device".

Given the flexible approach, the application could be adapted to many different domains, making it possible that SMEs form different business sectors could benefit from the developed architecture and approach.

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