

# Collaborative Working Solutions based on Web Technologies powered by the Webinos platform

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## ABSTRACT

Nowadays, there are many applications that make it possible the information sharing, but many current solutions may lack of security or depend on centralized servers with unclear privacy policies and even they may not be available for running on any device. For business purposes, the use of certain existing applications can be risky and unreliable and even many costly commercial solutions have some of the mentioned problems.

Webinos FP7-funded project has created an innovative platform able to work in different application domains and running on different operating systems. This paper is focused on how collaborative working applications can be developed based on the webinos open-source platform in the mobile domain and presents 'Creative Notes' application, an innovative solution for collaborative working able to run on many heterogeneous devices. This platform provides a secure framework, able to run on different devices, without the need of central servers for information storage and it works in an asynchronous way.

## INTRODUCTION

Webinos project (<http://www.webinos.org>) is an EU-funded project with more than twenty partners from across Europe, aiming at defining and delivering an Open Source Platform that connects user's devices securely and allows applications to run and use resources across mobile, PC, home media, TV sets and in-car devices in new ways.

Webinos partners have developed innovative applications in the different domains and in the mobile domain, one of the most impacting applications is the one promoted by Telefónica R&D, i.e. 'Creative Notes', mainly aimed at SMEs to help them successfully run their business, although it can be easily adapted to different use cases.

The paper is organized as follows: firstly an overall vision of webinos is given, and right after webinos architecture is presented, then 'Creative Notes' is in-depth described and finally the conclusions are exposed.

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## ABOUT WEBINOS

With a "single service for every device" vision, webinos intends to 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 context adaptation are fit for purpose.

Innovations in contextual description will be broad, covering but not limited to device capabilities, network access, user identity and preferences, location, behaviourally induced properties and finally the more complex issue of the users' social network context and social media engagement.

Webinos will boost the industry migration towards web-based services. Webinos can back this by providing interoperable, standardized, open source technology utilizable across domains with direct commercially exploitable value. Webinos will also act as an industry catalyst to encourage collaboration and discourage fragmentation in this space. There are strong industry moves towards Internet friendly and Internet integrated offerings, and there exists a window of opportunity to place the webinos technology on a robust open foundation that will remove economic barriers to engagement, embody policy on data privacy in concrete technology and creating a centre of web centric expertise.

Webinos features the following key concepts:

- Webinos bases on the achievements of the Web community and extends an open source web runtime environment.
- Webinos represents a leap forward: it is a federated web runtime that offers a common set of APIs to allow apps easy access to cross-user cross-service cross-device functionality in an open yet secure manner.
- Webinos aims at easy programming of applications by offering a Personal Zone that can consist of all devices owned by a user. This device inherently represents the changing circumstances of context and devices.
- Webinos creates open specifications and open source reference implementations that not only show the feasibility of the specifications but also simplify their adaptation by the industry.

The resulting platform features web components that support the rapid creation of innovative and secure web applications, where

- services can be used in several contexts across all user devices,
- services can make use of the specific capabilities and resources the underlying hardware platform provides,
- services can securely access private and non-private data and services on the cloud, social web, as well as data on the user terminal,
- services are developed once by service providers and deployed anywhere, and
- manufacturers and network operators have a service platform constituted by open standards and open source, which satisfies the requirements of the four domains: mobile, PC, Home media and in-car units.

Webinos will directly address security and privacy issues as part of Quality of Service that users of web services expect. The addressed challenges comprise: how to provision and adapt security across a range of devices, services, networks as well as how individuals can gain control over the privacy aspects of their web presence regardless of the service that is being used. Context and privacy are intimately intertwined: rich context is valuable but without user controlled privacy it becomes a liability. This dual approach is a hallmark of the webinos approach.

## 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.

The goal of webinos is to provide a multi-device, multi-user, multi-domain, web-enabled federated framework. Multi-device means all your devices can easily ‘talk’ to each other. Multi-user indicates you can contact your friends’ services too. Multi-domain shows that webinos is tailored towards different environments, as your car can do other stuff than your TV but they both can be webinos-enabled. Then, web-enabled means you program it using web technologies: HTML5, CSS and JavaScript. Finally, federated indicates different domains can exchange messages, much like email. Everything is done in a secure way as well.

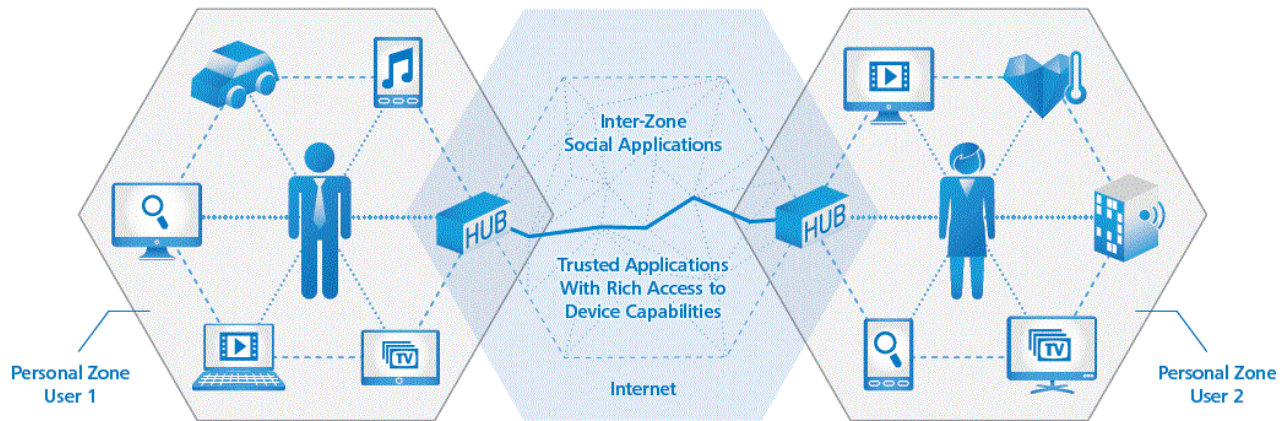
Now, if we forget other users and focus on our own devices, i.e. if you had a mobile, a STB and a laptop, together these form your Personal Zone. This zone is ‘managed’ by a single Personal Zone Hub (PZH). Your devices all have a Personal Zone Proxy (PZP) embedded in them.

Programming for webinos is not much different than programming for the web using some advanced HTML5 features and when invoking methods on remote services, the PZP forwards the marshaled request to the PZH, which in turn finds the correct PZP. If that PZP belongs to a different Personal Zone, it determines the corresponding PZH and forwards the request to that. This whole process is under strict policy control and may be forbidden at any step of the way.

The interaction between devices is implemented through a common *discovery service*, an *App2App 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. An alternative to the *events system* is the *App2App service* in which the user can subscribe to determined channel.

Webinos offers different APIs that can be categorized as follows (see [1] 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 Framework**

There are some evidences that workers can benefit from the use of technology to enhance their creative processes [2]. For example, letting designers to join effectively words and images, and thus show visual representations of the relationships among designers, images, and words [3]. Furthermore, companies in general (and overall SMEs) are hold to adapt and solve problems creatively in order to sustain their existence and grow [4].

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.

**Proposed Approach**

*Creative Notes* (see figure 2) is an advanced notes creator and editor in real time that follows the creative procedure. *Creative Notes* simplify permissions and groups following

the webinos architecture. All the communications are asynchronous so there is no need to refresh any page or sync anything.



**Figure 2: Creative Notes Application**

Thanks to webinos framework, different devices communicate each other in a secure and easy way. Important information can be transferred from one to every device connected with *Events API* and without the needing of an intermediate server. With this API every device will listen for events asynchronously. Every data handled by the application is stored in the device via *File API*. With *MediaCapture API*, photos, videos or audio can be added to the note in real time. This avoids the need of launching Camera, or Voice Recording application prior to launch Creative Notes. Finally Geolocation can be added to any note thanks to *Geolocation API*. Once the webinos Personal Zone is set, there is no need to authenticate or create any account, everything will work automatically with your webinos settings.

*Creative Notes* is a complete multimedia note editor/creator in real time and asynchronous syncing. Every device configured under the same mail account (in webinos

configuration) will be in sync. This configuration determines the Personal Zone. This means that if you have two or more devices and you create some multimedia note in one of these devices, this device will notify and send the note to the rest without the needing of an intermediate server. The updates are received instantly with the events oriented communication of Events API.

Every note can contain anything that you want. With *MediaCapture API*, the application can launch directly the camera, videocamera or voice recorder. All these media will be instantly saved in the device via *File API*, to be fast and responsive. These files will be transferred between devices, and in the future, notes can also contain location.

Every device stores internally all the notes from the Personal Zone where it belongs to. When a certain device reconnects, it performs a synching up process by asking the other users for the updated list of shared notes. Once received, it will check for the changes in both the local and the shared list of notes:

- Those local notes not present in the shared list of notes will be shared by notifying them to the rest of PZPs as new notes to be included in the shared list of notes.
- Including in its local list of notes those shared notes not included yet in that list.

The synching up process also takes care of updates in existing notes:

- If local changes are detected, an event is sent to notify it to the rest.
- If remote changes were detected, the existing local note will be replaced by the remote one.
- If both local and remote changes are detected, a new note will be created including both the common contents from local and remote versions and the new contents from both local and remote versions. This note will be an update of the respective existing local one and it will be sent to the rest of PZPs to update their local note list.

It is important to point out that this P2P decentralized architecture needs at least two devices connected at the same time to transfer notes. If a new note were created and there were not any other device on-line, this note would not be registered in the list of notes of the others until the device containing this new note were connected simultaneously with another one.

A possible example working scenario would be: one smartphone creates a new note and add some content to another one, but at that moment it is the only one connected. Later, a laptop launches Creative Notes, asking for the remote list of notes (to the smartphone in this case), getting both the new note and the updated one and storing them in its local list of notes. Later, the smartphone disconnects, but the laptop already has the new and the updated notes and this device can distribute the notes from the first device.

Creative Notes events are sent using the webinos *Events API*. These events are:

- *Cn-getNotes*: Ask for a list of notes to the rest of the devices in the Personal zone.
- *Cn-getNotesResp*: Answer to a *cn-getNotes* event
- *Cn-updatedNote*: The device has updated or created some note. This event can be fired when mixing local and remote notes.

Webinos *File API* is used to:

- Read *CreativeNotes.json* where the local list of notes is stored.
- Write *CreativeNotes.json* whenever a note has been modified. This functionality is executed when receiving a *Cn-updatedNote* webinos event or when mixing notes.

In summary, thanks to a non-centralized architecture, the notes are shared among devices without an intermediate server, thanks to webinos *Events API* and *File API*.

## CONCLUSIONS

An innovative application running under the Webinos platform has been created to enhance collaborative working and information sharing. Thanks to its flexibility and easily adaptable capabilities, the application is multi-purpose and can be configured to be used in many different domains.

Important issues present in the other existing solutions are solved thanks to this innovative application and security, privacy and decentralized access can be provided in a simple and effective way thanks to the use of Webinos platform.

## ACKNOWLEDGMENTS

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