
BlueTo: a location-based service for m-government solutions

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The aim of this project, called BlueTo, developed by CSP – ICT Innovation and the City of Torino with the support of FuturLink, is to deploy a location-based m-government solution delivering digital content previously distributed by the Public Administration on traditional media. The solution, based on Bluetooth technology, provides inherent located content to citizens and tourists. The core of the project was to test a methodology to ensure a successful transition to a m-government model. This was done exploiting the opportunities offered by new mobile technologies in order to better correspond the government aim of improving efficient, effective and transparent solutions. BlueTo model is described starting from both the back office functionalities as well as the front end features. The solution was optimized considering the editorial staff requirements collected during the analysis phase as well as the final users needs emerged in a new context of use such as the one characterizing the location-based services.

Keywords: Location-based Services, Information Applications, Bluetooth, Digital Multimedia content, Mobile Phones, M-Government solutions, Content Management.

1 INTRODUCTION

According to the tendency involving the Public Administration bodies a lot of e-government solutions can be provided by mobile telephony, exploiting the potential of these new technologies .

Mobile telephony, that is the most used communication medium by Italians, it could become the fastest and most simple medium to reach citizens and to provide immediate usefulness services, especially if the content delivery will be combined with the exploitation of context awareness allowed by a GSM/GPRS/UMTS network (Harkin, 2003).

A location-based service (or LBS) in a mobile telephone network is a service provided to the subscriber based on her current geographic location. We can see that the definition “location-based” identifies several kind of technologies, applications and contexts of use, concerning tourist informative services but also geolocalization systems and commercial applications. Bluetooth is one of the possible technologies applied in order to develop LBS and moreover is one of the more diffused abroad Europe because of its integration onboard a large number of last generation mobile telephone. This makes its use as networking and messaging system easy, profitable and useful. Moreover Bluetooth even its short range connectivity, it is able to provide no-cost data transfer and inherent location information. Both of these features results very important in a Public Administration view because of the importance of overcoming the digital divide.

On the basis of these technological aspects, the City of Torino stressed its interest in transpose and adapt services supplied by traditional channels (as Web site, magazine, newspaper) to the new mobile communication media, and in particular to mobile phones. In order to reach this goal, the services were adapted considering the technological aspects, the context of use as well as end user needs. In fact the design of this kind of applications is always influenced by the restricted capabilities of the user’s device regarding processing power, memory consumption, limited or no persistent storage, etc. At the main time the chance to execute a set of offline applications stored and run on the device itself is an added value because allows the user to consult the service anytime and everywhere (Pearrow, 2001).

2 OBJECTIVES

One of the main objectives of this project was to test a new kind of service delivery system in order to give Public Administration bodies and citizens innovative tools to modulate and personalize the offer of information and services.

Starting from the interest demonstrated by the City of Torino towards the appliance of new technologies and innovative services, different user scenarios, technologies and kind of services has been analyzed as well as a specific user model. On this basis the whole of location based services looked like the one that more correspond both to social and technological identified requirements. The high penetration of

mobile phone in the Italian context combined to the level of standardization reached by Bluetooth technologies drove the project towards the development of a innovative service based on the technological infrastructure presented in this paper.

3 BACKGROUND AND METHODOLOGIES

The project, called BlueTo (Bluetooth Torino) was based on different steps. First we analyzed the scenario, starting from the identification of a specific user model. Subsequently all the technical requirements were collected and the interface designed. The next step was based on the content and specification collection (with the verification of the information sources). In the last phase the prototype was developed and tested.

3.1 The User Model

By a general point of view, user modelling can be made in three different ways: using stereotypes, using surveys or using a "learned model" [Langley, 2000]. According to the purposes of BlueTo project the user model was based on the definition of stereotypes. First of all we start with an analysis of the user that brought to a generic description of the user model. The end user of BlueTo is not characterized by a gender or age distinction and neither by a distinction based on social position. The only requirement of this user model is the technological one. In fact, in order to interact with the application, the user must be equipped with a mobile phone with Bluetooth technology and she has to be able to use it.

Starting from this general user model the next step was based on the profiles definition. These have been determined considering the kind of content distributed by the system. Three main profiles (cultural, informative and civic one) have been identified on specific user needs. In fact, users belonging to the cultural profile need specific information about the main events presented in the city as well as location based content related to some points of interest (monuments, opening and closing time of the museums, details about theatre actions, etc.). Users belonging to the informative profile generally look at the service to find practical information such as emergency numbers or tourist information while civic profile includes users who are interested in the town hall activities. On this basis two main user categories have been outlined: citizens and tourist.

3.2 Analysis and definition of the prototype

Starting from the definition of different user scenarios, three kind of services were identified on the basis of the availability of content and the relevance of service in respect to the access point location. For content availability we considered the reliability of the information provider (information source e.g Public Administrations bodies web site or other official sources) and the updating modality used by different editorial staff. One of the aspects that more affected this step of analysis was the previous existence of content. As regards the relevance of service, the location of the access point was chosen in order to contextualize the service itself. In order to develop this kind of service a second analysis step was done on the technological side. Different solutions were analyzed on the basis of several criteria, such as to be a stable platform, proofed and used for the development of similar project moreover incident to Public Administration bodies. After a comparison of different technological providers we opt for a Spanish company called FuturLink because of the completeness of the platform they developed and distribute. Afterwards, according to the device peculiarity, a research on the interface was done, obtaining guidelines for both the layout as well as for the service structure. For example the graphical structure (background, fonts style, and use of images) was developed considering the memory capability of the device. For this reason the final result has been an essential but effective look and feel solution. Moreover the service was structured according to the device capabilities, in particular adapting contents to the kind of typical interaction of mobile devices (such as small display, content scrolling, etc.).

In connection with these analysis the prototype has been structured in three different services. *Welcome* application, that is located inside the international airport of Torino, is an introductory tourist guide for all users who are about to visit the city while *Torino* application delivers the agenda of the municipal administration as well as a guide of the historical Municipal Building. *Cultura* application, that is distributed through an access point in the city centre, is a guide to the main monuments and museums as well as to the cultural events proposed in the city.

4 BLUETo: ARCHITECTURE AND DATA FLOW

The structure of BlueTo project is composed by the customer remote location, the FuturLink ASP server (Active Server Pages), four Bluetooth Access Points distributed in several locations and users devices (mobile phones). The solution developed by FuturLink enables the administrator to use a single back office to manage three different services for what regards both the network and content management. The Suite, called Wilico B500, is installed onto a computer usually located on a remote location (customer remote location). The Suite interacts with the access points through an ASP server connected to the access points over Internet. This connection to Internet may be performed through an Ethernet or a GPRS connection.

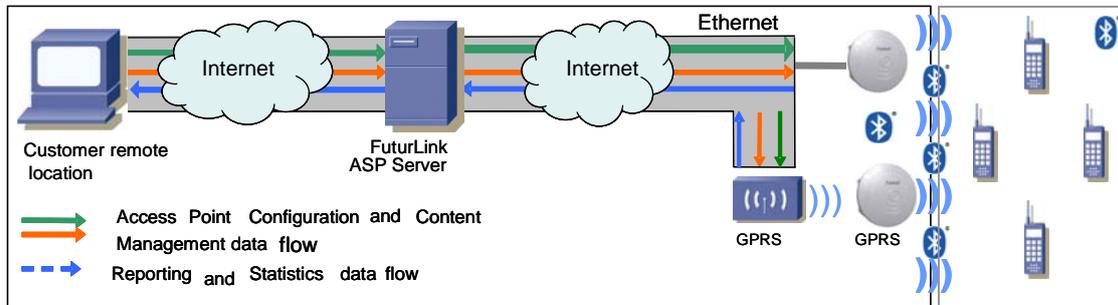


Fig. 1. Architecture implementation for different access points in several buildings and the data flow, referring to the configuration of the access point, the Content Management and Reporting&Statistics.

The Suite is a software that allows companies to manage and update in a remote way the multimedia content and the applications held within the access points and it's used for the access point configuration, content management, reporting and statistics (as you can see in the Fig. 1.). When the user refuses to accept for three times (an arbitrary decision), the system will insert her in a temporary exclusion list, so that it won't ask her to download the application till the next update. Contents distributed by the access points are updated at regular intervals set by the administrator. This enable the content management and updating process very feasible allowing the end user to benefit from a complete service always up-to-date.

5 BLUETo: AN M-GOVERNMENT SOLUTION FOR THE CITY OF TORINO

According to the technological analysis as well as to the collection of the final specifications about the services to be distributed, several criteria were identified and used in order to select and verify the content delivered by the three different applications.

First of all the binding related to the screen size of the mobile phone influenced the typology, amount and structure of the content delivered. In all the context where the priority was to deliver accurate and exact information the content was structured allowing the user to reach the desired information through the minimum number of steps (through the navigation structure). Considering that the application is downloaded on the device and that the user can display it and read the content anywhere and anytime, all the sections are organized in a structure based on a navigation by tabs. Each tab delivers special content, such as text or images, related to the same item. In fact all the applications are characterized by the delivery of multimedia content. Textual information, where is needed, is supported by several images (.gif or .jpg files). This was done in order to enrich the user experience. Respect to the typology of content delivered by the three applications, all the information sources chosen also provide content in English. Multilinguism was in fact one of the other service requirement identified during the analysis. Finally the position chosen for the different access points was based on a principle of "local" relevance. For example the application called *Welcome* has been located in the airport, providing a kind of content that can be more relevant for all the tourists coming for the first time to visit the city.

All the services share the same structure, based on three different levels. The first level corresponds to the more general sections and it is divided in subsections, or categories. Each category contains several items, that once selected are structured in three tabs containing text or images.



Fig. 2. A screenshot of the content management panel

As regards the navigation, two of the three services provide a second navigation modality. In fact in order to reach a more context-awareness it is useful to develop systems based on location-awareness too, such as the ones based on the use of maps. During the specification collection, for a usability reason and in order to enrich the user experience, has been decided to support the menu structure with a graphical navigation based on a map. Inside the map the meaningful resources were geolocalized, as it will be described in the following sections dedicated to the three applications.

6 STATE OF THE ART

In order to evaluate the three applications, a set of tests has been planned. First of all the access points were configured and a laboratory test session has been carried out until the platform could be considered stable. This phase was focused on different aspects: content editing, insertion and updating; visualization on different devices; updating of the platform and correct versioning; access point coverage.

The achieved results allowed to pursue with the project, installing the access point in their final location. In fact the first test session demonstrated that:

1. the back office allows heterogeneous editorial staff, characterized by no particular computer science skills, to easily manage the content;
2. content is correctly visualized on different devices, according to the belonging family of mobile phones;
3. the platform traces out the versioning and install in the device the correct updated version of the application;
4. the access point coverage can be easily modified in order to manage more than one campaign in the same building.

After this first step, the access points have been successfully installed in their final location. This test session was finalized to the collection of more detailed results about the application and users. In fact, through the suite network management, it is possible to obtain specific statistics and graphs related to the campaigns and the access points activity¹. The next step will be based on an advertising campaign that will present in the access point location some instructions about the services. In conclusion more tests will be done in order to collect details about user, system usability, usefulness of information, desired features etc.

7 USAGE SCENARIO

In this paragraph a typical usage scenario will be described to explain in a better way the functioning of the application BlueTo in a real context of use. A user goes to a place where a BlueTo application is located, for example *Cultura*. Here she sees some posters that communicate the possibility to download it on the device. The user reads that the service is free and safe and she had just to activate Bluetooth technology

¹ For example, in less than one week (26.05.2006 – 05.06.2006), the cultural application located in the city center detected 138 devices, 22 users downloaded the application on their device. This test was done before any the advertising campaign.

on her mobile phone. So the user enables Bluetooth and get an invitation to download the applications. She accepts and in about thirty seconds the download is complete. The application is now running on her phone and she can use it everywhere and when she prefers. For example she reads that at Palazzo Bricherasio there is an interesting exhibition and, looking at the section called "Emergency number", she can find the taxi telephone number and make a direct call from her mobile. When the user ends her visit in the museum she can take a look on the map installed on the application and decides to visit the monuments situated near Palazzo Bricherasio. In this case the location based service support the user in the events selection as well as enables her to reach the right place in the easier way, enriching the user experience.

A future step of BlueTo will concern both the integration of RSS files, conveying contents coming from distinct information sources directly in the system. So both the system and the user can be automatically updated when something new is on. Another future scenario will regard the content delivery in a pull modality. This feature will allow users to interact with the system through the mobile phone over Bluetooth technology. In fact, when the user will be in the range of the Access Point, she will be able to interact with the system sending a sort of feedback through her Bluetooth mobile phone. She will be able, for instant, to send in "pull" modality a comment about the service or about a monument, the town or an event or to send an MMS to share her experience with other users. Facing this progress new services will be investigated and deployed expressly for this kind of interaction modality, enriching and strengthening the communication process between Public Administration bodies and citizens.

8 CONCLUSIONS

The developed service achieved several results as concerns technological and applied innovation. The investigation of an m-government infrastructure model leads to the development of a solution corresponding to the requirements outlined by City of Torino. The technology and the applied methodology guarantee a successful transition from e-government to m-government models. In fact the system results to be flexible and robust allowing a good level of service personalization. Moreover the developed solution corresponds to the user needs. In fact BlueTo allows citizens and tourists to access *anytime and everywhere* to different kind of content directly on their mobile phones. Moreover this kind of Bluetooth application allows Public Administration bodies to reach citizens with low infrastructural cost and guarantee a no-cost service for the end user, promoting in this way the communication process and a deeper service diffusion. (Sandy, McMillan, 2005).

In short, the results can be summarized as follow:

- Increasing access to government solutions and an efficient service delivery system;
- Exploitation of new mobile technologies;
- Successful content customization to the device features;
- Deployment of three different context-awareness applications (*Welcome, Torino, Culture*);
- Content reuse;
- Usable backend able to allow an easy content and network management.

ACKNOWLEDGMENT

Thanks to FuturLink, the technological provider that supports us in the project development.

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