

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

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Abstract : *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 is the most used communication medium by Italians. Moreover it could become the fastest and most simple way 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).

Some examples of these services are:

- Mobile data transfer;
- Identification and authentication process;
- Messaging (i.e. sms, sms premium, mms, ecc.);
- Location Based Services;
- Micropayments.

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, commercial applications such as merchant fleet Global Position System (GPS) tracking, services about information on traffic and some prototypes of automatic navigation systems for civil vehicles.

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. (2,5G, 3G, smartphones and cameraphones). 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 both the technological aspects and the context of use. 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 research 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 and technologies has been analyzed.

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 droved the project towards the development of a innovative service based on the technological infrastructure presented in this paper.

In fact the City of Torino was interested to thoroughly analyse the specific subject related to the distribution in different localized contexts of information directed to final users through the use of consumer technologies characterized by a "push" modality applied to digital content. As regards final users the reference target identified were citizens as well as tourists.

3. Background and Methodologies

The project, called BlueTo (Bluetooth Torino) was based on different steps:

- Analysis of the scenarios;
- Technical requirements identification;
- Interface design;
- Content and specifications collection;
- Verification of the information sources;
- Prototype development.

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.

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. A deeper description will be subsequently tackled for what regards both its technological features as well as its main functions.

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 (as regards the interaction between the end user and the application on the mobile phone). 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.).

The prototype development was done considering the system as structured in two main parts:

- The front-end (visualized on the device);
- The back office (used and visualized through the software installed on the computer of the editorial staves).

Considering the structure of the prototype, in this paper we refer to two different user categories: end users of the service (mainly citizens and tourists) and editor users, who interact with the back office of the system in order to insert, manage and deploy the services.

4. BlueTo: architecture and data flow

In this section we introduce the main components of the architecture of BlueTo and the description of the service data flow.

The main elements that compose BlueTo architecture are:

- Customer remote location;
- FuturLink ASP server;
- Bluetooth Access Point;
- Users' devices (mobile phones).

By a general point of view communications pass over the Internet going to the access point. From the AP data reach the end user by Bluetooth radio frequency. The Bluetooth coverage can be chosen from three possible ranges proposed in the suite back office.

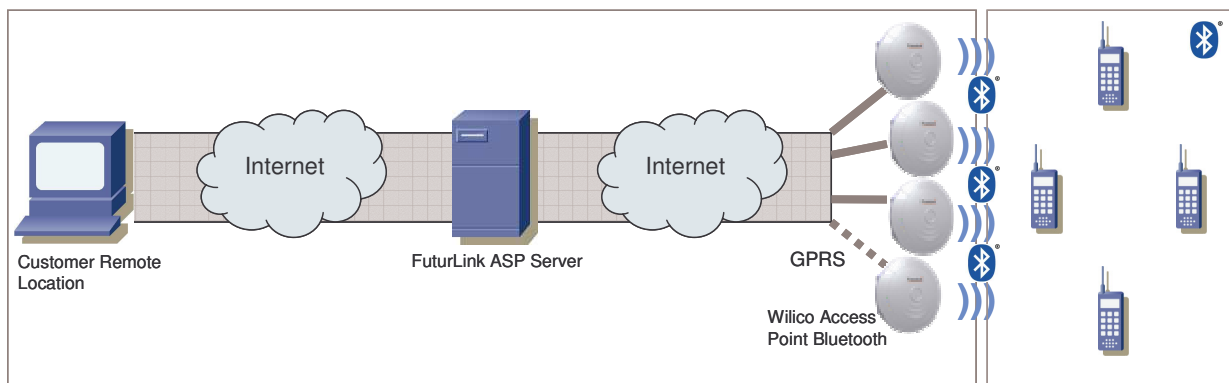


Fig.1 - Architecture implementation for different Wilico access points in several locations

The structure of BlueTo project is composed by four access points distributed in several locations.

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 (Active Server Pages) connected to the access points over Internet. This connection to Internet may be performed through an Ethernet or a GPRS connection.

The Suite is used to:

- Access point configuration;
- Content management;
- Reporting and 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.

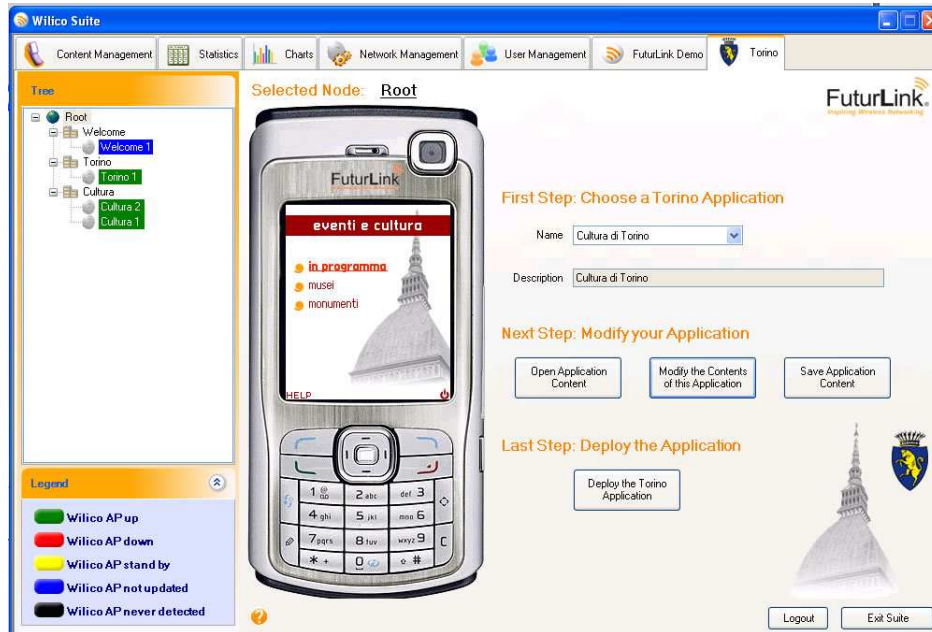


Fig.2 – Suite Wilico B500: a screenshot of the management panel

Access points are also connected to the ASP server through Internet to share all the information between them, providing roaming capabilities.

One of the access point has a SIM card and a GPRS module installed. This AP needs to be configured with a service provider settings in order to connect it with the ASP server.

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 point 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.

On the next picture it is represented a typical 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.

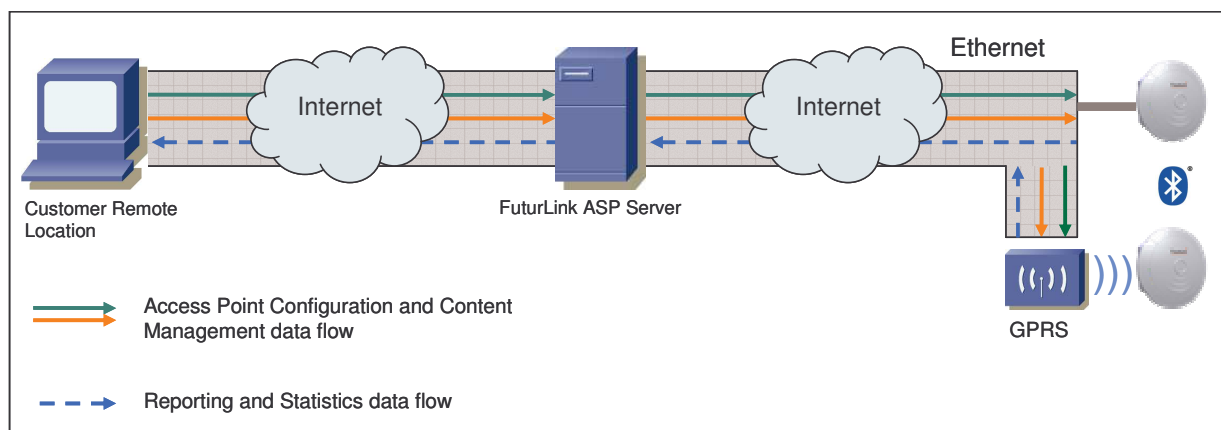


Fig.3 – Architecture and data flow of BlueTo services

5. Device and content typology

Each Wilico access point is connected to Internet in order to receive in a regular basis software upgrades and the updates of new Bluetooth mobile phones on the market.

Thanks to these updates the Wilico access point have the capabilities to identify all Bluetooth mobile phones makers and models to perform more advanced proximity marketing campaigns.

The set of features of mobile phones on the market with Bluetooth technology implemented is various. So we can find devices characterised by basic capabilities as well as more advanced models with full functionalities.

The devices may be categorized into four families, according with the processing power, the memory consumption and display size, going from the most advanced to the less one.

The first family of mobile phones is the most advanced and it is able to support Multimedia Interactive Rich Applications (e.g. .jar and .sis). The second family can support applications based on the Operative System of the Mobile Phone (.jar), while the third family can display just a video (.3gp) and the fourth one an image (.gif).

The list of the models belonging to each family is always up-to-date.

6. 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. Basically the three applications supply two kinds of content. 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 section characterized by the priority of giving more exhaustive content where organized in a deeply 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.

As regards the content selection, another applied criteria has been the official character of the information source. In fact just institutional information providers could deeply correspond to the highlighted need of delivery updated and traceable content. The editorial staff that will maintain the services has to be to put in a position to manage all the applications in a feasible way, especially as regards content insertion and

updating. Moreover the usable editor features that characterize the suite make the content management a very easy process even for general editorial staves without specific informatics skills.

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.4 – 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 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 where geolocalized, as it will be described in the following sections dedicated to the three applications.

6.1 *Welcome application*

This first service, that is located inside the international Airport Sandro Pertini of Torino as well as in a tourist office situated in the city center, is an introductory tourist guide for all users who are about to visit the city. The application deals with useful content for a tourist visit besides presents a description of the main cultural attraction in the city.

Welcome application is structured in four main sections:

- *Welcome*
- *Tourist information*
- *Emergency number*
- *What's on in Torino*

The sections *Welcome* and *Tourist information* contain a sort of city guide with a short description of the city of Torino while *What's on in Torino* presents the main cultural event proposed in the city. One of the features that characterize the section called *Emergency number* is that the system allows to make a direct call to the selected item: this aspect can be very useful since the service works on a mobile phone.

6.2 Torino application

Torino application is related to the access point localized near the Municipal Building of the city of Torino. This service is structured in two main sections: *On the agenda* and *Municipal Building*. The first one delivers the agenda of the municipal administration of the city of Torino while the second is a guide of the historical Municipal Building. This last section is characterized by the map navigation model that was previously introduced. The plan was used in order to outline the different rooms that compose the Municipal Building. Once a room is selected the user can access to the descriptive tabs related to that item.

6.3 Cultural application

This last service is distributed through an access point in the city centre. The application is a guide to the main monuments and museums as well as to the cultural events proposed in the city.

It is structured in three sections:

- *What's on in Torino*
- *Museums*
- *Monuments*

As it happens in the *Welcome* application, *What's on in Torino* contains bimonthly updated information related to the main cultural events. The second section proposes a complete list of the museums located in Torino. This section contains detailed information such as addresses, telephone numbers, opening and closing time and a brief description of the exhibitions.

The last section is structured in order to present ten of the main city monuments. This is one of the richest section of the application because presents, besides a textual description of each selected monument, an image supported by a detailed screenshot of the monument inside the city map. Moreover this section proposes, as it is for the section called *Municipal Building* in *Torino* application, a visual navigation model starting from the city map. Inside the map the main monuments are located and linked to the respective descriptive tabs.

7. State of the art

In order to evaluate the three applications, a set of test has been planned. First of all the access point where configured and a laboratory test session has been carried out until the platform could be considered stable.

This phase was focused on different aspects:

1. content editing, insertion and updating;
2. visualization on different devices;
3. updating of the platform and correct versioning;
4. 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 has 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 graph 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 instruction about the services. In conclusion more test will be done in order to collect details about user, system on usability, usefulness of information, desired features etc.

8. 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 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.

9. Future scenarios

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.

10. 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

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 user downloaded the application on their device. This test was done before any the advertising campaign.

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.

Acknowledgments

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Short biography

Franco Carcillo is the City of Turin's Telematic Services Director. As a result of his activity, the City of Turin's web site was awarded in 2002 (European City Award, Vienna) and in 2001 by the EU as 'Very best e-government practice' in the field of services directed to citizens. He is also responsible for the organization of events aiming to spread Internet knowledge and use in citizens' daily life. He has been working for 25 years in the ICT sector.

Lara Marcellin received a Master Degree in Communication Sciences (Communication in the Information Society) at the University of Torino, Italy.

She took part as content manager and web analyst in several projects involving the development of innovative services based on the exploitation of new technological and communication tools within public administrations, cultural bodies and private companies.

Her research is focused on digital contents management, user and system requirements analysis, content delivery in a local based perspective and on the development of multichannel applications dedicated to Public Administration bodies as well as on the design and test of new service supply models.

Agata Tringale took a Master Degree in Communication Sciences (Communication in the Information Society) at the University of Torino, Italy.

She worked as project manager, advanced media analyst, content editor in projects pertaining Information and Communication Technologies, especially Mobile Communication, and Urban Marketing, involving Public Administration bodies.

At the moment her job pertains to study, analyse and test software solutions for content delivery, enterprise collaboration and document management aimed at their implementation inside Public Administration bodies and private companies.