Provincia di Ancona

GOOD ON EMERGENCY SITUATION

Civil Protection and New Technologies in EMERGENCY SITUATIONS

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1. PREFACE

PATRIZIA CASAGRANDE ESPOSTO

The administration of the Province of Ancona has always been attentive towards the use of the new technologies that might improve governance and the quality of the services offered to the territory.
In this context, the Goes project represents a pilot experience with the aim of enhancing the level of safety of the road network. A sort of small-scale revolution has come about thanks to Goes. This initiative will enable us to extend the computerised network for the collection and transmission of information regarding practicability conditions to secondary roads. The system will work both in normal conditions and in emergency situations. If necessary, it will suggest alternative itineraries both to local public transport companies and to all interested users in general.
Hence, intelligent innovation allows to better serve all citizens. But what I would like to emphasize is how the project has been implemented.
On the one hand, internal competencies have been valued, in this case, those of the Civil Protection, and on the other hand we have opened our confines to Europe, allowing our local bodies to keep up with the best practices of the continent.
These are two choices that I believe to be fundamental and that have enabled this territory to grow in terms of acquisition of know-how and contribution to the enrichment of projects developed through various partnerships.
It is my hope that this approach will be more and more shared in the near future. It is the reflection of an administration that is modern in the conception of its role, and efficient in its *modus operandi*. Therefore, my heartfelt thanks to all those who have made the realisation of the Goes project possible.

Patrizia Casagrande Esposto
Special Commissioner of the Province of Ancona

GIAN MARIO SPACCA

The GOES (Good On Emergency Situation) project, that draws to a close today, was made possible thanks to the Civil Protection Financial Instrument of the General Management of European Commission for Humanitarian Aid and Civil Protection (ECHO). It represents a solid example of how technology can improve the quality of services offered to citizens.

Research and technological innovation are fundamental tools, not only for increasing safety in communities, but also for encouraging development policies. During the last few years, the European Union has worked to enhance interventions by individual member states in these areas and to encourage an exchange of information and good practices.

For some time now the Marche Region has been involved in the best European policies. It has implemented initiatives and interventions aimed at strengthening the meaning of European citizenship. It has valued innovation policy, promoted international co-operation initiatives, encouraged the creation of public-private aggregations with an elevated technological value and it has taken real steps towards bringing about projects and proposals aimed at strengthening the protection of citizens and the territory.

The GOES project consists of the implementation of a road network monitoring system. It has been developed and used by various local bodies integrated within the regional and national systems. The Marche region is therefore proud to welcome and promote the experimentation of such a system within its territory. It is destined to offer citizens more widespread information and increased safety within the road network.

Once the experiments that have already been carried out and that will be carried out within the project partner territories are complete, the product will be easy to apply to the remaining European territory, with a view to capitalising on and enriching the technologies developed.

This project, which implements an idea developed jointly by the regional structure of the Civil Protection and the Province of Ancona, with the participation of partners from Bulgaria and Spain and the support of the other provinces of the Region, constitutes real proof of how much can actually be achieved within the more extensive "Smart Cities" project.

Gian Mario Spacca
President of the Marche Region

CARLA VIRILI

A public administrator must be inspired by many principles: he or she must work to meet the needs of citizens, through the specificities of his or her appointment, while implementing useful projects and pursuing innovation with a view to improving services.

As is often the case, results do not always meet expectations, but I can affirm that in my experience as councillor for Civil Protection and Road Networks of the Province of Ancona, the GOES Project has indeed met such expectations in a very satisfactory manner.

The stimulus came from a European call for the submission of funding requests, offering the opportunity to finance the creation of Civil Protection systems. I saw this as a useful opportunity to increase safety for citizens and operators within the road network.

There were various reasons for this assessment: firstly, the importance of the so-called minor road network in the execution of daily activities; furthermore, the realisation that communication is scarce on the minor road network and lastly, an awareness of the fact that timely communication relating to an accidental event eliminates the risk of it being transformed into a civil protection event.

The results attained are tangible: organisations can now avail of devices usable by road operators in a simple and effective manner. Another effect was attained: that given by the methodological approach within a public body. Public bodies are often criticised for failing to take action, for their inability to access international funding and their lack of commitment and wastefulness with resources. I am proud to say that constant efforts were made to ensure the use of the resources available in an innovative and cautious manner. Operators also had the opportunity to increase their professionalism, acquiring further competences, abilities and knowledge. On my part therefore, I feel that I have a duty, and take great pleasure in thanking all those who believed in and worked towards the success of this project.

Carla Virili
Councillor for Civil Protection of the Province of Ancona up to 31/5/2012
and member of the GOES Steering Committee

1. INTRODUCTION

The "minor road network" is used by the majority of citizens for daily movements.
Nevertheless, while it is easy to access daily information on the practicability of the main roads, it is much more difficult to obtain information on the minor road network and when available, such information is more fragmented.
Yet practicability issues involving these roads, due to snow, ice, landslides, floods, accidents etc… may occasionally transform into civil protection issues.
From this premise came the inspiration to develop a project that might enable the creation of a standardised and automated system to improve the quantity, quality and speed of information, offering useful data for commuters and citizens as end users of the road network. The consequence is an improved road practicability and safety.
The GOES project is financed by the ECHO General Management – Humanitarian Aid and Civil Protection. It is the fruit of the active collaboration of six European institutions: the Province of Ancona as lead partner, the Marche Region, the Local Police of Valencia (ES), the Fundación Comunidad Valenciana – Región Europea (ES), the Municipality of Sofia and the IITC Technological Institute – BAS of Sofia (BL). Despite the exit of the FCVRE partner in December 2011, after a fruitful and shared start-up, the partnership has proven cohesive and determined to proceed on the journey undertaken, in order to attain the project objectives. This is also thanks to the fact that it is a close and well-balanced partnership (six partners), both from the point of view of competences and roles assigned, and the homogeneousness of the territories that are the object of experimentation, in terms of squared kilometres and population density. The solidity of the partnership was also facilitated by the fact that two of the partners (the Marche Region and IITC BAS) had already successfully collaborated on a previous European project financed by DG ECHO. This experience had a positive influence on the technical content management and on relational, administrative and financing aspects.
During the development of the project a decision was made to reinforce the role of citizens, who were no longer viewed as simple users of the information, but who may now also actively partecipate in the data collection phase, using their mobile phones or computers to provide information regarding problems encountered within the road network and general civil protection issues.
Therefore, a decision was made to differentiate the system into two versions, "GOES A" destined to receive information from all possible users and "GOES B", specifically destined to receive information from qualified road operators.
The experimentation of the system within the regional territory was preceded by information/training activity for the road operators of the five Provinces of the Marche and the operations rooms of the Marche Region. The GOES system was also illustrated to the Local authorities whose responsibility is to oversee public safety and the road practicability network (Prefect's Office, Traffic Police, Fire Brigade etc…).
The IT system developed within the GOES project is a valid tool for signalling emergencies and dangerous situations pertaining to events occurring within the secondary road network. The architecture developed for the GOES software may potentially be used to combine not only important reporting activity for the civil protection, relating to road practicability, but also indications relating to other types of risk, for example river overflows, landslides, coastal erosion, buildings in danger, poor maintenance of pedestrian zones, industrial accidents, anthropic risks and the effects of climate change. In particular, the partners of the GOES project are assessing the possibility of developing a proposal to extend the application of systems A and B to other contexts.
It is important to stress that the aims of the GOES project respond to the objectives of smart, sustainable and inclusive growth set in the Europe 2020 Agenda, on which European institutions are building the actions of the next programming period 2014-2020. In fact, the GOES objectives allow to:

1 improve access to information and communication technologies as well as their use and quality;

2 promote adaptation to climate change, prevention and risk management;

3 protect the environment and promote the efficient use of resources;

4 promote sustainable transport systems and eliminate obstructions in the main network infrastructures;

5 strengthen the capacities of institutions andpromote efficient public administration.

GOES

THE PROJECT

3. TECHNICAL DESCRIPTION

One of the main artefacts of the GOES project is the IT system created to monitor the practicability of secondary road networks. This software system was created and is applied within the territories of the project's institutional partners. The software enables the management and monitoring of information on secondary road practicability through web applications, hand-held computers and smart phone devices.

The data collection and transmission system is based on specific procedures for the various territories that are the object of experimentation: the Marche Region in Italy, the city of Valencia in Spain and Sofia in Bulgaria. The specificity of such procedures is based on the different characteristics of the territories considered and the varying management requirements of the road network, in which there are different administrations and organisations having various duties and aims in each nation. The software package created was studied to ensure flexibility and adaptability to various present and future needs within all territories. Nevertheless, it preserves the ability to harmonise procedures, structures and formats of data in such a way as to enable a continuous exchange of feedback and experiences between the partners involved, within the framework of continuous evolution and improvement of the system.

In short, upon the occurrence of a disastrous event that impacts road practicability, the system allows road operators, or even simple citizens to use a smart-phone, PC or hand-held computer to transmit geo-referenced information to a server that in turn enables archiving and consultation of such information, even in real time. The operating rooms qualified to view and manage such reports can therefore arrange alternative routes and pass on information to civil protection structures and users.

The system consists of two components:

GOES A: an open system that can be consulted and used by all citizens,

GOES B: an advanced version, destined for operators specifically assigned to manage road practicability within the territories involved.

GOES A enables the management of various types of reporting on road practicability within the territory. Any individual citizen may also forward the reports to the system. Information can be managed thanks to a console equipped with a geographical component that enables visualisation of all signals received on a map.

GOES A users

The generic user

The generic user can report incidents without needing to log in or register. This mode will guarantee speed in the use of the system by citizens, without requiring the installation of applications (APPS) or other software on their smart-phones and PCs. Users can simply access any browser and fill in a simple form, forwarding the essential information pertaining to the event to be reported.

After connecting to the project's homepage **goes.regione.marche.it/goesan**, as shown in Figure 1, by clicking on "Send Report", the user can fill in the on-line form as shown in Figure 2. There are obligatory fields in the form, such as the "Report" field, which the user must use to indicate the type of incident to be reported, choosing from among those proposed in the drop-down menu, and where necessary, adding a brief description in the relative field.

figure 1 *Access to the GOES A system*

Information regarding the geographical position of the incident being reported may be inserted by including the address of the site in question, including the Municipality, Street and possibly the street number, nevertheless, it is possible to indicate the site directly on the map, using the specific geo-referencing tool.

The system offers two possibilities for geo-referencing (that is,

1 the indication of the site by pointing it out directly on the map): The use of the Latitude and Longitude geographical co-ordinates (if the user is in possession of them) of the position in

2 which the user is

The use of automatic geo-localisation, through the integrated GPS receiver present in the most common smart-phones.

The form filling section of the incident reporting process ends when the "Save" key is pressed, and the information is then dispatched to the Server. The user may even attach one or more photographs to the form sent by selecting this option

figure 2
Example of on-line reporting form

from among those available on his/her smart-phone.

Administrator

Apart from inserting incident reports and accessing the management console, the administrator may also manage the operator profiles, through the administrator panel and address book.

Operator user

The operator user is a registered user, in possession of a username and password, he/she must use these credentials to log into the system when reporting an incident.

Operation room operator

The operation room operator is a registered user whose main duty is to manage report forms, but he/she may also report on road practicability issues.

figure 3 *Access to reserved area*

figure 4 *Incident report management console*

Management console

The incident report management console has **three sections**.

In the section on the left of the screen we have a list of possible incidents, the panel that allows information received to be searched and filtered, and below, the "View" panel, through which it is possible to activate a view of the road and to print a map extract.

The central section contains a map, while on the right of the screen there is a panel for managing the contents of the map and therefore the key to be used to illustrate incidents on the map.

figure 5 *Example of incident report form*

GOES B is a system studied to manage and monitor information on secondary road practicability, through Web applications and hand-held computers. The B system is professional version of the A system and may be used by road practicability operators in the province of the Marche, to re-engineer their work with technologically advanced systems.

The "core" of the system consists of a Web application, housed in the Marche Region's Web Server. This application enables the management of various types of forms arriving from hand-held computers or desktop PCs and allows them to be made available online through a management console.

The GOES B system works through two operational environments: the Web environment and the hand-held computer environment. The two environments share the same application level, which is created through Web Services, which deals with managing communication and data transferral in a manner that is independent from the device using the system.

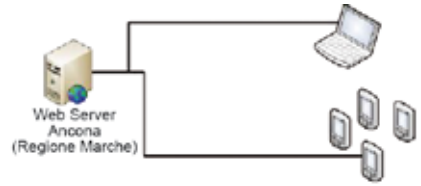


figure 6 *Architecture of the GOES B system*

figure 7 *GIS GT01 Mobile*

Mobile environment of system B

The hand held mobile device selected by the Province of Ancona is the GIS GT 01 Mobile shown in Figure 6Figure 6. The device has two specific software packages installed on it: HMMS – Helix Mobile Mapping System – with the "GOES Mobile" Module and the Navit hand held computer navigation software package, with maps of the area involved.

HMMS Mobile makes the SIT information available on the mobile device. HMMS Mobile is used for: uploading information from maps to the device; carrying out updating and data verification activities through the mobile device; launching the GOES Mobile application; transmitting the data to the web server. The various functions available enable easy navigation of the uploaded maps, including those localised through GPS.

The "GOES Mobile" Module is the hand-held computer application that enables three different types of forms to be filled out on site, to report on various problems regarding road practicability. This device also allows high-resolution photographs to be taken and transmits all this data to the central server. The software application was developed by Helix S.R.L. and tailored to meet the needs of the Marche Region's territory, with a significant collection and analysis of requirements, carried out with all the stakeholders

figure 8 *Access to the GOES Mobile system*

To the Mobile system comes about through a window, shown in Figure 8, where a user ID is requested, which associates the user with a central working team.

involved in the secondary road network practicability management issue.

The user can choose whether he/she is working in "ordinary" activity mode or in "on call" mode.

nce the user has been identified, the application starts and proposes a window for the selection of the work area in which to operate, as shown in Figur

figure 9
Start window

figure 10
Example of map in HMMS GOES Mobile

Figure 10 shows an example of a map with certain raster informative levels (orthophotomap) and vectorials (limits of areas).

In the lower portion of the window there is a toolbar of working tools, the last icon on the right is dedicated specifically to certain GOES procedures. Among these there is one to activate communication with the operational centre and one for geo-localisation .

The "GOES Mobile" report forms

figure 11 *Form M1 - Road accident report*

Form M1 road accident report

Form M1 is used to report road accidents occurring on the provincial road network. The form consists of a general section, see Figure 11, and sub-sections

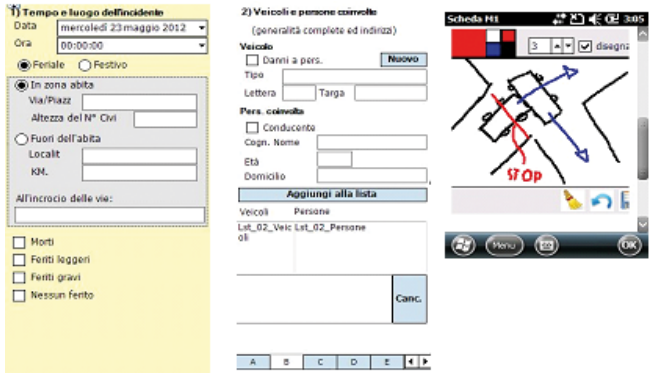


figure 12 *Some of the sub-sections of Form M*

(A, B, C, D, E, F, G). The procedure supports the user in filling out the form.

Form M2 on-call intervention

Form M2 may be filled in during the on-call shift as it is dedicated specifically to the description of the intervention carried out during the on-call shift hours.

The form consists of a general section and a section relative to employees called upon, who intervened or did not intervene on site (Figure 13).

The type of incident report may be any one of the following:

1. Road accident
2. Fallen trees / branches
3. Landslide - earth slide
4. Snow - ice
5. Presence of mud on road
6. Road flooded
7. Presence of material/animal/substance on the road
8. General problem on the road surface

figure 13
Form M2 – General section and interventions section

Form M3 may be filled in during the surveillance staff member's ordinary shift.

The form (Figure 14) consists of a single section, and unlike the other two, it does not always have a territorial correspondence (geo-referencing – special note).

In the "type of note" it is possible

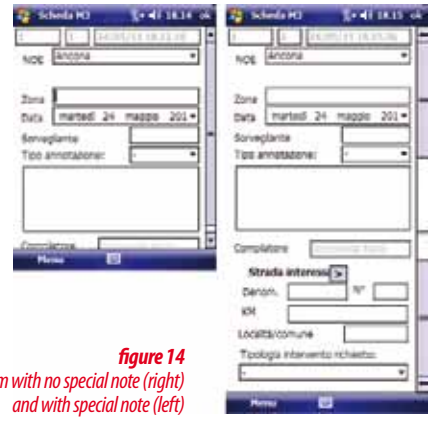


figure 14
Form M3 - Form with no special note (right) and with special note (left)

to choose between:

Road accident, Ordinary intervention carried out, Special and Companies operating on the road or fixture.

If the report is a "Special note" it will have territorial correspondence.

Web environment

By way of support to the management, viewing and analysis of the information acquired with hand-held computers, a web application has been created which is structured according to the following modules: Management of operators and teams; Management of Forms M1, M2, M3 and M4; Monitoring and Intervention System; Mapping.

The Web Application is implemented on an OpenLayer platform and enables the visualisation of WMS maps on maps and those provided by On-Line providers such as Open Street Map and SuperWebGIS for example.

Access to the portal (Figure 15) requires authentication; there are several user profile access levels, which are necessary to manage the organisational processes and structures of the staff members assigned to use such systems.

Users may access form consultation and completion with variable modes, on the basis of: User profile; Shift: ordinary or on-call.

As for system A, system B also foresees the role of an Administrator, who can insert and profile the users who are qualified to use the system.

figure 15 *Access to GOES B portal*

[2] *openlayers.org*

The procedure also enables the

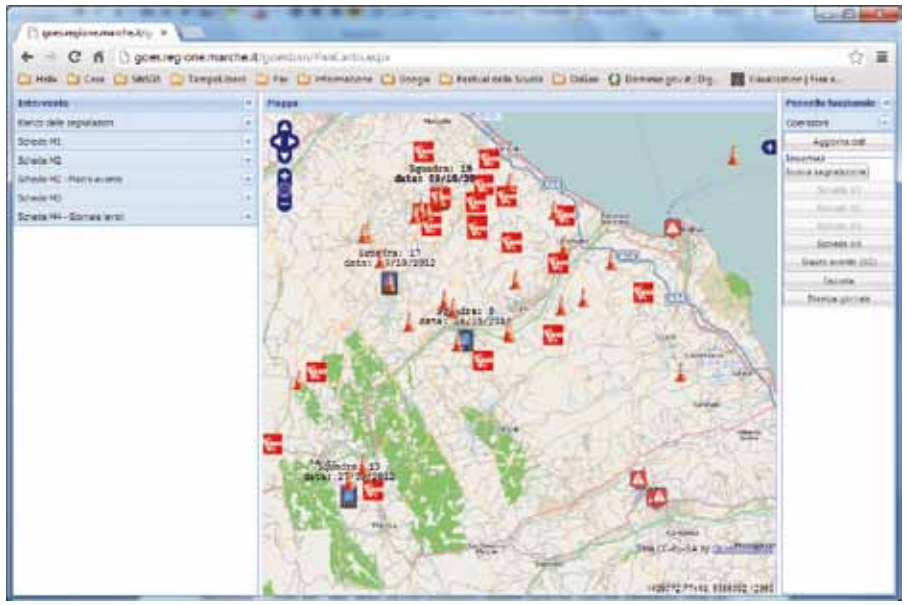


figure 16 GOES B console management system

creation of work groups, or teams, made up of various individuals. The teams in possession of a hand-held device may carry out activities on field while users of the other teams may only interact with the system through the web application.

The management console

The console consists of three sections: Intervention (left hand side of the console); Map and Functional Panel, (right hand side of the console).

In the Intervention section, the reports regarding incidents reported to the central unit may be consulted, along with those pertaining to the forms filled out by operators, which are divided up according to type and that is: M1, M2, M3, as already described for the Mobile environment and M4, which is the "daily work", available only in the Web environment; records may be classified with a simple click on the name of the field on the basis of which the classification needs to be carried out. In the "functional panel" there is also an "operations" menu, which contains the commands for inserting new incidents, new forms, grouping, exportations and printing of the daily work for form M4.

Navigation of the Map is simple and intuitive, with the Zoom and Move tools situated on the

4. GOES WITHIN THE TERRITORY OF THE MARCHE REGION

The project developed in the following phases:

1. Sending of a questionnaire to all the Provinces to reconstruct the current organisation of road practicability services and the management of information regarding possible practicability issues.
2. Planning and creation of system A
3. Beginning of experimentation of system A by the operators from the Civil Protection service of the Province of Ancona.
4. Planning and creation of system B
5. Training of 23 road operators from the road practicability service of the Province of Ancona on system B, these operators were chosen from among director surveyors, team leaders and supervisors:
6. Commencement of experimentation;
7. Implementation of system B with new functions, subsequent to the first experimentation phase
8. Presentation of system A to the Organisations equipped with operations rooms (Police, Carabinieri, Fire Brigade, State Forestry Corps).
9. Presentation of systems A and B to the other Provinces of the Marche region and beginning of experimentation phase within their territories;

During this phase, 4 training sessions were organised at the Integrated Operations Rooms in Ascoli Piceno, Fermo, Macerata and Pesaro with the participation of 37 employees overall, chosen from among the Road Practicability Service and the Civil Protection personnel.

In the light of the success of the experimentation of system B within the territory of the province of Ancona, it is the intention of the Marche Region to promote the application of the software in the remaining provinces, increasing the number of operators having hand-held computers and thus enabling the extension of punctual monitoring of road practicability to the entire regional territory.
The data made available from the systems developed in GOES, appropriately dealt with by the operators of the operational rooms, is qualifying for further smart city applications, which will enable citizens to become more aware of the state of road infrastructures, road networks and road practicability. In particular, the use of the system for civil protection purposes will enable more efficient management with respect to the past, as well as timely communication and co-ordination between the organisations involved in the management of emergencies and events involving secondary road networks.

left hand side of the map; it is possible to choose the cartographic base from among various options (Google roads, Google Satellite, Bing Road, Bing Satellite or OpenStreetMap), proposed in the drop down window located to the right of the map, in the same window we can turn the layers of incidents, forms and team positions (localisation of mobile devices) on or off.

The **GOES INTERMEDIATE MEETING** was held on the **14th and 15th of June 2011 at the Parlamentino room of the Li Madou Building of the Marche Region.**

During the first day dedicated to the planning table (in the photo), the partners assessed the situation, highlighting criticalities and possible solutions and assessed the technical and informative aspects of the project.

Apart from the project staff, the Director of the P.F. Civil Protection General Activities, Dr. Sarda Cammarota, the Director of the Government Department of the Territory Engineer, Roberto Renzi and the councillor for Civil Protection of the Province of Ancona, Carla Virili, also participated.

During the second day dedicated to the creation of public awareness regarding the project and the press conference, the protocol agreement between the Marche Region and the five provinces of the Marche was signed, for the set-up of the project experimentation and implementation procedures. On behalf of the Regional authorities, the councillor for the road network, Luigi Viventi, and the head of the department of Civil Protection of the Marche Region, Roberto Oreficini, were present, for the Province of Ancona, councillor Carla Virili was present, for the Province of Fermo, councillor Adolfo Marinangeli, and for the Province of Pesaro and Urbino, councillor Massimo Galuzzi. The chairman of the Province of Macerata, Antonio Pettinari, elected just a few days after the event, signed the agreement at a later stage. There were numerous interventions by politicians, below we have indicated the main ones.

"The protocol" Viventi said "pursues the same objectives that the Marche Region sets itself in all policies and actions that it takes. The theme of safety, and today we are dealing with **ROAD SAFETY, IS EXTREMELY IMPORTANT.** Dealing with this theme poses the essential problem of the state and conditions of our roads. In Italy we are currently living in a difficult economic and financial context and the commitment on the part of the Regions and local bodies to maintain decent road conditions is becoming more and more arduous. For this reason, the agreement that we are signing today within the framework of this important European project, which is based on the contribution of new technologies, can help us in this direction to contribute to improving the everyday lives of citizens. Citizens travel on secondary roads on a daily basis, and not only on motorways and main roads, said Virili, therefore it is vital to **GUARANTEE CONDITIONS OF SAFETY,** that are on a par with those present on national road networks". "**WE NEED TO MAKE UP FOR LOST TIME FROM THE POINT OF VIEW OF ROAD MAINTENANCE**" said Galuzzi "this project will help **TO GIVE AN INTERNATIONAL DIMENSION TO THIS IMPORTANT THEME**". "The protocol agreement is based on a project that the Civil Protection of the Marche region has been working hard on" said Mariangeli "**MONITORING IS IMPORTANT**, especially within a territory that is structured like ours".

5. GOES WITHIN THE TERRITORY OF VALENCIA

SUMMARY OF GOES ACTIVITIES IN SPAIN

The implementation of the GOES system was performed using logical data integration, by pairing data from GOES And SIRE, which is the current emergency management system in Valencia.

Once integrated into SIRE, to put the GOES system into practice, operators and strategic staff were trained on how it works from a practical point of view.

Having integrated the GOES system, the new model for data transmission allows the citizen or user to register incidents through the GOES website. This information is automatically integrated into the current SIRE platform to make it possible for the operator to deal with the incident.

Once effective operation is confirmed, a simulation takes place, through different use cases, in order to validated successful usability and supposed capabilities in a real-life scenario. An analysis is carried out and critical points are tested in order to make proper amendments.

A critical point of this integration is the process of transferring data between systems. Another critical point is the outside connection of the GOES server for access of citizens. Both points have been fully overcome.

Use and further running of the system beyond the project's lifetime is ensured because it requires very little maintenance and represents a valuable channel for communication by citizens, as well as making the decision making process for managers anytime and anywhere.

It has been proven that GOES improves response times in road emergencies. Availability of information also supports the decision making process for managers so effectiveness is increased and the right decisions are made properly. This means that the emergency service becomes more efficient with the integration of GOES system.

Implementation of GOES Activities in Spain

The implementation of the GOES system in the current system run by the Valencia Local Police has been carried out through specific works on requirements analysis, installation of hardware and integration of systems.

The Valencia Local Police currently have a holistic system operating for managing emergencies and police services (SIRE), so the capabilities of any other new system (like GOES) should be integrated into SIRE in order to ensure proper use in a real-life scenario.

Integration was performed the logical integration of data, by which discharge data from the GOES incident was identified and paired with the data needed for registration in SIRE. The most significant data to be integrated are the arousal, position and listing. As for the transferral of data between systems, a GOES database data-query was chosen every 5 seconds in order to get new incidents and move them to SIRE.

In order to put the GOES system into practice once it is integrated into SIRE, operators and system users must be trained on how it works.

Training is mainly carried out by consultants from Collaborative (which is the company in charge of GOES system integration and SIRE maintenance & development). The selected modality for training is in person.

Training schedule was from 18th to 22nd of February 2013, during 2 hours for 2 hours per diem.

The training schedule contains:

1. Training action 1: What is and how does GOES works.
2. Training action 2: How is GOES integrated with SIRE.
3. Training action 3: How to handle a GOES incident integrated in SIRE.
4. Practice with the platform and its different and new capabilities.

Staff who underwent training have 2 different skills and the training was be addressed and adapted to each of them:

1. Strategic staff from the Systems department.
2. Strategic operators from the call and management centre.

Training activities were carried out in the IT classroom, as well as in the call and management centre of the headquarters of the Valencia Local Police.

During the course of the training activity, it was noted that the GOES system allows citizens to notify the police headquarters about incidents occurring on public places, but ignores the human damage. So it is not possible to know if incidents entail a risk for human lives, which is a key piece of data when it comes to indicating the priority of the incident. This issue should be made good by the SIRE system so it is not considered as a criticality.

Concerning the data organization and transmission of the previous system, the SIRE system is used to collecting information on incidents involving the local police in Valencia which comes from telephone calls from citizens to 092 or radio calls from police officers, as well as 112 alerts. In the call and management centre, the room operators receive notification of the incidents and verify them in order to discharge them. Then, the resource manager assigns the optimal mobile resource for solving the incident.
For information transmission, TETRA radio (Digital Trunking) is used for sending and receiving information from mobile resources. GPS positioning of the mobile resource, as well as information about the address, type of resource and times, are transmitted through SDS messages on the Tetra radio.

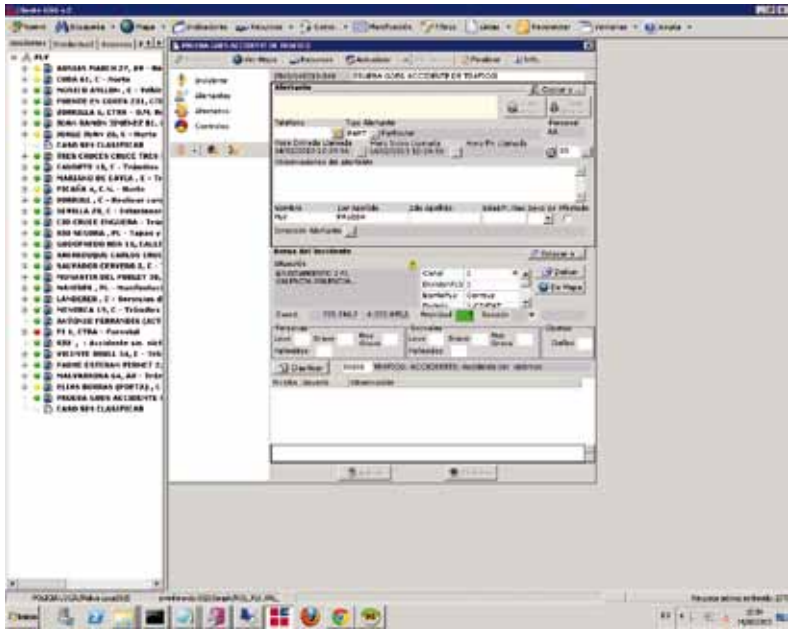


figure 1

After having integrated the GOES system, the new model for data transmission allows the citizen or user to register incidents through the GOES website. This information is automatically integrated in the current SIRE platform to make it possible for the operator to deal with the incident in the same way as other one, but noting that this incident comes from GOES system.

For validating and assessing the correct operation of the system, the Valencia Local Police proceeded as follows:

- A registered user is signed up.
- The testing incident is discharged through the mobile device (iphone, for instance) of a registered user from the road.
- The call and management centre is warned about the registering of a testing incident to be managed by them.
- Verification takes place to ensure that all information to be transferred between GOES And SIRE has been successfully transferred.
- Verification takes place to ensure that incidents can be correctly watched through mobile devices and platform.
- Queries through web or mobile device are made in order to check they work properly.

Once the proper operation is confirmed, a simulation through different use cases can be set up:

1. The scenario for use case No1 is a road traffic accident with injuries at San Vicente Martir Street No 16, at the corner with Maria Cristina Street (city centre). In this case, several citizens send reports though their mobile devices, accessing the GOES site. Furthermore, a registered user also reported the incident through an iphone. Then, the corret registration of the incidents in SIRE is checked and confirmed in order to manage the incident and send the right resources to solve it. Once discharged, warning shoes that these have reached the SIRE system and that the incident is managed by the system and sent to the best resource for the best resolution.

2. Use case No2 has the same structure and steps, but the incident is not an accident but the breakdown of some traffic lights in the same place.

figure 2 First scenary

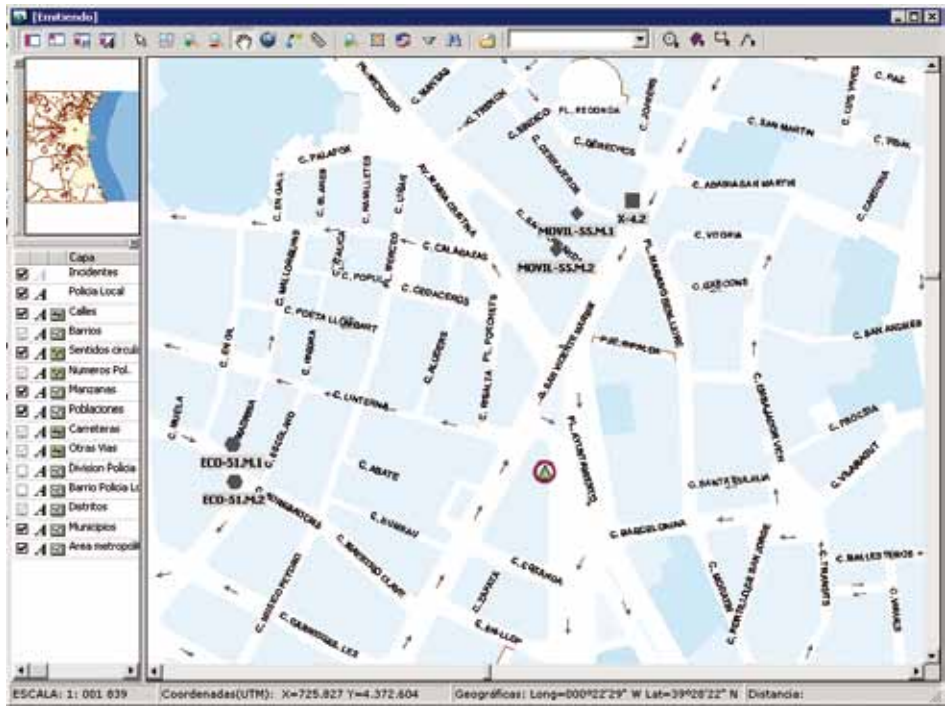


figure 3 Second scenary

Having implemented the simulation cases, an analysis is carried out and critical points should be tested in order to correct the procedure as well as the equipment that has been used.

For testing critical points a battery load test is carried out in GOES, as well as a database test in SIRE. Afterwards, a check is carried out to ensure that the integration of data is perfect by analysing the registers of both databases in order to check that they contain the same records.

In the event of a malfunction, a review of the integration process is carried out. The objective is to find the mistake and correct it. After that, the process of integration is repeated and finally correct operation of the same is validate.

The description and awareness of critical points is also a key issue because the assessment and proper operation of the system depends on them.

A critical point of this integration is the process of transferring data between systems. The SIRE system has been working successfully for years in the Valencia Local Police so it has been tested succently. A check is performed to ensure that integration achieves the full capabilities of GOES And respects the operation of SIRE at the same time.

Another critical point is the outside connection of the GOES server for the access of citizens. It should be always fast and stable in such a way that citizens can register incidents quickly.
After having checked and corrected this, the integrated system starts the implementation process.

Once the system is tested and operators are trained, the integrated GOES system is moved to production servers. The change from testing to production is very simple and transparent to users, so there are no significant problems.

Exploitation and further running of the system beyond the project's lifetime is ensured.

The GOES system is very useful for integrating citizens in the processes of early warning of incident. Nowadays most people have mobile devices and smart phones that allow them immediate access to the GOES platform.
It represents a valuable channel for communication from citizens. Besides, managers can monitor incidents on the road in real time and make the right decisions anytime and anywhere. The ability to gain information in real time on the evolution of the emergency or incident is certainly another added value of the integrated system. Therefore we think that the system is very useful for successfully dealing with incidents on the road.

On the other hand, the system requires very little maintenance since much of the subsequent management is performed by the SIRE system,the financial investiment is sustainable and will not be an impediment for using GOES in operations beyond the lifetime of the EU funding.

6.GOES WITHIN THE TERRITORY OF SOFIA

The Institute of Information and Communication Technologies – Bulgarian Academy of Sciences (IICT-BAS) plays a leading role in the ICT sector in Bulgaria. As a proposal, the GOES project as a proposal has foreseen extremely very well organized international cooperation, with representatives from Italy and Spain along with the municipality of Sofia as the Bulgarian test area, where IICT-BAS was mainly responsible for the implementation of a web based system for collecting, sorting and transmitting data about road infrastructure damages in real time. This particular software was needed for the municipality of Sofia, because it is the one of the oldest cities in Europe and the largest city of the Republic of Bulgaria. The municipality has recently experienced a boost in the city's economy and population, which has caused extensive environmental, traffic and transport issues that the responsible authorities have been trying to solve over the last few years. Sofia's transportation system is a major part of the national transport system, which has three Trans-European Transport Corridors (4, 8 and 10) crossing the city. Public transport is well developed, reliable and important to the city's economy; it is provided by means of underground trains, buses, trams and electric buses. Video surveillance is developed throughout the municipal territory, but the operational teams on the field still use radiotelephones and paper documentation to report any criticalities within the road infrastructure. That's why the GOES system software has been extremely well implemented in the everyday work of the municipal Directorate - Defence and Civil Mobilization and Crisis Management, which is responsible for crisis management in disaster situations; Sofia's Municipality Disaster Protection Plan develops measures for risk prevention, adequate and effective management in case of critical events involving the municipal population. The GOES software has been installed, tested and launched for operational use by the operational teams on the field and the coordination room in the responsible directorate. On 27.12.2012 the official presentation of the GOES software, with the operational teams, was reported on the central news on channel BTV.

IMPLEMENTATION OF THE GOES ACTIVITIES IN BULGARIA

According to the Data collected by every test case area within the framework of GOES project [1,2] a common vision for the system design has been adopted and implemented, with a view to sharing information on some issues, relating to traffic management in the municipality of Sofia. The system enables interaction between mobile groups on the roads and so-called mobile devices such as PDAs or tablets, and a Server based environment, in order to exchange data via the web application and support the everyday work of the responsible authorities. This was developed with various services available as open source, including the communication, management and publication of information in a geographic context.

Helix LTD developed the software basis and IICT-BAS adapted and modified it according to the needs of the municipality of Sofia.

The system architecture includes OpenLayers as a free released JavaScript library, which is operated with FreeBSD, allowing the inclusion of a map in a web page. The platform is used so widely around the world and among the projects that we can cite the OpenStreetMap project http://www.openstreetmap.org/ as a famous reference or the crowd mapping Ushahidi project http://ushahidi.com/products/crowdmap as relevant ones.

The base layer is the active background graphics used in the map. It can set only the basic level and will always appear below the other layers. The base rate also sets the active system map coordinates and the zoom levels availability.

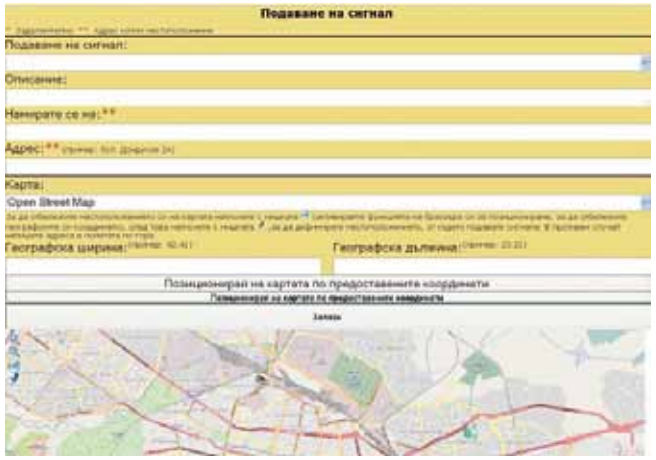
The non Base Layers can be stacked to other levels that can come from different data sources and can be viewed independently from each other. The sources can be: raster layers such as – Google, Image, KaMap, KaMapCache, MapGuide, MapServer, MultiMap, VirtualWorld, Yahoo and others, and vector layers like – GML, Boxes, PointTrack, GeoRSS, Markers, Vector, WFS.

The software has a main page through which the users can submit an emergency case, as shown in figure 1:

After the user enters the main menu, his or her e-mail and password are requested by the system for authentication, as shown in figure 2:

figure 1

figure 2



After this, the user can enter into the data collection page and report the problem on the road infrastructure, as shown in figure 3.

figure 3

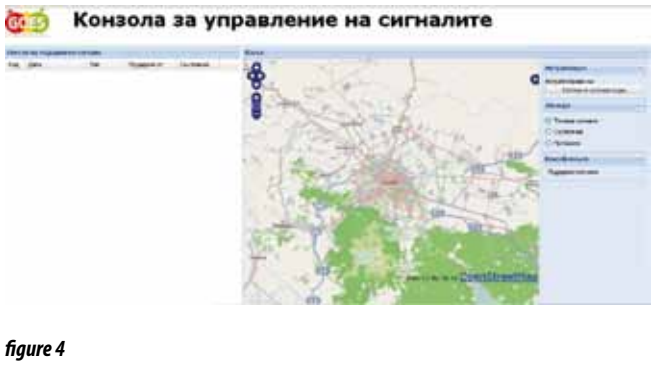


figure 4

The operational room has a main console where all declared cases are listed and operational teams are responsible for solving the problems according to the priorities set in advance by the operative group manager. Figure 4 represents the view of the operational room's visual tool.

Changes to the GOES project base software carried out by the IICT-BAS team

Changes to the GOES project can be basically summarized in the following change log:

DB changes - database create script:

- Changed PWD column in sa_utente table to varchar (32) since MD5 has length 32.
- Changed default password for admin to MD5 equivalent

Code changes:

- Added ForgottenPassword.aspx - user interface for sending a password reset to the specified email of the user.
- Added ChangePassword.aspx - user interface for changing the password once the user has logged in.
- Changed all password creation and verification to use MD5 encoding. This means that passwords are stored as MD5 in DB and are checked in the server code as MD5 strings.
- Successful logging through LogInA.asp creates a session cookie in ASP.NET as well.
- Web services in ASP.NET that manage signals are now Session enabled.
- Web services in ASP.NET that manage signals are authenticated against anonymous usage, so that it is impossible to delete anything unless a user has logged in.
- Prevent SQL Injection in LogInA.asp through the TxtMail input field.
- Map control in the InserimentoB.asp and Inserimento.asp now updates the longitude/latitude controls accordingly, directly on the client-side through JS

These changes address various kinds of issues, falling into different categories - security, privacy, better UX, etc.

The changes to the database are a direct result of the changes in the main part of the web application. They are necessary requirements to ensure the correct functionality of user password storage and changing.

We will try to go through every change, describing why it was necessary, what was intended by altering the behaviour of the application, what issue was tackled and how it was accomplished. These changes do not aim to represent the best practices in the web nowadays, but rather, to prevent certain security and privacy issues and lastly, to provide a more streamlined user-experience for those using the system. At the end of the day, this is the ultimate goal.

Forgotten password and change password pages

The GOES system needed to provide a mechanism to users to change their password, so that they can make changes to their own passwords. They were provided with a computer generated random string that cannot be easily memorized and thus may very well result ins a note next to the operator's monitor, that may be easy for the other people in the room to copy. Furthermore, there is another security implication - it is a good practice to frequently change one's password, thus limiting the options to brut-forcing guessing it.

For the reasons outlined above, we decided that it would be best if the user has the option to change his or hert own password to something they can feel comfortable with. For that reason, we implemented the following interface (fig.5), implemented into basic structure of the web page.

figure 5

Once the user has been authenticated, she/he can go to the respective page to change his/her password. There, the new password should be entered twice, thus making sure the entered string is the one intended by the user.
The other case – in the event that the user forgets her/his password, he/she is still covered since this is a very common scenario. The idea is that if the user cannot log in as they don't know their own password, they are given the option of obtaining a new, randomly-generated password that they can use to enter the system. This password is emailed to the address they have entered in the provided web page interface (fig.6):

figure 6

That way, they should log into their mail account, get their new password and use it to enter the system. At this stage it is highly advisable, but not necessary, for them to change the password they received with a one that they feel more comfortable with.

Storing passwords in MD5 string format

Passwords are very sensitive information and therefore they should be treated as such. Keeping the password in plain text is very dangerous, both from privacy and security standpoints. Having the password in a readable form may result in unauthorized usage of other users' credentials. For more information on that matter, the reader is advised to visit the following web site: http://www.plaintextoffenders.com/.
Bearing in mind the security implications of storing a password in plain-text, a decision was made to use MD5 to store them. MD5 is a cryptographic function that produces a hash value with a 128 bit length. By using this method, every string is crunched down to 32 hexadecimal integers. Thus the password field in the database was changed so that now it takes 32 characters, which is the length of a single MD5 encoding. In the system itself, a helper method was developed that converted any input string into an MD5 string. Using this helper method, the newly created password or the changed password was stored in the database for the respective user. Furthermore, when a user is in the process of logging in, the input password was converted to MD5 and was compared to the respective record from the database. This resulted in better security and improved management of user information.
Currently, only the user knows her/his password and there is no way for any individual with access to the database, be they authorized or unauthorized, to read or reproduce the password from the DB records.

Login in both Classic ASP and ASP.NET - crossing the technological boundaries of the application

The GOES system is based on various technologies that tend to complement each other. On the server-side there are modules created using the mature framework of classic ASP and others based on the ASP.NET framework. Since they are very different in their nature, sometimes it is difficult to manage them together.

The login process raised such an issue. As the user logs in once, she/he could do this providing either of the frameworks, but not both of them at the same time. The login page was created using the classic ASP framework. To tackle this obstacle, without forcing the user to login twice or without changing the user-experience in any way, the following routine was developed. Once the user enters their respective credentials, the data is first sent to a specifically created ASP.NET page using AJAX technology to authenticate that user. If that login is successful, then the HTML form is submitted back to the classic ASP module for authenticating there. Otherwise, the user is notified of the unsuccessful attempt and is asked to try again.
As a result of this, session cookies are created in both frameworks, storing the respective user data and keeping the user authenticated flag raised.

Authenticated web services

The previously described change was a very vital step towards the following important improvement to the security of the system - the execution of web services. The web services part of the GOES system was created to manage reports sent by citizens. The reports can be listed, changed and even deleted. However there was no limitation to who calls these services. This means that any anonymous user can do any of the calls mentioned above.
In order to prevent the scenario whereby every web service method was limited to being used by authenticated users only. Thus, once the user was authenticated, she/he was authorized to useing these methods. The limitation can go further, specifying which users manage reports, but that will require further changes to the implementation.

Preventing SQL Injection

SQL Injection is a very common security attack. It aims to compromise the integrity of the relational database backend, which is the case with the GOES system. The attack takes advantage of the implemented SQL queries and the most common symptom is concatenating user input without evaluating or validating it. If the user input starts with a semi-colon, which means end of SQL statement, then any SQL command can be used either to select sensible data, or to modify or delete content. In the case of the GOES system, the Login page was prone to such attacks, where the username was directly concatenated in the SQL query for checking if that user exists. A method was implemented that sanitized the input to be compliant with SQL syntax in such a way that it does not interfere with the correct execution of the program. This resulted in special characters like new line, single and double quotes and other characters to be escaped. SQL injection is not possible with the ASP.NET web service methods, since the content that is part of the SQL query is converted to an integer and if that does not happen, an exception is thrown that prevents further execution of the incorrect user input.

Client-side improvements in the UI

Along with the server-side improvements and security fixes, the client-side of the application needed attention

as well. The form for reporting new events in the field to the system needed a UI boost by providing a way for the latitude/longitude fields to get populated by interacting with the map control.
The map control, based on the OpenLayers framework, exposes various event handling to happen. That way when the marker for setting the reported event's location was put on the map, an event was dispatched. Handling it we were able to extract the geographical location of the marker on the map and populate that data into the HTML input fields through JavaScript.
Furthermore, the whole UI had to be translated (localized) to Bulgarian. Although there were mechanisms that attempted to stream-line that process, there were quite a few places, where this was not possible. Tracking down these changes required extensive browsing through every layer of the application - from pure HTML, through JavaScript controls, to backend logic.

7.LESSONS LEARNT

The G.O.E.S project substantially met its initial objectives concerning the creation of a standardised computerised network, enabling the collection of all data influencing road practicability conditions and emergency situations, and the transmission of such data to the operations rooms of the civil protection.
From this point of view expectations were indeed exceeded, with the creation of a system that is usable by all partners to gather and file away all data on the ordinary management of roads in a geo-referenced database.
On the other hand, it has proven more difficult than expected to enable road operators to use the system created on a daily basis, replacing the older and more consolidated working methods and thus building a standardised method for the transmission of data gathered to potentially interested bodies (police force having operations rooms, local public transport companies etc…).
The reason for this is mainly due to the difficulty encountered in fully involving such a wide group of users from different organisations and administrations from the initial development phases of the project, given that they all have their own hierarchical organisations, customs and working methods that are difficult to change. The creation of a single software package was occasionally perceived not as an opportunity to improve services to citizens, but rather, as an external interference in the normal working routine of already structured organisational contexts. For this reason, the information and training activities for the adoption of the GOES system went on longer than the natural expiry date of the project.
On the other hand, the definition of a manner in which citizens could become protagonists of the system and authors of reports was a source of debate during the course of the project experience. In this case, awareness of the importance of the role potentially assigned to citizens in enabling them to report on incidents was accompanied by the need to structure a system in which the "truthfulness" of each report might be traceable, certain and verifiable. This required the creation of differentiated profiles, all of which are registered and accredited during the entry phase of the software use, corresponding to roles and degrees of accessibility for the management of different systems (administrator, operation room operator and user operator) so as to increase the reliability level of reports and allow operators to verify them in the operating room.
Lastly, the creation of the GOES project was an important opportunity for confrontation between European territories having the same characteristics, as far as geographical extension and population is concerned, although differing from the point of view of their cultural approach in the management of the territory and emergency situations. The possibility of collaboration in an international context proved that common needs can lead to the creation of valid solutions for all parties, as long as they are capable of guaranteeing a certain level of transferability, inter-operability and adaptability to different technological, organisational and structural contexts.

ANCONA

Within the Province of Ancona and the entire territory of the Marche Region, through the GOES project, the expertise and qualification of the Civil Protection system was able to verify the potential of technology supporting the emergency

response capacity and the operators' daily work. Moving within a connected and inter-related world and availing of a software package that allows information to be transmitted quickly on problems created by calamities and sudden and unforeseeable emergency situations enables a reduction in response times and optimisation in the organisation of interventions and resources.

Furthermore, the possibility of being able to avail of a further specific aspect of the system (the so-called system "B") enabled us to introduce operators on the road network to innovation in daily work processes requiring levels of adaptability and flexibility that are not always simple to obtain. The response and awareness shown by the operators was admirable, and they will continue to undergo training on the use of the system in future.

SOFIA

In the Municipality of Sofia (SM) an opportunity has been created for reporting problems on the roads via the Internet. SM has opened access to web applications with GIS based solutions where, in future, operational teams and citizens can alert the responsible authorities directly, when something needs attention rapidly. This web application may be used on all Internet compatible devices (desktop computers, palmtops, pocket pcs, etc) and its implementation in the Sofia-traffic portal may increase interactive cooperation between citizens and the response teams of the Municipality of Sofia.

VALENCIA

In Valencia the integration process has been useful in confirming the transferability of systems. It means that GOES can be deployed without barriers into the system operating for managing emergencies and police services in Valencia. Furthermore, an additional channel for communication by citizens enriches citizen satisfaction while data availability improves efficiency and response on the part of the emergency services.

On the other hand, a rapid response and availing of real time data for decision-making have become the key issues in the improvement of the service.

8.CONCLUSIONS

The GOES project was an important collaboration and know-how exchange experience within a European dimension on common civil protection problems.

There was much reflection on the need to guarantee a rapid response and more incisiveness in interventions in the event of calamities and emergencies within the road network, determined by various causes. This came about in a participative and constructive manner with the definition of the start-out characteristics of the respective systems and thus, the identification of common requirements.

The work carried out by the technological partners, combined with the clearness of mind with which the managers and road network operators from the civil protection team defined the respective organisations and needs, led to the creation of a flexible, interoperable system that is adaptable to various organisational and technological contexts and almost completely open source, thus freely usable by any interested individual.

GOES has shown how technology can support the decision-making mechanism, guaranteeing a more rapid and effective response to emergency situations that are potentially dangerous for citizens, causing human, instrumental and technological resources to converge and become organised in an adequate manner with respect to the problematic situation.

Opening up the system to the direct intervention of the population, which may itself become the author of the reports, constitutes a new and open approach by institutions as regards technology and citizens, who by accessing the system, become an integral part of it. They can therefore intervene in the data transmission process and, as such, influence the rapid and effective response ability to problems pertaining to safety by the institutions. Nevertheless, although aware of the fact that the contribution of citizens is an opportunity, we believed it necessary to define precise methods and filters that might enable verification of the truthfulness and correctness of the data provided, so as to avoid useless alarms and to protect the professionalism and competence of operators.

ANCONA

In the Province of Ancona, the potential seen in the GOES software led to a decision being made to possibly extend the functions of the system, so as to apply it to other fields, such as the surveillance and monitoring of the hydro-geological structure of the territory, the reporting of landslides, and issues relating to the hydrographic network (riverbed obstruction, riverbank landslides, stability of embankments etc…) that may cause the danger of overflowing and flooding, which are more and more frequent in this territory and an evident sign of the climate change underway.

SOFIA

As a test area in Bulgaria for the GOES project software implementation, the Municipality of Sofia has improved its limited opportunities for reporting problems regarding road infrastructure in real time. The new software can be used as basis for future development of a centre where civil citizens, along with operational teams, can play an important role when damages to critical infrastructure is detected. The GOES software will be used in the near future only by authorized operational representatives and the

software will be opened up to civil citizens after some organizational improvements take place and all incoming reports for problem areas will be able to be monitored and repaired on time.

VALENCIA

In Valencia the GOES system has proven to be very useful in involving citizens in the processes of early detection of emergencies relating to road traffic and has helped improve response times in emergencies of this kind.

The availability of information will also support the decision making process for managers so that effectiveness will improve and the right decisions can be made. The final achievement is an obvious benefit for citizens in terms of efficiency and effectiveness of the emergency services. This means that emergency services will become more efficient with the integration of GOES system.

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