Design of an Enhanced Interface for Composition of Alert Messages: Methodology and Results

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ABSTRACT

Alerting the population during crisis using available communication systems can significantly reduce the impact of emergency situations. However, the understanding of the alert and trust by recipients is influenced by the alert message content and style. It is therefore desirable that alert messages are formulated with sufficient information and in a style that eases understanding of the message and fosters trust, so that the recommended protective actions are actually undertaken. Within the EU Alert4All project, an alert message dispatcher is being currently implemented, which disseminates alert messages through multiple communication systems in a harmonized manner, fostering best practices in the formulation of alert messages in a user-friendly manner. The design of the dispatcher features and graphical user interface was supported by a field practitioner workshop with participants from different European countries. This paper describes the workshop methodology, its results and the impact on the message dispatcher design.

Keywords

Alert message, warning, emergency management, crisis, alert library, user interface, practitioner.

INTRODUCTION

Alerting the population in crisis situations can significantly reduce their impact in terms of injuries and losses to life and property. To be effective, alerting systems must be able to deliver the alert messages to the citizens at risk, but this is not sufficient. Upon reception, alert messages must be noticed, understood and trusted by those at risk. The understanding of the alert message and trust by the recipients can be influenced by the alert message content, delivery mode and style. Furthermore, the variety of cultures and languages combined with significant migration and tourism movements make even more complex to effectively inform the (whole of the) population at risk for a given incident in a European context.

The content of alert messages is managed in different ways across European countries: it can be decided on demand, in some cases templates are used or pre-defined messages are applied for cases in which they exist and are applicable. Furthermore, pre-defined messages for a specific area are not necessarily applicable to other areas, and templates used by different authorities do not necessarily match. Best practice-compliant and harmonized procedures to formulate alert messages all over Europe (and even beyond) could significantly help addressing these issues, improving the effectiveness of received alert messages, simplifying cross-border alerting at the recipient dimension. The Alert4All project proposes a harmonized procedure for creating alert messages by using a newly designed alert message dispatcher. The new message dispatcher, the so-called Global Alerting Gateway (GAG), aims at allowing creation of a single message to be distributed through a wide range of communication channels, such as satellite and terrestrial television, Global Navigation Satellite Systems (GNSS) and mobile networks by using an optimized transport protocol. The protocol specification, however, is out of the scope of the present paper. The design of the GAG has been supported by a workshop with a heterogeneous team of field practitioners from different European countries and different administrative responsibilities with the aim to increase the user acceptance and optimization of the functionalities to be implemented. This paper presents the workshop methodology and results and its impact in the design of the alert message dispatcher.

FOSTERING BEST PRACTICES BY THE USE OF ALERT MESSAGE LIBRARIES – THE ALERT4ALL PROJECT APPROACH

In the Alert4All project, the proposed approach to harmonize alert messages is based on a recommended alert message content structure, which is the conclusion of a pre-study on best practices in alerting the population, and on the use of standardized libraries to fill this structure with information. The pre-study on best practices, documented in (Mendes, Ferrer, Ramírez, Max, Hirst, Sautter, Kluckner, Nilsson, Trnka, 2012), provides guidelines for the formulation of alert messages to be effective. In particular, it is recommended that the information elements in Figure 1, which are supported by the Common Alerting Protocol (CAP) (OASIS, 2010), are included in the message. It is intuitive that specifying the hazard type, location at risk and time to onset are essential information for the citizen to understand the situation and specifying protective actions is required to guide citizens. Furthermore, information about the hazard intensity shall provide the citizen with an indication of the level of risk or potential impact, improving the own risk assessment. Informing about the certainty associated to the knowledge on the hazard onset is important to improve trust (Mileti, Sorensen, 1990; Working Group on Natural Disaster Information Systems, 2000), to minimize the long term impact on trust and actual alert impact due to past false alarms. It is also a matter of trust that the citizens can recognize which authority issued the alert message, which could even be endorsed by several authorities (PPW, 2004; Perry, Lindell, Michael, 2007; Mileti et.al., 1990). Specific guidelines related to the alert message style have been also identified in the literature (Working Group on Natural Disaster Information Systems, 2000). According to them, the most important information should be provided using headlines and the use of ambiguous and complex words, expert jargon or complex sentences and misspellings must be avoided.

Figure 1: Alert message content abstraction

It is unrealistic to pre-define an alert message for each possible situation, but it is feasible to envisage a limited (but extendable) dictionary for each information element in **Fehler! Verweisquelle konnte nicht gefunden werden.**. By combining the different values available for each information item, a wide spectrum of alert messages can be created, thus addressing a large set of emergency situations.

We define an alert library as a set of limited (but extendable) dictionaries, each of them covering an information element in Figure 1, i.e. containing the keywords and/or codes applicable to that information element. The library is then stored in a database in the GAG. At the same time, the GAG provides a user-friendly graphical user interface (GUI) that practitioners use to "configure" alert messages by selecting options from drop-down menus that result in the selection of keywords and / or codes from the libraries. Through an intelligent alert message-processing engine that takes into account semantics and syntax rules, the alert message is automatically composed (potentially in any language) in a human-readable format.

The benefits of this approach when addressing mixed crowds together with some examples are discussed in (Párraga Niebla et. al., 2012). By using pre-defined libraries in an automatized system, ambiguities, jargon and typos are avoided, automatized translations become feasible, decision processes to formulate alert messages are dramatically shortened and people at risk can expect the same alert structure everywhere in Europe, improving understanding and trust. However, this goes at the cost of reduced degrees of freedom for the field practitioner when formulating the alert message. Moreover, taking advantage of state-of-the-art processing power and multimedia capabilities at receiver devices, a more advanced concept can be applied, as depicted in **Fehler! Verweisquelle konnte nicht gefunden werden.**, to achieve reduced capacity requirements in communications networks and alert delivery delay. If alert libraries exist, it is possible to transmit only an "encoded" version of the alert message and decode it at the recipient side using a client-based application. Moreover, alert messages can be presented in different modes (text, speech and even video), improving social inclusion. Additionally, this solution opens the door to the use of very low capacity systems to disseminate alert messages without reducing the information content, e.g. using satellite navigation services to embed alert messages (De Cola, Mulero Chaves, Párraga Niebla, 2012).

WORKSHOP WITH FIELD PRACTITIONERS IN THE ALERT4ALL PROJECT

The use of an alert library-based system with GUI to formulate alert messages imposes a change of paradigm for field practitioners that are probably more familiar with less automatized procedures and systems for alerting the

population. Therefore, in order to achieve a user-friendly design of the GAG functionalities and GUI and to improve the acceptance of the concept behind, a workshop with field practitioners from different European countries, authority type and administrative responsibility was organized during the design phase of the Alert4All project[1]. In this workshop, the field practitioners could experience the use of a prototype of the system and its benefits, as well as provide feedback that was used by the development team to complete the GAG design. In total, the Alert4All project has planned four workshops with field practitioners to involve them in the whole engineering process: (i) requirements workshop, (ii) design workshop, (iii) implementation workshop and (iv) final demonstration. The design workshop is addressed in this paper. Participants of the workshop were covering different areas involved in alerting the population (operational responsibility and communication).Civil protection authorities at local, regional and national level; experts in communication towards the citizens and media experts attended the workshop. The participants had different nationalities (Spanish, German, Norwegian, British, and Portuguese) and language skills (at least mother tongue and English). This selection allowed for gathering different opinions involved in alerting the population and fostered debate between the parts, even if the limited amount of participants does not allow getting a statistically meaningful conclusion.

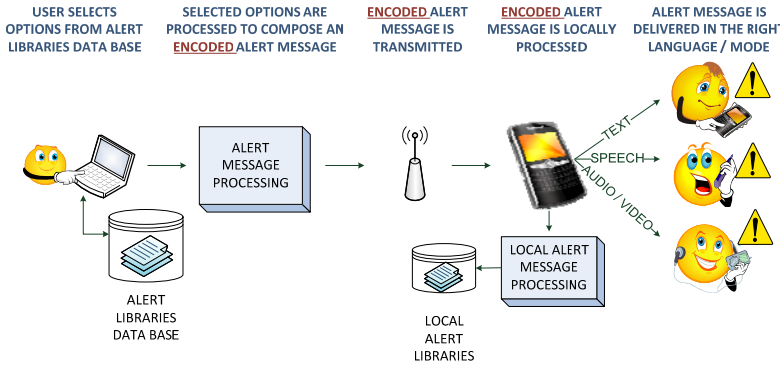

Figure 2: Advanced alert message concept based on alert message libraries

During the workshop, participants experienced two completely different paradigms to compose alert messages: the first, based on composition of the alert message by inserting free text, as in conventional systems (Figure 3) and the second, based on the principles of using pre-defined alert libraries (Figure 4). For this purpose, two prototype GUIs were implemented to manage the alert dissemination system in a fictive scenario consisting of a concatenation of events in short time to add the stress component to the exercise

Figure 3: GUI for composing alert messages using the free-text approach

Apart from experiencing both methodologies (free-text-based and alert library-based), the GUIs were prepared to show the users what is the delay to deliver an alert message using different communication technologies with both approaches: the free-text option was using XML CAP files, while the library-based option was using the Alert4All protocol, which is a lightweight encoding of CAP that can rely on encoding of alert libraries, as

[1] Other aspects of the Alert4All project were also addressed in this workshop. This paper focuses on the GAG only.

documented in (De Cola, et.al., 2012). To deal with multi-language, users were allowed to use online translators in the free-text-based GUI if needed; with the alert-library based option the alert message is re-composed at the recipient side and displayed in the language configured by the recipient automatically (no translator needed).

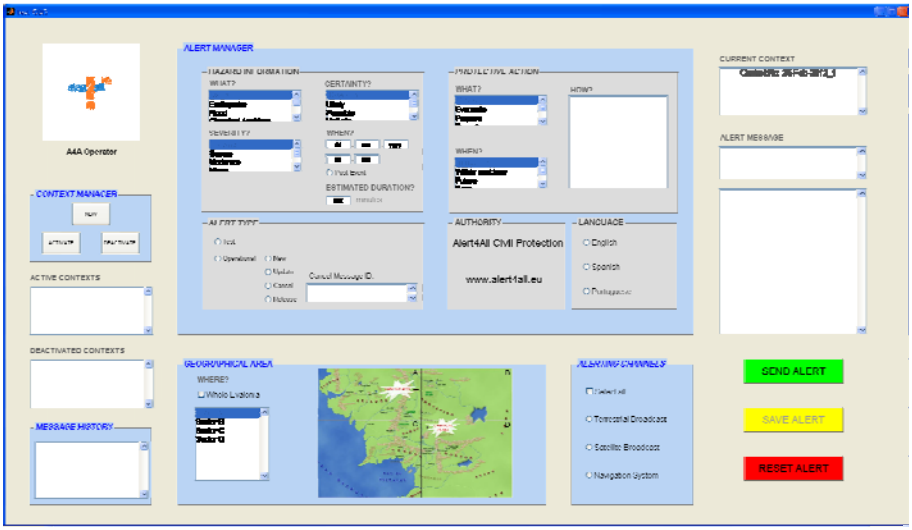

Figure 4: GUI for composing alert messages using the alert library approach

To carry out the exercise, four teams of two members each were set up. During the exercise, the fictive scenario was shown through a presentation that was visible by all participants through a beamer. Approximately every 5 minutes, the beamer was showing an update of the fictive crisis situation to the participants that were warned about the update through a siren. For each of these events, the participants had to decide whether to alert the (fictive) population or not and in case they decided to do it, they had to decide the alert message content and provide it in three languages: English, Spanish and Portuguese (none of the teams were skilled in all three languages: at least one was missing in every team). For the first 3 events, participants were asked to use the text-based GUI; for the last 3 events, participants were asked to apply the alert-library based GUI.

In order to gather feedback, participants were asked to answer a questionnaire. This questionnaire presented the different system requirements to the participants and the approach followed to address them with each version of the GUI. Participants evaluated each approach according to their experience during the exercise and could provide ideas to improve them. Finally, the teams completed a SWOT (Strengths-Weaknesses-Opportunities-Threats) analysis of both GUIs and discussed the results in plenum to achieve the conclusions of the exercise, which are globally presented in the following section. This way, it was possible to identify the better-valued features of each GUI and find the features that were not satisfactorily provided by any of them.

SUMMARY OF EXERCISE RESULTS

With this exercise, the participants experienced several aspects of both approaches to alert the population. When using the free-text based GUI, several undesired effects were revealed: the message content, style and length varied significantly between teams, so that the formulation of the alert message was completely dependent on the expression skills in each team; in some cases, the length of the alert message exceeded by far the capacity of the alert message display window, resulting in a clipping of the alert message and frustrating its legibility. Even if the alert message display window would have been sufficiently large, the length of the message and the amount of included details complicated significantly the understanding of the message. Furthermore, the alert messages were not containing all information items identified in best practices as for Figure 1, showing that best practices are either unknown to the practitioners or not systematically used when free text is applied. Additionally, the challenge to issue the alert messages in three languages was not satisfactorily fulfilled, since online translators were uncomfortable to use and introduced ambiguity in the message. These undesired effects, which are the result of not having a structured procedure for creating alert messages, were solved satisfactorily with the alert-library based GUI, since the generation of alert messages was completely guided: the practitioners were driven to apply best practices by the system. Also the multi-language challenge was successfully fulfilled; the operators only had to configure the alert message and the system automatically created the message in the three requested languages. Even if from the best practice perspective the library-based system outperformed the free-text system, the limitation in the degrees of freedom to formulate alert messages was uncomfortable for the practitioners. In particular, the practitioners had the impression that not all situations can be covered by a fully

automatized system and proposed that at least the option to insert free text at any time should be present in such a system. Taking all these points into account, the preferred solution for the practitioners was to have a library-based concept with the option to add free text to the alert message whenever required, e.g. when the libraries do not contain the right options for a specific crisis. Based on these conclusions, the team tailored the design of the Alert4All protocol to transmit CAP alert messages in a light manner, which allows for enough flexibility to exploit alert libraries without taking any freedom to the user when composing the alert message. Therefore, the graphical user interface for the GAG has been designed according to these principles and documented in (Chagas, Areias, Garcia Monteiro, Mulero Chaves, Kluckner, Sautter, Johansson, Brynielsson, Narganes, 2012).

CONCLUSION

This paper presents the methodology and results of a workshop with field practitioners in the area of alerting the population with the aim at completing the design of the alert message dispatcher proposed in the Alert4All project system (the GAG) to alert the population during crises, which is currently under implementation. The proposed approach introduces a new paradigm to generate alert messages in a fully guided manner, fostering the application of best practices to alert the population by requesting the relevant information fields, relying on pre-stored limited dictionaries for each information field that will allow a completely harmonized approach to alert the population in the long term. The harmonized approach together with the guided application of best practices will contribute to improve the understanding of alert messages and trust, allowing advanced applications for multi-language and multi-modal delivery of alerts. The experience made by the practitioners during the workshop and feedback obtained served the completion of the GAG design, tailored to the end users, improving the system usability and acceptance. In particular, a free-text option feature has been added to relax the limited degrees of freedom in the formulation of alert messages by an automatized system. The GAG is currently under implementation and a third workshop with field practitioners is planned in January 2013 to complete the system.

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