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Flexible Communication Platform for Crisis Management

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***Abstract*—**Topics Disaster and Emergency Management are highly debated among experts. Fast communication will help to deal with emergencies. Problem is with the network connection and data exchange. The paper suggests a solution, which allows possibilities and perspectives of new flexible communication platform to the protection of communication systems for crisis management. This platform is used for everyday communication and communication in crisis situations too.

***Keywords*—**Communication Platform, Crisis Management, Crisis Communication, Information Systems, Interoperability, Security Environment.

I. Introduction

THE paper is focused to the research project with acronym INTROP. In 2012 the Department of Civil Protection acquired a project no. SV12-FEM-K106-05-BAR named „Interoperability Workplaces to Support Teaching of Security Management in a Computer Network" [1] solved in the framework of Specific Research of University of Defence. The project time frame is 2012 to 2014. The project deals with the determination, description, and simulation of communication processes of crisis management with the aim to create a tool enabling high-quality communication and data exchange for the members of crisis staffs, safety councils, and Integrated Rescue System [4], [8].

The objective of this research project is to describe the creation of a flexible communication platform for crisis management order to prepare and train members at national level. Project is aimed at promotion of processes and effective decision-making during the preparing and solution of crisis situations. This tool will enable the preparation to be performed under conditions approximating those of real emergencies and crisis states.

Project is aimed at promotion of processes and effective decision-making during the preparing and solution of crisis situations. The project proposal is to the establishing of such a platform that creates the needed methodical, program and data backgrounds providing suitable communication in the field of crisis management to above mentioned target groups. It equally includes comprehensive training and evaluation of the human factor. This goal is based on detailed analysis of the current state [6], [9]-[11] and also reflects the requirements of experts in the field of emergency management [2], [3], [12].

Paper is divided into two parts. The introduction describes approaches and methods, which have been selected to create the Flexible Communication Platform for Crisis Management [5]. The next part is focused on the current state of communication and information systems for crisis management in Czech Republic. The final part of the paper concentrates on the possibilities of flexible communication platform, computer-aided tools and innovative technologies application for use in crisis situation.

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II. Problem Definition

The paper is focused to the actual problem of communication in crisis situations. Large-scale crisis situations and accident caused by selected hazardous chemical substances and natural disasters are extraordinary event manifested by uncontrolled flows of energy (fire, explosion), leaks of toxic substances and extensive damages [14], [15]. These are partially or totally uncontrollable, time- and space-bounded event which was created or whose inception is imminent and that leads to immediate or delayed serious damage or threat to life and health of people, livestock, environment or damage to property [8].

To solve large-scale emergency, it is appropriate to use the corresponding Emergency or Crisis plan. Another information source is Operational plans at regional level. These specifically include individual emergency plans, which are subdivided into: Regional Emergency Response Plan are processed by Fire fighters in cooperation with the region, all the possible places where accidents can occur mainly anthropogenic action [14], [15]; Internal Emergency Plan are focused on particular facilities or subject, they are processed by the body meeting the requirement of the legislation; External Emergency Plan are focused on particular facilities or subject too, but they are processed by Fire fighters processes [15].

Quick solution to the crisis depends on the timely application of contingency plans and sufficient information about the situation. Preparation and up dating emergency plans are based on Crisis Code (Act No.240/2000 on crisis management) [16], [17]. These plans are under this law is sufficient to deal with most emergencies. There are problems with communication and data exchange crisis staff and participating organizations and persons. These problems do not appear in the planning and testing of crisis management entities and the Integrated Rescue System, but may show up in

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real deployment in large-scale emergencies. In these situations may fail telecommunications networks, electrical power lines and other communication infrastructure that ensures proper transmission of information and data [16]. The majority of these entities are included in critical infrastructure and supposed to work at all times, but the experience of past crisis situations have shown that they are also very vulnerable [8].

III. Approaches and Methods

There are many research institutes dealing with science and research in communication technologies. They toy with the question of the use of common security technologies and other security options that use the principle of COTS (Commercial Off The Shelf) [1] as much as possible. That means the maximal utilization of commercial products and services to create a specific system or technology [9], [13]. An example is the testing workplace. That is implemented with minor changes in specialized classrooms of Department of Civil protection. This can be seen in Fig. 1.



Fig. 1 Specialized Classroom for testing Flexible Communication Platform

In this group of institutions there is the University of Defence too. Its researchers are working on various scientific research projects of military and security character. The basic issue of this article is to protect the communication critical infrastructure. Therefore, the focus is put only on research in security for the protection of elements of crisis communications [8].

One of the goals of the project will be a methodology of communication. The communication will be carried out in the form of the solving of a model crisis situation on simulated area in the scope of three primal problems/tasks - Protection, Communication and Reaction.

The contents of primal problems are as follows:

A. Protection

This problem/task will comprise the complex of activities performed during preparations to emergencies. For the first approach and generalization, the following activities will be performed: to inspect and update Operational plans for emergency, to recognize the formation of emergency, to forestall the emergency by precautions, to reduce the consequences before the emergency.

B. Communication

The aim of this task will be the familiarization with the Operational plans of a crisis situation. This will be achieved partly by proactive measures mentioned in previous paragraph "Protection", partly by reactive measures related to communication and interoperability with stakeholders [9].

The basic questions are:

- who will communicate,
- how will communicate,
- the connection is realizable,
- communication network will be blocked,
- how communication will be stable,
- will be provided all necessary conditions for interoperability?

C. Reaction

The task originates from the need to define the activities in the frame of emergency management. It comprises the reconstitution of affected/damaged communication area into a stabilized level, like the ensuring of basic functions in given area, i.e. properties serving for communication, for data exchange, for interoperability etc. The problem will also comprise not only how to stabilize the area but the creation of conditions for further development of communication security area [13]. The test Specialized Classroom (Fig. 1) is connected to other specialized workplaces, among which a testing and exchange of information and data. These are shown in Fig. 2.



Fig. 2 Other specialized work place for testing Flexible Communication Platform

Individual tasks can be solved separately or complexly as interrelated whole, when all the tasks will be solved in corresponding phases.

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IV. System Development

Nowadays the project is in the phase of "Protection" task analysis. The stage being currently under way solves the analysis of processes used in the above mentioned primal problems and states the rules and communication bonds among the entire subject participating in individual phases of crisis communication. The emphasis is put on a flexible character of communication platform for crisis communication solving in order to enable repeated application of methods and procedures prepared for individual tasks and easy integration of possible expansions.

Suitable types of emergencies, which will be simulated in the area of interest, had to be chosen for the practices implementation. The emergency is defined as a harmful effect of forces and phenomena caused by human activities, by natural actions, and also accidents endangering life, health, property or environment, and requiring rescue and settlement works [14]. Data of statistical monitoring of events, administered by General Management of Fire Rescue Service, will be used for the comparison of the frequencies of emergency occurrence. The primal indicators of the relevancy of emergencies are the statistics providing the frequency of occurrence of given emergency [10].

V. Specialized Workplaces

The Specific Research project Interoperability Workplaces to Support Teaching of Security Management in a Computer Network [1] uses existing structures and systems of communication. The key idea is to connect existing heterogeneous information and communication systems and other relevant organizations in the area of education and crisis management. The main idea of this research is to create a model of the situation and secure remote connections. This connection is mainly used for distance learning, exchange of data and use of all tools interoperability. This would validate all the functionality that may be utilized by the system.

These individual management entities will be able to exchange information, data and experiences. They can use selected simulation programs, information and communication systems of other entities connected to the network. Therefore, this will enable the sharing of information and practical experience across the whole spectrum of management and crisis management [7], [9], [12]. The flexible communication platform to the protection of communication systems for crisis management is implemented at interface with communication among different systems of crisis management entities. This system can be implemented among the various computers, between members of the Crisis Staff, among expert workplaces and among other stakeholders.

This flexible communication platform used to communicate the Internet. Of course, it uses a secure connection via encryption algorithms. Internet is sufficiently expanded in the city of Brno, where doing the research and testing communication platform. Problems arise in areas where there is such an extensive and high-quality connection to the internet. This problem solved itself in the course of the project. There has been a large reduction in prices of mobile operators in the Czech Republic in recent months. This enables the effective use of mobile phones and devices to communicate. Data transfers are relatively cheap and available everywhere. These services can currently available to all people and workplaces that do not have the option of cable-fast connection.

Use the principle of flexible communication platform primarily applies the basic tools for Windows and communication network settings. The method allows the sharing of computers, the computing space and simulation programs for the education and training of other entities registered in this system [12]. Illustrative diagram of flexible communication platform architecture to the protection of communication systems for crisis management can be seen in Fig. 3.

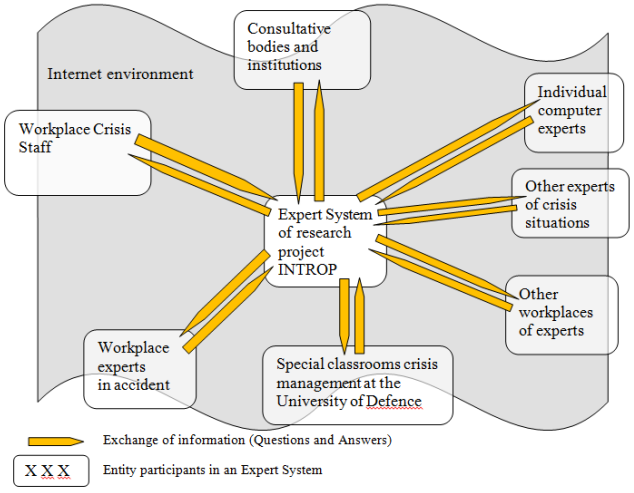


Fig. 3 Scheme communication architecture of Flexible Communication Platform

VI. The Real Testing of Flexible Communication Platform

As already mentioned in the previous chapter, the principle and method of flexible communication platform for crisis communication was first tested in the academic environment. The platform issued to support the Teaching of Security Management in the Department of Civil Protection of University of Defense. Lessons were distance learning and online students were sent video of the presentation, the presentation itself and important data. Tested the continuity communication network with each party gradually and then the overall stability of the platform.

During testing, it is necessary to take into account the fact that throughput communication network is very variable over time. This complicates the stability of information system and the communication between stakeholders must be modified to the actual situation. All the results were recorded and the restrictive conditions for using the flexible communication platforms in real situations were defined. The result was a test environment illustrating the real usage of the information and

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communication system for specialized workplaces outside of crisis situations.

Developing of a network standard for a facility and connecting interface design is a precondition for building effective flexible communication platforms. The result will be Expert system, which will satisfy requirements for the needs of management and executive units of crisis management. This system is designed as an open network to which the verification can be accessed by other users of the environment of crisis management and various experts on the issue of terrorist acts, accidents and natural disasters.

As far as the teaching and practice are concerned, extraordinary events at which the declaration of crisis state is expected are considered relevant. Those events are labelled crisis situations. The crisis situation is such an emergency which can be distorted in the normal activities of communication infrastructure and public administration bodies. To contain these emergencies, certain measures must be taken to maintain the functionality of communications networks and connections.

VII. Conclusion

The main aim of this paper is to describe and implement Flexible Communication Platform for Crisis Management. Finally, it is necessary to say that all computers, software products, information and communication systems represent the function of crisis manager helper in his decision making. All of this is only "lifeless" and "thoughtless" products. The crisis manager is principal, especially his knowledge, abilities and acquirements, and many times his extemporization too.

For increasing the ability to compete of graduates, the forming of interactive teaching environment, in which the simulation of extraordinary situations will be possible, appear to be needed. Thanks to it, the students will be able to solve model situations inspired by past events and gain much needed interconnection between theory and practice already during their studies. Thanks to it, the usage of teaching facility for the preparation and training of the staffs of crisis management bodies and IRS units, as well as the members of companies and institutions crisis staffs can be expected.

At the same time, it should be noted that this solution flexible communication platforms for crisis situation is a compromise in many aspects and it does not fully meet needs of all stakeholders. In addition, relations between the lines of preparation for solution of civilian crisis management and lines of preparation, education and training for management crisis staff have to be considered carefully [6].

The resulting state of flexible communication platform can be recognized as an essential qualitative advance, but it has to be developed henceforth. The communication platform and expert workplace of crisis management belongs among the priority issues and it needs to be contemplated from the national security point of view, as well as the crisis management viewpoint.

The first steps to resolve such issues meet consistently all requirements resulting from the Conception of population protection. It is important to detect system uncertainties and gaps, when an issue emerges, and to formulate all requirements on education and training in this area to be further developed.

Finally, it should be noted that the proposed solution of flexible communication platform is suitable not only for educational purposes, but also for the deployment of real emergency scenarios in the Czech Republic. Thus the defined architecture of communication platform allows reflecting any changes in emergency scenarios more quickly.

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