CRISIS AND DISASTER MANAGEMENT AS A NETWORK-ACTIVITY

Do we have to extend the term "vernetzte Sicherheit" in German speaking countries?

Christian Flachberger[1] and Johannes Prinz[2]

[1] *christian.flachberger@frequentis.com*
Frequentis AG, Innovationsstrasse 1, 1100 Vienna, Austria

[2] *johannes.prinz@frequentis.com*
Frequentis AG, Innovationsstrasse 1, 1100 Vienna, Austria

Abstract

Fundamental changes often are indicated by the emergence of new terms or by a changed usage of existing terms. This paper points out, how the German term "vernetzte Sicherheit" more and more often is used with a new, different meaning and within a new, different context. The paper describes the emerging change behind it towards a networked way of civil crisis & disaster management. The objective of this paper is documenting these emerging new practises and making the new concepts available to a broader community of stakeholders for discussion. Furthermore, it intends to raise awareness for the changed usage of the term "vernetzte Sicherheit" in German speaking countries as a focal point for the dissemination, further development and practical implementation of the ideas behind it.

The paper starts with an identification of the relevant stakeholders and the changes experienced by those stakeholders. These changes drive crisis & disaster management towards a more networked activity supported by electronic systems for information exchange and collaboration. In the following sections examples from concrete research projects on national and European level are given. The experiences suggest how crisis & disaster management as a networked activity can become reality.

The paper concludes with a discussion of the German term "vernetzte Sicherheit", which has initially been coined in the context of civil – military collaboration in armed conflicts [1]. Today, the term is used more and more frequently for a new way of electronically facilitated collaboration between stakeholders involved in a civil disaster relief mission still within one territory. In the last section, three different strands of activities are pointed out which are continuing to establish this paradigm change: policy making and standardisation, focused R&D and stakeholder involvement and awareness raising

1   STAKEHOLDERS AND CHANGES THEY ARE FACING

In the past, management concepts based on hierarchical organisations have dominated crisis & disaster management. Today, a paradigm change is on the way. While professional organisations are of course still organising themselves in a hierarchical way, they are pushed into collaborating with an increasing number of organisations and even the citizens (i.e. crowds) operating in a different manner. Crisis & disaster management will in the future be a highly networked and collaborative activity while still aiming for maximum efficiency and best performance. The

established networks generally are mixed-sector networks in the sense that the strategic orientations of the contributing organisations differ [1].

For the further considerations it is necessary to identify the stakeholders involved into these networks. The following list derived from the research projects in section 2 gives on overview.

1.1 IDENTIFIED STAKEHOLDERS

- Public authorities, directly responsible for civil protection
- Professional responders (governmental and non-governmental organisations)
- Operators of vital infrastructures (in many cases privately owned)
- Industries, working with dangerous goods (Seveso II)
- Different departments of the public administration, who can contribute all kind of valuable data
- Specialised institutes and organisations, who operate sensor networks, evaluate their data or calculate forecasts
- Experts
- Citizens

While collaboration between the stakeholders is required for a future networked way of crisis management, collaboration barriers have been identified e.g. by J. Herranz (2008), cited by W. Treurniet et al (2014) [1]. These barriers come from the different nature of the stakeholders, which can be categorized depending on their behavioural patterns to three classes: bureaucratic, entrepreneurial, community type.

1.2 RELEVANT CHANGES EXPERIENCED BY THE STAKEHOLDERS

The following changes have been observed:

- Years ago, most operators of critical infrastructures were state owned. Today, most of them are privately owned and therefore not under direct control of the state. Additionally, they are more interdependent than in previous times. Of course, the state has a fundamental interest in the functioning of the provided vital services, such as power supply, telecommunications, traffic, food logistics and medical services.

- Industries working with dangerous substances according to the Seveso II Directive (e.g. chemical plants) today will be required to improve collaboration further based on the directive Seveso III, which shall replace the current with 1st June 2015. It explicitly aims at "strengthen the provisions relating to public access to safety information, participation in decision-making and access to justice, and improve the way information is collected, managed, made available and shared" [4], [5].

- The public administration owns manifold information of value for the decision making during crisis situations. This includes registers for people and companies, geo-information such as land utilisation, sewage system models, and many more. To ensure that the spatial data infrastructures are compatible and usable in a community and trans boundary context, the INSPIRE Directive established in May 2007 requires common Implementing Rules (IR) to be adopted by all member states in a number of specific areas [6]. By these means, the INSPIRE Directive also tears down the technical barriers to use these data during for crisis and disaster management.

- By social media networks, citizens were empowered to organise themselves quickly in huge groups during disaster & crisis situations [28]. While this

includes a huge potential of resilience, the activities of unguided spontaneous volunteers may become a problem for the co-ordinated emergency management of the professional first responders itself. Nevertheless, today, citizens offer a strong unused potential of resources of information and capabilities within the crisis response network [3].

These observed changes have been selected and described above, because they have one thing in common: They are driving crisis & disaster management towards a more networked and collaborative activity and immediately motivate to search for technical solutions. These technical solutions must facilitate the collaboration of the mentioned organisations by establishing electronic means of exchange and exploitation of information. From this motivation, a number of research projects were born and allowed to develop concepts and technical systems and to perform validation exercises.

2   PRACTICAL EXPERIENCES

This section describes selected research projects on national and European level. Within these projects, different experiments were performed about the collaboration of stakeholders facilitated by prototypes of dedicated electronic systems. Some experiments focused on a single country, others involved organisations from different European member-states.

2.1   VKT-GÖPL

VKT-GÖPL is an abbreviation in German language and is standing for "validation of concepts and technologies for a common public-private situation picture" [7], [9], [14]. The project was carried out between 2009 and 2012. The concept of the common public-private situation picture is based on the idea, that public safety and security only can be managed by a common effort of the relevant stakeholders which include besides public authorities and NGOs also privately owned operators of critical infrastructures.

The goal of the project was to develop and validate a concept for such a common public-private situation picture for the strategic level of crisis & disaster management. The project followed the method of concept development and experimentation (CD&E) known from the military domain [11]. Two major validation experiments where performed: one based on a pandemic scenario, the other on an earthquake scenario.

2.1.1   Challenges

During the project, the ability (or possibilities, respectively) of the involved parties to share pieces of information in electronic form turned soon out to be one of the major challenges. This challenge was at least partly overcome by collecting useful publicly available information and feeding it into the system. This generated a rich information background within the virtual situation room, which motivated the involved parties to participate. Furthermore, the willingness for collaboration improved when moving from a theoretical discussion to practical experiences during the validation experiments.

2.1.2   Results and Experiences

Besides the concept and prototype of a virtual situation room for the strategic level of civil crisis and disaster management, following experiences are part of the results:

- It was difficult to motivate privately owned operators of critical infrastructures to contribute to information sharing. A regulatory framework would be needed.

- Practical experiments based on concrete crisis scenarios helped to overcome collaboration barriers which were experienced during theoretical discussions with the stakeholders.

- The benefit of a virtual situation room and a shared situation picture may be easier to demonstrate on the tactical level of crisis management than on the strategic level. The decisions made by the tactical level (i.e. the crisis staff co-ordinating the different emergency organisations) are more short-term and less influenced by the political process of balancing of interests.

2.2 IDIRA

IDIRA stands for "Interoperability of data and procedures in large-scale multinational disaster response actions" [10], [12], [13]. This project lifts the idea of VKT-GÖPL to the European multi-national dimension. The project is running from 2011 to 2015.

IDIRA aims at developing a new capability for more efficient multi-national and multi-organisational disaster response. This shall include a technological framework covering recommendations for operational procedures and a set of fixed, deployable and mobile components including data and voice communication assets. Heart of the technical system is a "common operational picture" COP. The COP brings together situation information from all participating parties and makes the common picture available again to them. Basic categories of information involved in this picture are: usable and damaged infrastructure, incidents, needs, hazards, and capacities.

2.2.1 Challenges

A specific challenge of this project came from the requirement to facilitate multi-organisational and even multi-national collaboration. Already within a multi-organisational environment, a semantic barrier for information exchange and collaboration can be found: Different organisations are using different terminologies within their working processes. As a further consequence, on situation maps, these organisations are using different sets of tactical symbols. This problem even becomes more severe on multi-national level, where different languages are used.

Another challenge comes from the inertia to change (or adapt) well-established working processes of emergency organisations towards a more collaborative way of working.

2.2.2 Results and Experiences

While the project is still running and final results are therefore not yet available, the following experiences can already be documented:

The barrier of changing (or adapting) established processes can be avoided by making clear right from the beginning, that existing processes are fully respected. The intention is not to change them, but instead to *enrich* them by providing a better information base for the individual phases of these processes [15]. The concept is based on the following consideration: More or less all emergency management processes are following the so-called OODA (Observe – Orient – Decide – Act) loop [16]. Each phase within this loop requires input data (e.g. a situation picture) and provides output data (e.g. decisions about the deployment of specific resources). If the output data from the individual process phases (i.e. observe, orient, decide, act) of each participating organisation is shared with the other organisations, all would then get more comprehensive input data for their processes (i.e. observations from all organisations for their comprehensive situation picture or knowledge about the resources deployed by other organisations). Fig. 1 illustrates this idea.
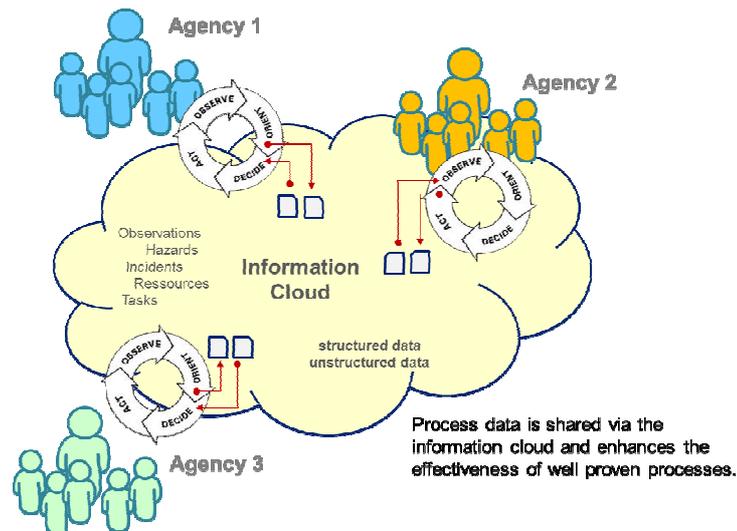
Fig. 1: Information sharing enriches existing processes

Overcoming the semantic barrier is more difficult. While more or less all required technical standards for data exchange and data structures are available, no comprehensive standards for a common semantics (a dictionary of terms, a taxonomy or an ontology) is available. Within IDIRA, the tactical situation object TSO was used [17] as taxonomy. The experience within the project showed, that it was not possible to establish a broad acceptance of the TSO as semantic standard for information exchange. One reason behind is the structure of the TSO itself, which was considered as rather detailed (and complicated) and – at the same time – didn't cover several important aspects of crisis situations.

A possible solution could be inspired by the concept of crowd-map as designed by the ushahidi project [18]. In case ushahidi is setup for information gathering and creation of a situation map during a concrete crisis situation, a specific taxonomy is defined ad-hoc according to the needs of this crisis relief effort. Obviously, during a real crisis situation, the involved stakeholders are pragmatic and find agreements focused on just one concrete crisis situation. A way forward could therefore be based on the concept of defining taxonomies ad-hoc, when they are needed for structured information exchange in a given situation. After several years of experiences, the set of (already partially agreed) specific taxonomies could be used as bases for a new standardisation effort, for example within M/487 of the European Commission [19].

2.3   RE-ACTA

The abbreviation RE-ACTA is standing for "Resilience Enhancement by Advanced Communication for Team Austria". Re-acta has been started in 2013. The project RE-ACTA is focussing on the collaboration of professional responders with the citizens. The basic idea of this project is, to utilize the potential of pre-registered (but still spontaneous) volunteers during crisis situations by a new concept called "crowd tasking" [20]. This idea was introduced by the Austrian Red Cross based on the experience with "Team Österreich" [21].

The goal of this project is to develop and validate a new concept for crowd tasking. The basic idea of crowd tasking is, to utilize pre-registered loosely-coupled volunteers for small tasks during a crisis relief effort [20]. These tasks can pursue either a direct effect or just the gathering of additional situation information from a broad base of people in the field – or both at the same time. The project follows the method of concept development and experimentation (CD&E) [11]. A process model is developed and a proof of concept prototype is built including a volunteers portal, a mobile app and a reporting tool for the civil protection. The project is still in its very early stages.

2.4 SKKM

SKKM is a German-language abbreviation and stands for "National Crisis- and Disaster Management Portal Austria[1]". SKKM is the real-time situation picture used by the Austrian Ministry of Interior for situation monitoring. SKKM is not a research project, but rather an innovative operational system implemented by Frequentis AG together with the end-user [22]. The goal of this project is enabling the Austrian Ministry of Interior to monitor easily a high number of relevant information sources, to explore and visualize this information in order to provide specific, meaningful situation pictures and to enable them to share these situation pictures with other organisations.

Currently, 213 different information sources are integrated into the SKKM system at the Austrian ministry of interior, among them:

- Static data (base maps, roads, rivers, height model, surface model, points of interest, …)

- Sensor data (radiation sensors, river levels)

- Data from expert institutes (detailed weather forecast)

- Data from infrastructure providers (road- and traffic conditions)

- Data from emergency organisations (fire incidents and status of fire stations)

Each information source is represented by a layer, which can be taken from the layer storage and can be put onto the situation map as shown by Fig. 2. The situation map in the end comprises a stack of different layers chosen by the user according to the questions which shall be explored. The user-benefits come from the possibility to combine any pieces of information in a visual way and to draw conclusion from this combination.
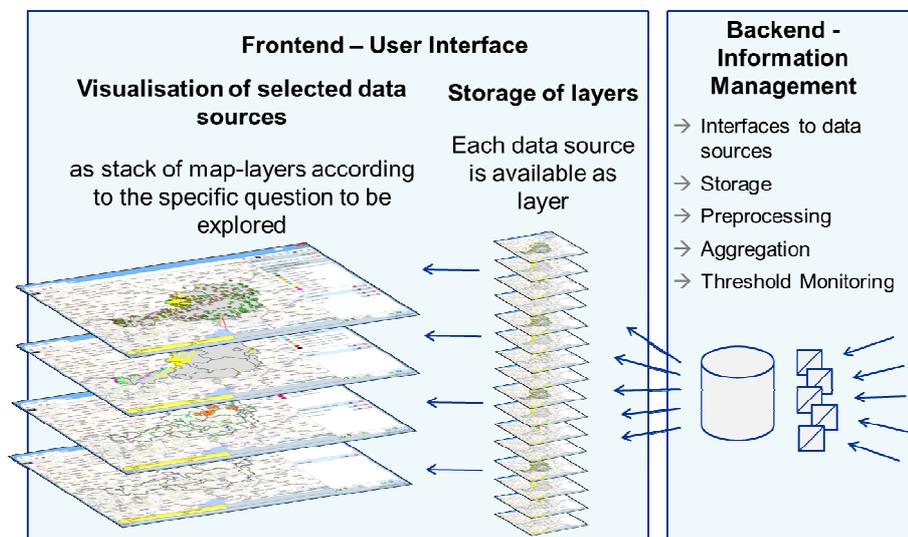

Fig. 2: Concept of the real-time situation picture of the Austrian Ministry of Interior

The project was developed and implemented hand in hand with the end-users following the iterative methodology of a SCRUM process [23].

---

[1] „Staatliches Krisen- und Katastrophenschutzmanagement Portal Österreich"

2.4.1 Challenges

Since many different data sources where integrated, a lot of different proprietary data formats and transport mechanisms had to be dealt with. This could be solved by a technical architecture based on data adaptors at the periphery of the system.

2.4.2 Results and Experiences

This project shows, how the concept of "crisis and disaster management as a network-activity" can successfully be introduced into real operations. The project includes the information exchange with and collaboration of most of the relevant stakeholders mentioned above: civil protection, professional responders, infrastructure operators and specialised institutes. Future goals for the expansion of SKKM in Austria include the expansion of the system towards a collaboration platform on tactical level and the expansion from a mere situation picture towards a management system including decision making, task- and resource management.

3 CONCLUSION: "VERNETZTE SICHERHEIT" – CRISIS MANAGEMENT AS A NETWORK ACTIVITY

After setting the context, this paper started with a listing of the involved stakeholders and changes they are experiencing. These changes drive crisis & disaster management towards a more networked activity supported by electronic systems for information exchange and collaboration. These changes furthermore motivated a number of research projects described above. Practical experiences from these projects indicate how crisis & disaster management as a networked activity can become reality. Individual organisations will be enabled to work more autonomously by utilizing the network of organisations around them for getting things done. Information technology will facilitate information sharing between these organisations. Vertical (i.e. hierarchical) information flow following a concept of command and control will be supplemented much more than today by horizontal information flow following a concept of collaboration. This will happen on all levels of management (operational, tactical and strategic) and will implicate the challenge to develop an efficient and effective pattern of a composition of command & control and collaboration in networks, where both concepts will be present at the same time.

This is also a cultural change about the way of working. Such a change can be facilitated further by providing an infrastructure, which allows all involved persons to experiment and experience networked crisis management. This is for example done by manifold security research projects on national and European level, but also by initiatives like the safety lab of Fraunhofer FOKUS in Germany [26]. The safety lab is a collaborative initiative of research organisations and the industry and provides a showroom demonstrating the benefits of "vernetzte Sicherheit" to the stakeholders.

As mentioned at the very beginning of this paper, the dynamics of change is also becoming visible by a changing usage of terminology in Germany. The German term "vernetzte Sicherheit" initially was coined as a political concept focusing on safety and security in the context of armed conflicts in foreign regions [24]. Nevertheless, considering the change described above, civil crisis intervention displays increasing aspects of collaboration and networking. It is therefore justified by observations and it is growing practice in the community to use the term "vernetzte Sicherheit" in a much broader sense and interpretation. This broader understanding is for example promoted on the homepage of Fraunhofer FOKUS [25] and by the brochure about the safety lab mentioned above [26].

Looking to the future, different strands of activities are continuing to establish this paradigm change:

- *Policy Making and Standardisation*: The discourse about a concept of networked crisis and disaster management is continuing also on European level and being pushed forward by policy makers for example of DG Enterprise with their effort to establish interoperability standards on different layers (technical, syntactic, semantic and organisational) [19].

- *Focused R&D*: Among others, the recently started European research project EPISECC [29] focusses on the architecture of a collaborative information space for the crisis & disaster management, again addressing the different layers of interoperability.

- *Stakeholder involvement and awareness raising*: Among other initiatives, the project ESENET [27] conducts a number of workshops in different European member states and provides a structured possibility for online discussions, addressing communication from citizen to authority, authority to citizen and authority to authority.

ACKNOWLEDGEMENTS

REFERENCES

[1] http://de.wikipedia.org/wiki/Vernetzte_Sicherheit, access at 02.07.2014

[2] Treurniet, W. et al (2014). *Governance of occasional multi-sector networks.* Proceedings of the 11th International ISCRAM Conference – University Park, Pennsylvania, USA, May 2014, pp. 118 – 122

[3] Treurniet, W. (2014). Shaping comprehensive emergency response networks. In T. Grant, H. Monsuur & R. Janssen (Eds.), Network Topology in Command and Control: Organization, Operation, and Evolution. Hershey, USA: IGI Global

[4] http://ec.europa.eu/environment/seveso/review.htm, access at 02.06.2014

[5] COMMISSION DECISION of 26 June 1998 on harmonised criteria for dispensations according to Article 9 of Council Directive 96/82/EC on the control of major-accident hazards involving dangerous substances (notified under document number C(1998) 1758)

[6] DIRECTIVE 2007/2/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

[7] http://www.kiras.at/gefoerderte-projekte/detail/projekt/vkt-goepl/, access at 02.06.2014

[8] http://www.kiras.at/, access at 02.06.2014

[9] Ch. Flachberger, H. Borchert (2011). *Lagebilder zur Verbesserung der Öffentlich-Privaten Sicherheitszusammenarbeit.* Fachtagung Sicherheitsforschung 2011, kiras, bmvit, Österreich, Jan. 2011, http://www.kiras.at/fileadmin/dateien/allgemein/tagungsband/KIRAS2010Ansicht.pdf

[10] P. Kinsella, Ch. Flachberger. (2011). *From Interoperability to Collaboration - How voice and non-voice information exchange technologies can facilitate collaboration between emergency services*, BAPCO 2011 Conference, London, April 2011

[11] http://en.wikipedia.org/wiki/Concept_development_and_experimentation, access at 02.06.2014

[12] http://www.idira.eu/, access at 02.06.2014

[13] Ch. Flachberger (2013). *Common Operational Picture for Crisis and Disaster Management*, Frequentis Research Bulletin, Issue 02, September 2013

[14] Project Presentation on Youtube: http://www.youtube.com/watch?v=JNr2fncJkRw

[15] Ch. Flachberger (2013). *Shared Situation Awareness – An Enabler for Collaboration – Concepts and Experiences from the IDIRA Project.* PSC Europe Forum Conference, 29. - 30. October 2013, Bucharest, Romania

[16] Boyd, John, R. (1995). *The Essence of Winning and Losing.* A five slide set by Boyd, 28 June 1995, http://www.danford.net/boyd/essence4.htm, access at 02.06.2014

[17] CEN (2009). *Disaster and emergency management - Shared situation Awareness.* CEN workshop agreement CWA 15931-1, February 2009

[18] http://ushahidi.com/products/crowdmap/, access at 02.06.2014

[19] European Commission (2011). Programming mandate addressed to CEN, CENELEC and ETSI to establish security standards. M/487, Brussels, 17th February 2011

[20] G. Neubauer et al (2013). *Crowdtasking - a new concept for volunteer management in disaster relief.* ISESS 2013, 9. – 11. Oktober 2013, Neusiedl am See

[21] http://apps.teamoesterreich.at/, acess at 02.06.2014

[22] Jachs, S. (2014). *Gemeinsames Lagebild - Das neue SKKM-Portal des Innenministeriums ist eine Daten- und Kooperationsplattform für das Krisen- und Katastrophenmanagement.* Öffentliche Sicherheit, Das Magazin des Innenministeriums, Ausgabe 01-02/2014

[23] http://en.wikipedia.org/wiki/Scrum_(software_development), access at 02.06.2014

[24] http://de.wikipedia.org/wiki/Vernetzte_Sicherheit, access at 02.06.2014

[25] http://www.fokus.fraunhofer.de/de/espri/index.html, access at 02.06.2014

[26] Fraunhofer FOKUS (2013). *safety lab: vernetzte Sicherheitslösungen aus Sicht der Bevölkerung gedacht.* http://www.fokus.fraunhofer.de/de/espri/_pdfs/SafetyLab.pdf, access at 02.06.2014

[27] http://www.esenet.org/results/results-from-the-workshops/, access at 02.06.2014

[28] Maron, F.D (2013). *How Social Media Is Changing Disaster Response.* Scientific American, Jun 7, 2013. http://www.scientificamerican.com/article/how-social-media-is-changing-disaster-response/

[29] Seventh framework programme of the European Union, SP1-Cooperation, Grant Agreement Number 607078, EPISECC, *Establish Pan-European Information Space to Enhance security of Citizens*, FP7-SEC-2013-607078, http://episecc.eu/