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How EU Funded Research Projects have improved Covid19 Resilience of Rescue and Emergency Control Rooms

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Abstract

The Italian National Fire and Rescue Services (CNVVF) has been participating since 2006 to EU research projects aimed at improving rescue services through the design, development and implementation of enhanced capacity for data exchange. The most important result of such projects is the possibility to manage complex and large-scale emergencies using interoperability platform. Such solution is based mainly on the CAP standard, that has been adopted by the CNVVF from 2008. A side effect of such efforts is the added value of resilience against the Covid19 pandemic that the interoperability platforms and the adoption of a common data exchange standard can mean in terms of

protection of the operators and continuity of rescue services in complex emergencies.

1. Introduction

The CNVVF (Corpo Nazionale dei Vigili del Fuoco - Italian National Fire and Rescue Services) is a nation-wide organisation¹ that, with some 42.000 units (36.000 professional and 8.000 volunteers) carries out technical rescue and is recognised by the Civil protection law as the main component of the National Civil Protection Service. In such perspective, the CNVVF needs to maintain a constant flow of real time information between all the Authorities involved in emergency management. From the daily rescue operations to the more complex emergencies, only seldom there's just one authority involved. Most often, more of them must work together, so that they should possibly reach the scenario with the needed resources as soon as possible.

The sole application of the art. 26 of EU directive on universal service [1], about the adoption of the 112 European Emergency

¹ Not including Valle d'Aosta region and Bolzano and Trento provinces, which manage their own services



Number in every EU member state, is not sufficient to guarantee the flow of information that rescue authorities need to coordinate and cooperate before and during any operation. In fact, the 112 was born and is managed to allow citizens to turn to rescuers. So, a different tool has to be adopted to improve data exchange between first responders during the emergency phases. The faster the flow, the better the rescue is deployed and, to this end, the most efficient way to reach the goal of a fast flow of information is to allow each authority to manage its own data with its proprietary system and, at the same time, let it send and acquire seamlessly data from other authorities using a common protocol of data exchange.

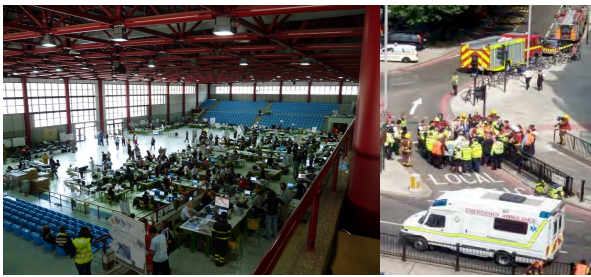


Figure 1 - Left: The Command and Control room in the early phases of the Central Italy 2009 Earthquake (in the following days the number of people nearly doubled). Right: a multi agencies meeting held in the immediate aftermath of the 7th July 2005 attacks in London

2. The process of testing and introducing interoperability in the CNVVF

When it comes to manage disasters, the number of the involved authorities is high enough to make the decision-making process complex. Fig. 1 shows how the Command and Control room of the 2009 Central Italy earthquake had been organised, in order to let all the different actors to exchange the enormous quantity of data needed.

The management of such event has been rightly praised for its efficiency and it was basically based on direct personal contacts. Such aspect, was unchanged in the following large scale events in Italy (earthquakes of 2012 and 2016). However, it shows immediately its criticality in presence of the Covid19

pandemic: how to let managers and their staff work and exchange the needed load of data, while maintaining the social (or physical) distancing to protect them in the emergency scenario?

Starting from 2007, the CNVVF has participated to a number of EU research and innovation actions, focused on the improvement of interoperability of rescue and civil protection services. In particular, the CNVVF has been partner in the 6th, 7th and 8th (a.k.a. Horizon 2020) Framework Programs. PETRAnet (2005-2007), REACT (2007-2009) [2], SAVEME (2009-2012), HELI4RESCUE (2011-2013), IDIRA (2013-2015), STORM (2016-2019), IN PREP (2018-2020), FIRE IN (2018-2023) and the STRATEGY projects (2020-2023), which is going to be kicked off in September 2020. All these projects have one common element: the inclusion of specific activities aimed to allow first responders at exchanging data independently from location, language, and technological barriers.

Some examples can help to understand the practical application of the interoperability improvement reached with such projects:

- the main Italian uses of the CAP are the exchange of data on vegetation fires that the CNVVF sends to the Carabinieri Corps, to allow investigations and local collaborations of various kinds with local agencies, such as, for example, the one among the most busy operating rooms involved in the civil protection activities in Veneto region, including the water basin management authorities of large reservoirs who, having the possibility of been informed in real time of calls arriving at the CNVVF on flooding events, can decide how to regulate water flows to limit bigger risks.
- the STORM [3] project has showed how laser scanning techniques can be used from the first phase of assessing damages suffered by buildings up to the design of the provisional works [4]. The system, remotely accessed, let different authorities and boards to take their decisions and allowed field operators to work without delays;



The research leading to these results has received funding from Horizon 2020, the European Union's Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreements no 740627 and 740575

- the IN_PREP [5] project have tested in the desktop exercises held on 2018 in Foligno and 2019 in Savona (the final field exercise planned in Savona on March 2020 has been postponed due to the Covid19 pandemic), the possibility to manage local complex emergencies with a team work from remote. In the exercises the problems caused by injects have been faced, resolved and recorded, within a process that would help all the participants to give their best without meeting in the same physical room.

The constant interest of the CNVVF to such projects as an end user has brought it to propose and test innovative uses of existing technologies to improve the service of the first responders. Obviously, rescue is a person-operated service, that hardly will ever be replaced by machines, but the complex information and data exchange activities that allow first responders to be deployed efficiently, especially during large scale emergencies, still has wide margins for improvement.

In order to solve the technological aspect of the problem, the EU has constantly published research calls over the years emphasising the importance of data interoperability.

Interoperability, in terms of rescue services, means the possibility for the different parts to maintain the proprietary data management structure while sending and receiving data that could have been automatically processed without any further operation [6].

Technically, such development has been implemented through the adoption of a standard format of the messages containing the data to be sent or received. Consensus has been reached within the projects to use the CAP (Common Alerting Protocol), which is a standard born for exchanging public alerts and warnings between alerting systems [7].

Over the years such standard has been adopted in a growing number of emergency management organisations (i.e. the US Department of Homeland Security, the Chinese Civil Protection Agency, the EU Emergency Response Coordination Centre - ERCC).

The CNVVF, after the decrees of 2008 and 2011, that established the possibility of automatically exchanging data useful for emergency management with all the bodies involved, has adapted the emergency data management system, which is now fully interoperable, having deployed all the functionalities for a real-time two-way standard-based data sharing.

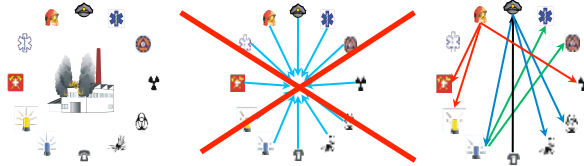


Fig. 2 - Every emergency has its specific needs, also in terms of authorities involved (left). The solution emerged within the years of research activity funded by the EU is a not-centralised structure of data exchange (center), but a network based only on the adoption of a common standard of data exchange (right), that lets every single o group of the authorities involved in the emergency management to decide which data exchange with any specific part involved.

3. CAP standard, interoperability and Covid19 resilience

The first application of CAP in Italy have been recorded during the 2009 L'Aquila earthquake: four months after the first shock, a system capable of managing the process of ensuring the safety of cultural heritage buildings has been set up by the CNVVF. Such test, together with an application aimed at improving the forest fire fighting operations in Calabria region in the same year, has been financed with EU research funds of the REACT project and proved immediately the advantages of working on a technological platform [8].

The test demonstrated an increase of the efficiency of the processes (digital communication cannot replace personal contact, but in many situation its accuracy can help to improve the overall process), which was not only due to the reduction of the organisation and movement time of the meetings, but also to the accuracy of the data produced. So that, aiming at making rescue operations more efficient, the EU has also



reached the unexpected effect of having laid the foundations to add resilience to emergency management services.

In the case of the Covid19 pandemic, the CNVFF has experienced that the CAP based emergency management system has ensured the continuity of management, protecting operators through a reduced number of presence. Even working with a reduction of some 30% of the back office units (including the control rooms), the rescue services have not been affected, as well as the capability of cooperating with other authorities from remote, due to the possibility to get data in any place and in any moment.

4. Discussion

Adopting a common protocol imply investing funds in the upgrading of the systems that manage rescue operation data. The economical effort is not different from normal maintenance costs of such systems. A problem that affects many organisations can be found in the cultural approach to data exchange. The resistance to open the information flow to automatic system rather than keeping a direct control can be considered the main obstacle to the set-up of interoperable rescue networks.

The consciousness that the Covid19 pandemic could last months or years and, even not hopefully, could be replaced by other virus pandemics could be a turning point in the adoption of really interoperable networks aimed at the emergency management.

The alternative is the risk of discovering, during an emergency, Covid19 infected areas in the most critical nodes of the control and command systems.

5. Conclusion

The EU, through the funding of projects aimed at improving interoperability in rescue and civil protection activities, has allowed the relevant authorities to improve their response systems in case of complex or large-scale emergencies.

An unexpected result of the approach financed by the EU research programs is the possibility for different rescue authorities to

work in a Covid19 resilient mode. The technological side of the challenge can be considered substantially overcome. The nature of the obstacles that the involved organisations have to face is the adaptation of their systems. If, previously, the adoption of interoperable systems could be considered just an improvement of the services, it is now the best way to respond to the calamities in which multiple services have to operate simultaneously.

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