Hindawi
Wireless Communications and Mobile Computing
Volume 2019, Article ID 1647092, 2 pages
https://doi.org/10.1155/2019/1647092

Editorial

Emergency Networks and Future Public Safety Systems

Maurizio Casoni[1], **Song Guo**[2] and **Abderrahim Benslimane**[3]

[1]*University of Modena and Reggio Emilia, Modena, Italy*
[2]*The Hong Kong Polytechnic University, Hong Kong, China*
[3]*CERI/LIA University of Avignon, Avignon, France*

Correspondence should be addressed to Maurizio Casoni; maurizio.casoni@unimore.it

Received 29 July 2019; Accepted 29 July 2019; Published 14 August 2019

Natural or man-made disasters, CBRN (chemical, biological, radiological, and nuclear), can cause many casualties in urban areas and massive destruction in critical infrastructures. Terrorist attacks, especially in high-rise buildings, can be responsible for entrapment of a large number of people. Entrapment can also occur as a result of collapsed structures due to accidental or deliberate explosions (e.g., collapsed mines, technical failures, and confined spaces).

In past events, PPDR (public protection and disaster relief) agencies, e.g., fire brigades, ambulance service, and police, have always had many difficulties to effectively do their work because of technical and organizational issues. Interoperability among first responders belonging to different teams has always been very difficult, as well as coordination actions among the agencies [1]. In addition, managing and recovery of collapsed terrestrial telecommunication infrastructures has always been a major issue to solve in crisis events [2–4].

Ideally, future public safety systems should be interoperable, secure, and resilient for voice and data communications, supporting broadband communications and services. Therefore, the development and setup of advanced telecommunication and networking technologies for emergency networks as support of future public safety systems are among the most important tasks to face [5–7].

The purpose of this special issue is to publish original efforts in the ICT domain for effective future public safety systems.

Earthquakes have been responsible for more than 30% of the total fatalities from natural disasters in the last 30 years. A seismic alert system represents one of the most important measures to prevent and minimize earthquake damage. Klapez et al. present and evaluate the performance of Earthcloud, a cloud-based alert system helpful to reduce processing and communication delays.

Communications among first responders are fundamental for their work to provide help.

Crespo-Bardera et al. propose a two-hop relay network, merging MIMO textile technology at the first responders' jacket into the LTE-A cellular network. Their results prove the improvements in terms of network capacity and coverage of this novel architecture.

Future public safety systems have to operate over, possibly, dedicated radio resources.

Chaudry et al. present an overview of current LMR and emerging broadband LTE netwtorks to be deployed in the 700 MHz band. Their comparative study between current LMR networks and next LTE ones clearly shows the way for future public safety networks, even if several LTE services still do not meet mission-critical requirements, so that further studies and standardization activities are required.

However, public safety agencies around the world started migrating to LTE networks to support broadband communications. Sun et al. evaluate the performance of an off-network mission-critical push-to-talk device in direct mode communications over LTE. Their study may help to define configuration guidelines and end users to properly set the system.

Interoperability among agencies and countries is a mandatory requirement for future public safety systems. Sedlar at al. present the design, implementation, and results of a test bed for the 112 emergency service, which uses the Pan-European Mobile Emergency Application (PEMEA) protocol. This test bed shows the feasibility of this approach, and it eases next developments of this system.

Emergency networks can employ wireless sensor networks, which can be sparse. Zhao et al. present a sensing coverage algorithm of sparse mobile sensor node, with trade-off between packet loss rate and transmission delay.

After a severe meteorological event, telecommunication infrastructures and radio resources can be strongly damaged and made out-of-service. Therefore, it is very important to detect as soon as possible, possibly real time, the current availability of the radio spectrum. Santana et al. present a tool that senses and monitors in real time the radiofrequency spectrum and optimally places a number of sensors using Lora or other IoT technologies, to provide an emergency wireless coverage.

When telecommunication infrastructures are damaged by natural disasters, unmanned aerial vehicles (UAV) are also very useful to provide wireless coverage, given that they could be rapidly deployed. Mayor et al. investigate the optimal deployment of drones equipped with WiFi. Their proposal minimizes the number of drones required to provide reliable communication services.

A telecommunication infrastructure is composed of heterogeneous radio and mobile technologies. Therefore, in emergency scenarios, an efficient management of them is mandatory. Bisio et al. propose a decision maker in charge of performing network selection and handover decision. They evaluate several metrics through customized algorithms and show the best techniques for all the considered metrics.

In case of natural disasters, it is also very important to manage all available ICT resources at the best, to reduce delays and to improve information throughput among all actors involved in disaster recovery. Choksi et al. propose a solution for real-time resource allocation and scheduling to handle multiple objects in postdisaster situations. Their algorithm performs successfully in terms of maximal resource utilization and fulfilling the demand for different tasks at various places. Kumar et al. propose a resource scheduling algorithm for the postdisaster management in which they estimate the waiting time for the availability of resources using queueing theory.

With this special issue, we hope that readers will be interested in emergency networks and future public safety systems and they will find this issue helpful for their research and work.

Conflicts of Interest

Editors have no conflicts of interest to the assigned manuscripts when handling them and making decisions.

Maurizio Casoni
Song Guo
Abderrahim Benslimane

References

[1] H. Miller, R. Granato, J. Feuerstein, and L. Ruffino, "Toward interoperable first response," *IT Professional*, vol. 7, no. 1, pp. 13–20, 2005.

[2] S. Ghafoor, P. D. Sutton, C. J. Sreenan, and K. N. Brown, "Cognitive radio for disaster response networks: survey, potential, and challenges," *IEEE Wireless Communications*, vol. 21, no. 5, pp. 70–80, 2014.

[3] R. Fantacci, F. Gei, D. Marabissi, and L. Micciullo, "Public safety networks evolution towards broadband: sharing infrastructures and spectrum with commercial systems," *IEEE Communications Magazine*, vol. 54, no. 2, pp. 24–30, 2016.

[4] M. Casoni, C. A. Grazia, M. Klapez, N. Patriciello, A. Amditis, and E. Sdongos, "Integration of satellite and LTE for disaster recovery," *IEEE Communications Magazine*, vol. 53, no. 3, pp. 47–53, 2015.

[5] K. Gomez, S. Kandeepan, M. M. Vidal et al., "Aerial base stations with opportunistic links for next generation emergency communication," *IEEE Communications Magazine*, vol. 54, no. 2, pp. 31–39, 2016.

[6] Y. Kyung, T. M. Nguyen, K. Hong, J. Park, and J. Park, "Software defined service migration through legacy service integration into 4G networks and future evolutions," *IEEE Communications Magazine*, vol. 53, no. 9, pp. 108–114, 2015.

[7] M. Casoni, C. A. Grazia, and M. Klapez, "A software-defined 5G cellular network with links virtually pooled for public safety operators," *Transactions on Emerging Telecommunications Technologies*, vol. 28, no. 3, p. e3092, 2017.