# Using Drones for Enhanced Communications in Cases of Emergency

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## Abstract

Traditional communication systems often fall short in the chaos that follows crises caused by earthquakes, hurricanes, tsunamis, or major infrastructure failures due to industrial accidents or terrorist attacks, especially when ground-based communication infrastructure is damaged or compromised. During such critical events, timely and reliable dissemination of emergency information is vital to coordinating rescue efforts, guiding civilians, and mitigating loss of life and property. Against the vulnerabilities and limitations of traditional communication systems, drones have emerged as an agile and versatile solution for enhanced emergency communications. Their rapid deployment, mobility, and ability to traverse otherwise inaccessible terrains make them increasingly indispensable for public safety, particularly for distributing real-time alerts and instructions.

This keynote presents a comprehensive, analytical exploration of the use of drones for enhanced communications in cases of emergency. It covers deployment strategies, communications technologies, smart coordination algorithms, and integration with satellite communication systems. The keynote also incorporates in-depth discussions using real-world examples from leading countries in this area. It assesses urban versus rural adaptations, comparative effectiveness to traditional methods, and examines key future trends, drawing on a wide spectrum of up-to-date R&D efforts and case studies.

## Short Bio of the Presenter

Prof. Ivan Ganchev is a Senior Member of the Institute of Electrical and Electronic Engineers (IEEE[1]); the IEEE Communications Society (Essential); the IEEE Computer Society Special Technical Communities on: (i) Smart and Circular Cities, (ii) Wearable and Ubiquitous Computing, and (iii) Reliable, Safe, Secure and Time Deterministic Intelligent Systems; the IEEE Computer Society Technical Communities on: (i) Intelligent Informatics, (ii) Big Data, and (iii) Internet of Everything; the IEEE Computer Society Technical Committees on: (i) Internet, (ii) Computer Communications, and (iii) Cloud Computing; the IEEE Communities on: (i) Cloud Computing, (ii) Big Data, (iii) Future Networks, (iv) Internet of Things, and (v) IEEE Smart Cities; and the IEEE Consultants Network. He received his doctoral and engineering (*summa cum laude*) degrees from the Saint-Petersburg University of Telecommunications in 1995 and 1989, respectively. He is an International Union of Radio Science (URSI[2]) Senior Member, an International Telecommunication Union - Telecommunication Standardization Sector (ITU-T[3]) Invited Expert, and an Institution of Engineering and Technology (IET[4]) Invited Lecturer.

Prof. Ganchev was involved in 40+ international and national research projects. Previously he served as a member of the EU FP5 Academic Network for Wireless Internet Research in Europe (ANWIRE) and 8 European 'COoperation in Science and Technology' (COST) Actions: COST 285 "Modelling and Simulation Tools for Research in Emerging Multi-service Telecommunications", COST 290 "Traffic and QoS Management in Wireless Multimedia Networks", IC0906 "Wireless Networking for Moving Objects (WiNeMO)", IC0905 "Techno-Economic Regulatory Framework for Radio Spectrum Access for Cognitive Radio/Software Defined Radio (TERRA)", IC1304 "Autonomous Control for a Reliable Internet of Services (ACROSS)", IC1303 "Algorithms, Architectures and Platforms for Enhanced Living Environments (AAPELE)", CA15127 "Resilient Communication Services Protecting End-User Applications from Disaster-based Failures (RECODIS)", CA16226 "Indoor Living Space Improvement: Smart Habitat for the Elderly (SHELD-ON)". Currently he is a Management Committee Member (MCM) of the COST Actions CA23126 "Warning Communication Knowledge Network (AlertHub)" and CA24144 "Extended-range Multi-hazard Predictions and Early Warnings (ANTICIPATE)".

Prof. Ganchev's research interests include novel telecommunication and information paradigms; modelling, simulation, and emulation of complex telecommunication and information systems, networks, and services; smart networks and services; smart ubiquitous networking; Internet of Things (IoT); Internet of Services; Internet tomography.

Prof. Ganchev has served on the Technical Program Committee of 400+ prestigious international conferences, symposia, and workshops. He has authored/co-authored 1 monographic book, 3 textbooks, 4 edited books, and 350+ research papers in refereed international journals, books, and conference proceedings. He was a recipient of IEEE IAEAC 2017 Best Paper Award and IEEE IS 2012 Best Paper Award, and was nominated for the ITU-T Kaleidoscope 2008 Best Paper Award. He has given over 40 keynote/plenary/invited talks and public lectures at international conferences, universities, and research institutions.

Prof. Ganchev is an Area Editor of the Elsevier "*Computer Networks*" journal, an Academic Editor of the Wiley "*Wireless Communications and Mobile Computing*" journal, an Editorial Board Member of the MDPI "*Electronics*" and Wiley "*Internet Technology Letters*" journals, a Regional Editor (Europe) of the *International Journal on Trust Management in Computing and Communications*, and an Advisory Board Member of the MDPI "*Engineering Proceedings*" journal. He also seats on the Editorial Board of and has served as a Guest Editor for multiple prestigious international journals.

[1] **IEEE**: The Institute of Electrical and Electronic Engineers, USA.

[2] **URSI**: The International Union of Radio Science, Belgium.

[3] **ITU-T**: The International Telecommunication Union - Telecommunication Standardization Sector, Switzerland.

[4] **IET**: The Institution of Engineering and Technology, UK.