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CIPRNet

Critical Infrastructure Preparedness and Resilience Research Network

Project type: Network of Excellence (NoE)

Thematic Priority: FP7 Cooperation, Theme 10: Security

Start date of project: March 1, 2013   Duration: 48 months

D8.3 Textbook: Training Material on DSS and Training Material on CIP MS&A based 'what if' analysis

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Revision: Version 1

Università Campus Bio-Medico di Roma (UCBM)

Project co-funded by the European Commission within the Seventh Framework Programme (2007–2013)		
Dissemination Level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Author(s)	Roberto Setola (UCBM)
	Maria Carla De Maggio (UCBM)
	Clio Di Marcello (UCBM)
Contributor(s)	

Security Assessment	E. Rome (Fraunhofer)
Approval Date	16/01/2017
Remarks	No security issues

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LIST OF ACRONYMS

Acronym	Explanation
CI	Critical Infrastructure
CIP	Critical Infrastructure Protection
CIPRNet	Critical Infrastructure Preparedness and Resilience Research Network
DIESIS	Design of an Interoperable European Federated Simulation Network for CI
DoW	Description of Work
DSS	Decision Support System
EISAC	European Infrastructures Simulation and Analysis Centre
FP	Framework Programme
I2SIM	Infrastructure Interdependencies Simulator
M&S	Modelling and Simulation
MS&A	Modelling, Simulation and Analysis
OpenMI	Open Modelling Interface
V&V	Verification and Validation

1 Introduction

Within the activities of Dissemination and Spreading Excellence, CIPRNet project has worked on publishing a Textbook entitled "Managing the Complexity of Critical Infrastructures. A Modelling and Simulation Approach" based on the Training Material developed by the Consortium for the Master Class training events. The book has been published by Springer under open-access framework to guarantee high quality, reputation, visibility and dissemination of the book. The publication date announced by Springer was between end of January 2017 (earliest) and 21 February 2017 (latest).

This deliverable report D8.300 briefly describes essential facts on the publication. The real deliverable is the published book itself.

The book, whose editors are Roberto Setola (UCBM), Vittorio Rosato (ENEA), Elias Kyriakides (UCY) and Erich Rome (Fraunhofer), is composed of two parts. The first one is a general part on Modelling, Simulation and Analysis of Critical Infrastructures, collecting the contents of the presentations held during the first day of the CIPRNet courses and Master Classes. The second part is composed of three chapters, each one describing in detail the tools designed and improved during the CIPRNet project; those tools have been the focus of the specialised part of each edition of the CIPRNet Courses and Master Classes (second and third day of the events); these contents, already collected in deliverables D9.20 (Draft training material OpenMI) [1], D9.30 (Draft training material of the DSS demonstrator system) [2], D9.40 (Draft training material of the 'what if' analysis demonstrator system), have been revised, improved, and turned into high-quality pieces in order to be published in the book.

2 CIPRNet Training Textbook

The CIPRNet Training Textbook is the result of a process started during the first editions of the CIPRNet Course and Master Class on Modelling, Simulation and Analysis of Critical Infrastructures. The purpose of the textbook is to collect all the material presented to the attendees of the CIPRNet Master Classes and the Courses inside the post graduate Master in Homeland Security. The CIPRNet consortium decided to publish the book as an open access publication, in order to promote its spread.

The contents have been reviewed across the three editions of the two courses, according to the feedback and the comments provided by the attendees, both internal and external to the consortium. The third edition of the two courses had foreseen a final version of the general part of the course (corresponding to the chapters of part 2). In the first place, the material of the specialized part of each edition of the courses has been reviewed during a rehearsal event, in the second place it has been reviewed thanks to the feedback received during the CIPRNet Course and the Master Class.
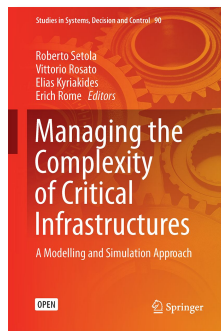
All the contents have been security checked by the CIPRNet Security Advisory Board.

Each chapter of the general part of the book (part 1), wherever possible, has been authored by authors with different consortium affiliations, in order to enhance the collaboration and to provide a more general vision of the treated issue.

The contents of all the chapters, after the authors check, have been reviewed by the editors to ensure coherence across the book and to avoid overlapping of topics. Last, Springer editor contributed to improve the overall quality of the book assessing layout and language issues.

At the end of this process, the CIPRNet Training Textbook, entitled "Managing the Complexity of Critical Infrastructures. A Modelling and Simulation Approach", has been published in the Studies in Systems, Decision and Control of Springer. The book, published as an eBook open access publication, can be found at http://www.springer.com/gp/book/9783319510422. The webpage itself describes the book to the public as follows.

"This book summarizes work being pursued in the context of the CIPRNet (Critical Infrastructure Preparedness and Resilience Research Network) research project, co-funded by the European Union under the Seventh Framework Programme (FP7). The project is intended to provide concrete and on-going support to the Critical Infrastructure Protection (CIP) research communities, enhancing their preparedness for CI-related emergencies, while also providing expertise and technologies for other stakeholders to promote their understanding and mitigation of the consequences of CI disruptions, leading to enhanced resilience. The book collects the tutorial material developed by the authors for several courses on the modelling, simulation and analysis of CIs, representing extensive and integrated CIP expertise. It will help CI stakeholders, CI operators and civil protection authorities understand the complex system of CIs, and help them adapt to these changes and threats in order to be as prepared as possible for mitigating emergencies and crises affecting or arising from CIs".

R. **Setola**, V. **Rosato**, E. **Kyriakides**, E. **Rome** (Eds.)

Managing the Complexity of Critical Infrastructures

A Modelling and Simulation Approach

Series: Studies in Systems, Decision and Control, Vol. 90

► Reports on new research directions in the field of critical infrastructure protection, dependency, preparedness and security
► Explains how to model and simulate scenarios composed of several critical infrastructure systems
► Edited and written by leading experts in the field

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This book summarizes work being pursued in the context of the CIPRNet (Critical Infrastructure Preparedness and Resilience Research Network) research project, co-funded by the European Union under the Seventh Framework Programme (FP7). The project is intended to provide concrete and on-going support to the Critical Infrastructure Protection (CIP) research communities, enhancing their preparedness for CI-related emergencies, while also providing expertise and technologies for other stakeholders to promote their understanding and mitigation of the consequences of CI disruptions, leading to enhanced resilience. The book collects the tutorial material developed by the authors for several courses on the modelling, simulation and analysis of CIs, representing extensive and integrated CIP expertise. It will help CI stakeholders, CI operators and civil protection authorities understand the complex system of CIs, and help them adapt to these changes and threats in order to be as prepared as possible for mitigating emergencies and crises affecting or arising from CIs.

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Figure 1: CIPRNet Training Textbook product flyer on Springer website.

The book is composed of 11 chapters and a preface, adding up to a total of 299 pages. It has been realised thanks to the contribution of 32 authors, all coming from the partners of the consortium. In the table below all the chapters, their authors and a short description are listed.

N	TITLE	AUTHORS	DESCRIPTION
0	Preface	Elias Kyriakides (UCY), Erich Rome (Fraunhofer), Vittorio Rosato (ENEA), Roberto Setola (UCBM)	Introduction to the contents of the book and presentation of CIPRNet
		PART 1	
1	Critical Infrastructures, Protection and Resilience	Roberto Setola (UCBM), Eric Luiijf (TNO), Marianthi Theocharidou (JRC)	What are Critical Infrastructures, historical overview and the most relevant episodes. Description of the most relevant initiatives from technical and regulatory point of views.

2	Modelling dependencies between critical infrastructures	Roberto Setola (UCBM), Marianthi Theocharidou (JRC)	Why focusing the attention on dependencies, dependency taxonomy, critical review of literature on modeling (inter) dependencies.
3	Critical Infrastructures Disruption scenarios analyses via simulation	Mohamed Eid (CEA), Elias Kyriakides (UCY), Vittorio Rosato (ENEA)	Why to use simulation to analyze CI scenarios, what types of investigation are possible. Review of the most relevant simulation approaches.
4	Physical simulators of CIs	Antonio Di Pietro (ENEA), Carlo Liberto (ENEA), Elias Kyriakides (UCY), Nikolas Flourentzou UCY), Ivo Pothof (Deltares), Gaetano Valenti (ENEA)	Analysis of the most used simulation paradigms to reproduce relevant CIs (single domain) e.g. electric grid, TLC network, etc.
5	Phenomenological simulators of CIs	Alberto Tofani (ENEA), Gregorio D'Agostino (ENEA), José Martí (UBC)	Description of phenomenological simulators (e.g. I2Sim, CISIA, etc.) and their use to simulate CI scenarios.
6	Federated simulations	Tom van den Berg, Wim Huiskamp (TNO)	Federated simulation of more than one infrastructure, on a single domain (e.g. DIESIS).
7	Cyber Threats Impacting Critical Infrastructures	MichałChoraś, Rafał Kozik, Adam Flizikowski, Witold Hołubowicz, Rafał Renk (UTP)	Modelling of threats to critical infrastructures.
8	Verification and Validation for CIPRNet	Jeroen Voogd (TNO)	Description of the most relevant approaches and techniques to check the correctness of a simulator scenario with a specific focus on CIs.
	PART 2		
9	Design of DSS for supporting preparedness to and management of anomalous situations in complex scenarios	Antonio Di Pietro, Luisa Lavalle, Luigi La Porta, Maurizio Pollino, Alberto Tofani, Vittorio Rosato (ENEA)	Description of the CIPRNet DSS, its components, structure and functionalities with some examples.
10	The use of what-if analysis to improve the management of crisis situations	Erich Rome, Thomas Doll, Stefan Rilling, Betim Sojeva, Norman Voß, Jingquan Xie (Fraunhofer)	Description of the aim of the What-if tool designed inside CIPRNet, its components, structure and functionalities with some examples.
11	Model coupling with OpenMI	Bernhard Becker, Andreas Burzel (Deltares)	Description of the advantages of OpenMI as federated middleware.

3 Bibliographic information

Book Title

Managing the Complexity of Critical Infrastructures

Book Subtitle

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Editors

Roberto Setola

Vittorio Rosato

Elias Kyriakides

Erich Rome

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Communications Engineering, Networks

4 References

[1] EU FP7 Project CIPRNet, Deltares, Deliverable D9.20 "Draft training material OpenMI". Delft, The Netherlands, 05.03.2014.

[2] EU FP7 Project CIPRNet, ENEA, Deliverable D9.30 "Draft training material of the DSS demonstrator system". Rome, Italy, 06.11.2015.

[3] EU FP7 Project CIPRNet, Fraunhofer, Deliverable D9.40 "Draft training material of 'what if' analysis demonstrator system". Sankt Augustin, Germany, 11.07.2016.