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IFIP is the global non-profit federation of societies of ICT professionals that aims at achieving a worldwide professional and socially responsible development and application of information and communication technologies.

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The flagship event is the IFIP World Computer Congress, at which both invited and contributed papers are presented. Contributed papers are rigorously refereed and the rejection rate is high.

As with the Congress, participation in the open conferences is open to all and papers may be invited or submitted. Again, submitted papers are stringently refereed.

The working conferences are structured differently. They are usually run by a working group and attendance is generally smaller and occasionally by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is also rigorous and papers are subjected to extensive group discussion.

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Hamideh Afsarmanesh · Luis M. Camarinha-Matos
António Lucas Soares (Eds.)

Collaboration in a Hyperconnected World

17th IFIP WG 5.5 Working Conference
on Virtual Enterprises, PRO-VE 2016
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Proceedings

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Preface

Everyday life in societies is dramatically influenced by an exponential increase in connectivity, and we now talk of a hyper-connected world. Digital interconnection of people and things is expanding to anytime and anywhere. It is estimated that by 2020 over 50 billion networked devices will co-exist in the world. The hyper-connected world of the future would comprise environments transparently enriched with sensors, actuators, devices, machines, and computational elements that are interconnected and collaborating. Together with people, these provide complex collaborative environments with context sensitive interactions. The area of collaborative networks provides an important foundation for the emerging hyper-connected world, wherein humans, organizations, intelligent agents, and devices co-exist. These entities generate data, interconnect through data, and act together, potentially evolving toward an increasingly effective collective intelligence within an exponentially growing platform.

Profound and challenging social, political, economic and even cultural consequences are associated with such a vast level of heterogeneous connectivity. From the collaborative networks' perspective, it is therefore fundamental to first understand the structure and inter-relationships among entities within the hyper-connected world, and second design and develop collaborative support environments, tools, and systems addressing their functional/non-functional requirements.

There is already a base for ICT developments supporting this area. In the last two decades, advances in ICT, Internet, and cloud have led to the explosion of collaborative networks, both for networks of people, through social networks and virtual communities, and for networks of organizations through business ecosystems, dynamic supply chains, virtual organizations, and their breeding environments. This explosive trend is further amplified by the emergence of the Internet of Things and Cyber-Physical Systems, addressing a pervasive interconnection of and collaboration among physical and virtual objects. The challenges so far addressed by the collaborative networks community are however still touching only the tip of the iceberg. Many challenges in this area remain untouched and are waiting to be resolved.

Furthermore, models and support tools for new organizational collaboration structures, governance, and legal principles need to be envisioned and developed to deal with the large number of interconnected entities and their huge amounts of diverse data objects, enabling them to reach new levels of collective awareness and intelligence, facilitating new forms of evolution and co-creation, more effective problem solving, as well as collective decision making.

PRO-VE 2016 therefore addresses the timely topic of a hyper-connected world. It provides a forum for sharing experiences, discussing trends, identifying challenges, and introducing innovative solutions aimed at fulfilling the vision of a collaborative

hyper-connected world. Understanding, modeling, and proposing solution approaches in this area requires contributions from multiple and diverse knowledge areas (social sciences, organization science, technologies, etc., which is well in line with the interdisciplinary spirit of the PRO-VE working conferences.

PRO-VE 2016, held in Porto, Portugal, was the 17th event in this series of successful conferences, including:

PRO-VE 1999 (Porto, Portugal), PRO-VE 2000 (Florianopolis, Brazil), PRO-VE 2002 (Sesimbra, Portugal), PRO-VE 2003 (Lugano, Switzerland), PRO-VE 2004 (Toulouse, France), PRO-VE 2005 (Valencia, Spain), PRO-VE 2006 (Helsinki, Finland), PRO-VE 2007 (Guimarães, Portugal), PRO-VE 2008 (Poznań, Poland), PRO-VE 2009 (Thessaloniki, Greece), PRO-VE 2010 (St. Étienne, France), PRO-VE 2011 (São Paulo, Brazil), PRO-VE 2012 (Bournemouth, UK), PRO-VE 2013 (Dresden, Germany), PRO-VE 2014 (Amsterdam, The Netherlands), and PRO-VE 2015 (Albi, France).

This proceedings book includes selected papers from the PRO-VE 2016 conference, providing a comprehensive overview of major challenges and recent advances in various domains related to collaborative networks and their applications, with a strong focus on the following areas, also related to the selected main theme:

- Hyperconnected Systems,
- Managing Data and Knowledge,
- Networked Business Processes,
- Collective Intelligence and Decision Making,
- Creating Supply and Production Networks,
- Operating and Management of Networks,
- Collaborative Engineering,
- Product-Services,
- Intelligent Product Ecosystems,
- Product Personalization,
- Service Orientation,
- Cloud Technology Aspects for VOs,
- Design Science Research,
- Business Models in Hyperconnected Context,
- Agribusiness Value Chain, and
- Collaborative Networks in Circular Economy.

We are thankful to all the authors, both from academia and research, as well as industry, for their contributions. We hope this collection of papers represents a valuable tool for everybody interested in research advances, emerging applications, and future challenges for research and development in collaborative networks. We very much appreciate the time spent and the dedication of the members of the PRO-VE International Program Committee who supported the selection of articles for this conference,

and provided valuable and constructive comments to help authors with improving the quality of their papers.

July 2016

Hamideh Afsarmanesh
Luis M. Camarinha-Matos
Antonio Lucas Soares

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**PRO-VE 2016 – 17th IFIP Working Conference
on Virtual Enterprises
Porto, Portugal, 3–5 Oct 2016**

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