

# Lecture Notes in Computer Science

1774

Edited by G. Goos, J. Hartmanis and J. van Leeuwen

**Springer**

*Berlin*

*Heidelberg*

*New York*

*Barcelona*

*Hong Kong*

*London*

*Milan*

*Paris*

*Singapore*

*Tokyo*

Jaime Delgado George D. Stamoulis  
Al Mullery Didoe Prevedourou  
Keith Start (Eds.)

# Telecommunications and IT Convergence Towards Service E-volution

7th International Conference  
on Intelligence in Services and Networks, IS&N 2000  
Athens, Greece, February 23-25, 2000  
Proceedings



Springer

## Series Editors

Gerhard Goos, Karlsruhe University, Germany  
Juris Hartmanis, Cornell University, NY, USA  
Jan van Leeuwen, Utrecht University, The Netherlands

## Volume Editors

Jaime Delgado  
Pompeu Fabra University, Department of Technology  
La Rambla, 30-32, 08002 Barcelona, Spain  
E-mail: jaime.delgado@tecn.upf.es

George D. Stamoulis  
University of Crete, Department of Computer Science  
Knossos Ave., P.O. Box 2208, 7144 09 Heraklion, Crete, Greece  
E-mail: gstamoul@csd.uoc.gr

Al Mullery  
I C Europe  
06450 Belvédère, France  
E-mail: al.mullery@bigfoot.com

Didoe Prevedourou  
INTRACOM S.A., Hellenic Telecommunications and Electronics Industry  
Markopoulou Ave., 19 002 Peania, Attica, Greece  
E-mail: dpre@intracom.gr

Keith Start  
ORCA Research Associates  
6 Balally Hill, Dublin 16, Ireland  
E-mail: keiths@eircom.net

## Cataloging-in-Publication Data

*Die Deutsche Bibliothek - CIP-Einheitsaufnahme*  
Telecommunications and IT convergence : towards service evolution : proceedings /  
7th International Conference on Intelligence in Services and  
Networks. IS&N 2000. Athens, Greece, February 23 - 25, 2000. Jaime  
Delgado ... (ed.). - Berlin : Heidelberg : New York : Barcelona :  
Hong Kong : London : Milan : Paris : Singapore : Tokyo : Springer, 2000  
(Lecture notes in computer science : Vol. 1774)  
ISBN 3-540-67152-8

CR Subject Classification (1998): C.2, I.2.11, D.2, H.4.3, H.5, B.4.1, K.4, K.6

ISSN 0302-9743

ISBN 3-540-67152-8 Springer-Verlag Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

Springer-Verlag is a company in the specialist publishing group BertelsmannSpringer  
© Springer-Verlag Berlin Heidelberg 2000  
Printed in Germany

Typesetting: Camera-ready by author  
Printed on acid-free paper      SPIN: 10719902      06/3142      5 4 3 2 1 0

# **Telecommunications and IT Convergence**

## **Towards Service E-volution**

Telecommunications is the enabler of the emerging Information Society, whose members will greatly benefit from the provision of affordable, high-quality, ubiquitous services. A revolution in information technology and telecommunications is already in progress, and will escalate during the beginning of the 21st century. The two worlds have already begun to converge; this convergence path is marked by the continuously expanding penetration and scope of telecommunications services, thus broadening the opportunities available to the users.

However, the forthcoming integration of information technology and telecommunications implies neither that computers will disappear behind an "active network" nor that networks will disappear behind the "all-pervasive" computers; on the contrary, both will appear within a single system. In this combined system, active computation power will be pervasive (in every room, in every appliance, for every person), while all this "computation" will be effectively totally interconnected; more importantly, its scope will not just be the home or the business, it will be the entire globe.

One of the driving forces of convergence is the increasing competition among the different service-supplier chains in the field. Successful and innovative combination of computation and telecommunication capabilities and features tends to help the players involved to acquire competitive advantage. However, there is still a considerable way to go, and several key questions have yet to be answered. Who will be taking the market-lead in this race and what appear to be the most likely evolution paths? Which technologies are or will be playing a major role? What will the role and impact of the Internet be in this convergence process and how is it expected to evolve through this? What will be the impact of other factors such as regulatory and pricing policies?

The IS&N conferences have been devoted to techniques and tools for development and management of services and communications. With the theme of IS&N'2000 being *Telecommunications and IT Convergence Enabling Service Evolution*, the conference especially relates to trends and enabling technologies that can be brought to bear on this new, integrated world and on the breakthrough it promises in everyday life in the new millennium.

The IS&N conferences have their origins in the RACE programme of the European Union co-funded research. What was initiated as a set of project workshops addressing communications management and programming infrastructure, became a series of truly international conferences, given the general interest of the subject matter. These conferences offered a unique opportunity to discover and discuss the overall technical area of telecommunications services and the relevant software, covering subjects such as communications management, Intelligent Networks, mobility, architecture, brokerage, security, service modelling and creation, etc. The Conference has become, over the years, a major forum for the discussion of issues and the exchange of outstanding technical ideas and results related to the areas above.

For IS&N'2000, seven chapters, with a total of 23 papers, have been selected for this book; namely, eCommerce, Developing Communications Efficiency through Management and Control, Architectures for Multimedia Communications, Service

Creation Techniques for Software Development and Deployment, Agent-Based Management, Virtual Home Environment, Integrated and Scalable Solutions for Telecommunications Management. This shows that the issues related to communications management, architectures, and service creation are still of great interest, while the virtual home environment is emerging as a new key topic in IS&N.

In summary, this book reflects the state of the art in research on IS&N topics, with the focus mentioned above, not only from European Union co-funded projects (mainly in the ACTS programme), but also from research organisations around the globe.

February 2000

Jaime Delgado  
George D. Stamoulis  
Alvin Mullery  
Didoe Prevedourou  
Keith Start

## Previous IS&N Conferences and Proceedings

The first IS&N conference was organised in 1992 in Paris, France. Since then, the IS&N conferences have been held almost every year, with proceedings published as part of the Lecture Notes in Computer Science (LNCS) series of Springer-Verlag. These are as follows.

*“Towards a Pan-European Telecommunication Service Infrastructure – IS&N’94”*, Hans-Jürgen Kugler, Al Mullery, Norbert Niebert (Eds.), Aachen, Germany, September 1994, LNCS 851, ISBN 3-540-58420-X.

*“Bringing Telecommunication Services to the People – IS&N’95”*, Anne Clarke, Mario Campolargo, Nikos Karatzas (Eds.), Heraklion, Greece, October 1995, LNCS 998, ISBN 3-540-60479-0.

*“Intelligence in Services and Networks: Technology for Cooperative Competition – IS&N’97”*, Al Mullery, Michel Besson, Mario Campolargo, Roberta Gobbi, Rick Reed (Eds.), Cernobbio, Italy, May 1997, LNCS 1238, ISBN 3-540-63135-6.

*“Intelligence in Services and Networks: Technology for Ubiquitous Telecom Services – IS&N’98”*, Sebastiano Trigila, Al Mullery, Mario Campolargo, Hans Vanderstraeten, Marcel Mampaey (Eds.), Antwerp, Belgium, May 1998, LNCS 1430, ISBN 3-540-64598-5.

*“Intelligence in Services and Networks: Paving the Way for an Open Service Market – IS&N’99”*, Han Zuidweg, Mario Campolargo, Jaime Delgado, Al Mullery (Eds.), Barcelona, Spain, April 1999, LNCS 1597, ISBN 3-540-65895-5.

## List of Reviewers

Chelo Abarca  
 Miltos Anagnostou  
 Stefano Antoniazzi  
 Alessandro Barbagli  
 Speros Batistatos  
 Kyriakos Baxevanidis  
 Nuno Beires  
 Johan E. Bengtsson  
 Hendrik Berndt  
 Lennart H. Bjerring  
 Jose Maria Bonnet  
 Indranil Bose  
 Steffen Bretzke  
 Heinz Brüggemann  
 Gaetano Bruno  
 Magdaleine Chatzaki  
 Jaime Delgado  
 Luca Deri  
 Bruno Dillenseger  
 Manos Dramitinos  
 Sofoklis Efremidis  
 Pier Luigi Emiliani  
 Takeyuki Endoh  
 Motohisa Funabashi  
 Isabel Gallego  
 Dieter Gantenbein

Takeo Hamada  
 Harri Hansen  
 Keith Howker  
 Brendan Jennings  
 Mikael Jørgensen  
 Henryka Jormaka  
 Jorma Jormakka  
 Toni Jussila  
 Dimitrios Kalopsikakis  
 Fotis Karayannis  
 Andreas Kind  
 Anna Kyrikoglou  
 Maria Lambrou  
 Herbert Leitold  
 Beat Liver  
 Ferdinando Lucidi  
 Thomas Magedanz  
 Yannis Manoleessos  
 Claudio Maristany  
 Ramon Martí  
 Al Mullery  
 Norbet Niebert  
 Vincent Olive  
 Thanassis Papaioannou  
 Symeon Papavasiliou  
 George Pavlou

Reinhard Posch  
 Martin Potts  
 Didoe Prevedourou  
 Kimmo Raatikainen  
 Tony Richardson  
 Jose Luis Ruiz  
 Stelios Sartzetakis  
 Peter Schoo  
 Hans-Detlef Schulz  
 Fofy Setaki  
 Vjekoslav Sinkovic  
 Paul Spirakis  
 George D. Stamoulis  
 Keith Start  
 Peter Stollenmayer  
 Thanassis Tiropanis  
 Sebastiano Trigila  
 Kirsi Valtari  
 Eric Veldkamp  
 Iakovos Venieris  
 Paul Wallace  
 Frans Westerhuis  
 Mike Wooldridge  
 Fabrizio Zizza  
 Han Zuidweg  
 Kostas Zygorakis



## **Acknowledgements**

The authors of the papers in this volume are warmly thanked for their contribution. The authors of the many submitted papers that could not be accepted are also thanked for their efforts.

The editors would like to thank the members of the Technical Program Committee and the numerous reviewers, listed below, for their effort in assuring the quality of this volume, as well as the section editors, who have written the introductions to each section. We would also like to thank Fofy Setaki for her most valuable contribution to the organisation of the conference and Raymond Llavador, who assisted in the review process. Finally, special thanks go to Mario Campolargo, Kyriakos Baxevanidis and Alessandro Barbagli of the European Commission for their support and encouragement.

### **Steering Committee**

Alvin Mullery (Chairman), Jaime Delgado, Dido Prevedourou, George D. Stamoulis

### **Technical Programme Committee**

Jaime Delgado (Co-Chairman)

George Stamoulis (Co-Chairman)

Chelo Abarca

Miltos Anagnostou

Alessandro Barbagli

Speros Batistatos

Kyriakos Baxevanidis

Nuno Beires

Hendrik Berndt

Jose Maria Bonnet

Steffen Bretzke

Stefan Covaci

Petre Dini

Sofoklis Efremidis

Dieter Gantenbein

Anastasius Gavras

Brendan Jennings

Henryka Jormaka

Andreas Kind

Thomas Magedanz

Reinhard Posch

Kimmo Raatikainen

Stelios Sartzetakis

Peter Schoo

Paul Spirakis

Keith Start

Sebastiano Trigila

Eric Veldkamp

Mike Wooldridge

Fabrizio Zizza

Johan Zuidweg

### **Organising Committee**

Dido Prevedourou, Fofy Setaki

# Table of Contents

## **eCommerce**

Miltiades Anagnostou	1
----------------------	---

A Mobile Agent Brokering Environment for the Future Open Network Marketplace <i>David Chieng, Ivan Ho, Alan Marshall, Gerard Parr</i>	3
---	---

Legal and Administrative Services Through Electronic Commerce <i>Silvia Llorente, Jaime Delgado</i>	17
--	----

## **Developing Communications Efficiency Through Management and Control**

Tony Richardson	31
-----------------	----

Load Balancing for a Distributed CORBA-Based SCP <i>Conor McArdle, Niklas Widell, Christian Nyberg, Erik Lilja, Jenny Nyström, Thomas Curran</i>	33
---	----

Measurement Based Connection Admission Control Algorithm for ATM Networks that Use Low Level Compression <i>Ioannis Papaefstathiou</i>	49
--	----

Integrating Position Reporting, Routing and Mobility Management in Multihop Packet Radio Networks <i>Konstantinos Amouris, Symeon Papavassiliou, Sheng Xu</i>	61
---	----

## **Architectures for Multimedia Communications**

Han Zuidweg	73
-------------	----

Towards Mobile Agent Based Provision of Voice over IP Services <i>W. Chang, M. Fischer, T. Magedanz</i>	75
--	----

Supporting Advanced Multimedia Telecommunications Services Using the Distributed Component Object Model <i>Dionisis X. Adamopoulos, George Pavlou, Constantine A. Papandreou</i>	89
--	----

Near Client Caching in Large Scale iVoD Systems <i>P. Hoener, U. Killat</i>	105
--	-----

Integrated Trouble Management to Support Service Quality Assurance in a Multi-provider Context <i>Dan Dragan, Thomas Gringel, Jane Hall, Richard Sinnott, Michael Tschichholz, Wilhelm Vortisch</i>	117
<b>Service Creation Techniques for Software Development and Deployment</b> Peter Schoo	133
Web-Based Agent Applications: User Interfaces and Mobile Agents <i>Alberto Rodrigues da Silva, Miguel Mira da Silva, Artur Romão</i>	135
XML and CORBA, Synergistic or Competitive? <i>Steven Vermeulen, Bart Bauwens, Frans Westerhuis, Rudi Broos</i>	155
Multi-level Component Oriented Methodology for Service Creation <i>Kurt Verschaeve, Bart Wydaeghe, Frans Westerhuis, Jan De Moerloose</i>	169
Cooling the Hell of Distributed Applications' Deployment <i>José Bonnet, Fabrice Dubois, Sofoklis Efremidis, Pedro Leonardo, Nicholas Malavazos, Daniel Vincent</i>	181
<b>Agent-Based Management</b> Andreas Kind	189
An Approach to Network Control and Resource Management Based on Intelligent Agents <i>Evangelos Vayias, John Soldatos, Nikolas Mitrou</i>	191
Providing Customisable Network Management Services Through Mobile Agents <i>David Griffin, George Pavlou, Panos Georgatsos</i>	209
Accounting Architecture Involving Agent Capabilities <i>Kostas Zygorakis, Didoe Prevedourou, George Stamoulis</i>	227
IN Load Control Using a Competitive Market-Based Multi-agent System <i>A. Patel, K. Prouskas, J. Barria, J. Pitt</i>	239

**Virtual Home Environment**

Abarca Chelo	255
An Agent Based Service Inter-working Architecture for the Virtual Home Environment <i>P. Jaya Shankar, V. Chandrasekaran, N. Desikan</i>	257
Architectures for the Provision of Position Location Services in Cellular Networking Environments <i>Sofoklis A. Kyriazakos, George T. Karetsos</i>	269
PANI: Personal Agent for Network Intelligence <i>David Kerr, Richard Evans, John Hickie, Donie O'Sullivan, Setanta Mathews, James Kennedy</i>	283
Agent-Based Support of Advanced Personal Mobility Features <i>M. Louta, K. Raatikainen, A. Kaltabani, N. Liossis, E. Tzifa, P. Demestichas, M. Anagnostou</i>	297
<b>Integrated and Scalable Solutions for Telecommunications Management</b>	
Sebastiano Trigila	313
Approaches to Integrating Telecoms Management Systems <i>V. Wade, D. Lewis, C. Malbon, T. Richardson, L. Sorensen, C. Stathopoulos</i>	315
Deploying a Hierarchical Management Framework Using Mobile Agent Technology <i>Damianos Gavalas, Dominic Greenwood, Mohammed Ghanbari, Mike O'Mahony</i>	333
<b>List of Authors</b>	349