

LNCS 4761

Roman Obermaisser
Yunmook Nah
Peter Puschner
Franz J. Rammig (Eds.)

Software Technologies for Embedded and Ubiquitous Systems

5th IFIP WG 10.2 International Workshop, SEUS 2007
Santorini Island, Greece, May 2007
Revised Papers



ifip



Springer

TP31-53
S496
2007

Roman Obermaisser Yunmook Nah
Peter Puschner Franz J. Rammig (Eds.)

Software Technologies for Embedded and Ubiquitous Systems

5th IFIP WG 10.2 International Workshop, SEUS 2007
Santorini Island, Greece, May 7-8, 2007
Revised Papers



 Springer



Volume Editors

Roman Obermaisser

Peter Puschner

Vienna University of Technology, Real-Time Systems Group

Treitlstr. 3/182-1, 1040 Wien, Austria

E-mail: {romano, peter}@vmars.tuwien.ac.at

Yunmook Nah

Dankook University, Department of Electronics and Computer Engineering

Hannam-dong, Yongsan-gu, Seoul 140-714, Korea

E-mail: ymnah@dku.edu

Franz J. Rammig

University Paderborn, Design of Parallel Systems

Fürstenallee 11, 33102 Paderborn, Germany

E-mail: franz@uni-paderborn.de

Library of Congress Control Number: 2007936568

CR Subject Classification (1998): C.2, C.3, D.2, D.4, H.4, H.3, H.5

LNCS Sublibrary: SL 3 – Information Systems and Application, incl. Internet/Web and HCI

ISSN 0302-9743

ISBN-10 3-540-75663-9 Springer Berlin Heidelberg New York

ISBN-13 978-3-540-75663-7 Springer 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. Violations are liable to prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media

springer.com

© IFIP International Federation for Information Processing 2007

Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper SPIN: 12174065 06/3180 5 4 3 2 1 0

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Switzerland

John C. Mitchell

Stanford University, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz

University of Bern, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

University of Dortmund, Germany

Madhu Sudan

Massachusetts Institute of Technology, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Moshe Y. Vardi

Rice University, Houston, TX, USA

Gerhard Weikum

Max-Planck Institute of Computer Science, Saarbruecken, Germany

Preface

The workshop on Software Technologies for Future Embedded and Ubiquitous Systems (SEUS) started as an IEEE event in 2003 but was reborn as an IFIP event during 2006-2007. The SEUS series will be one of the few flagship events of the newly formed IFIP WG10.2. The Steering Committee of the new SEUS series is chaired by Franz Rammig, the chairman of IFIP TC10. This workshop continued the tradition of the first, second, third, and fourth IEEE SEUS workshops held in Hakodate (Japan), Vienna (Austria), Seattle (USA), and Gyeongju (Korea), respectively. It was our great honor and pleasure to hold SEUS 2007 on Santorini, the most famous island for its stunning caldera view among the Cyclades cluster in Greece.

The application domain of both embedded computing and ubiquitous systems have had explosive growth over the past few years. Given the advances in these fields, and also those in the areas of distributed computing, sensor networks, middleware, etc., the area of ubiquitous embedded computing is now being envisioned as the way of the future. The systems and technologies that will arise in support of ubiquitous embedded computing will undoubtedly need to address a variety of issues, including dependability, real-time, human-computer interaction, autonomy, resource constraints, etc. All of these requirements pose a challenge to the research community. The purpose of SEUS 2007 was to bring together researchers and practitioners with an interest in advancing the state of the art and the state of practice in this emerging field, with the hope of fostering new ideas, collaborations and technologies.

SEUS will now be even more of an elite event where new trends will be discussed based on a very selective set of contributions. One of its unique characteristic is that some of the papers are presented by invited world-class research leaders, and we have 23 such contributions in this workshop. This year we received 102 regular submissions for the technical program and finally accepted 35 papers, including 31 full papers and 4 short papers, with an acceptance rate of 34%. We owe a great deal of thanks to the members of the Program Committee and the reviewers. The success of this year's SEUS would not be possible without their hard work. We are also grateful to all the members of the Steering Committee for their advice and support. We would also like to thank the organizers of ISORC 2007 for their help in organizing the workshop. Finally, we would like to thank all the authors for their contributions, which made the workshop a success.

June 2007

Yunmook Nah
Roman Obermaisser

Organization

General Co-chairs

Moon Hae Kim
Franz J. Rammig
Peter Puschner

Konkuk University, Korea
University of Paderborn, Germany
Vienna University of Technology, Austria

Program Co-chairs

Yunmook Nah
Roman Obermaisser

Dankook University, Korea
Vienna University of Technology, Austria

Publicity Co-chairs

Tei-wei Kuo
Seongje Cho

National Taiwan University, Taiwan
Dankook University, Korea

Program Committee

Uwe Brinkschulte
Lynn Choi
Paul Couderc
Wilfried Elmenreich
Sebastian N. Fischmeister
Kaori Fujinami

University of Karlsruhe, Germany
Korea University, Korea
IRISA, France
Vienna University of Technology, Austria
University of Pennsylvania, USA
Tokyo University of Agriculture and
Technology, Japan

Petr Grillinger
Minyi Guo
Jan Gustafsson
Hwansoo Han

TTTech, Austria
University of Aizu, Japan
Mälardalen University, Sweden
Korea Advanced Institute of Science and
Technology, Korea
National Taiwan University, Taiwan
Information and Communication University,
Korea

Tei-Wei Kuo
Dongman Lee

Budapest University of Technology and
Economics, Hungary
University of Hyogo and Nagoya University,
Japan

Istvan Majzik

Yukikazu Nakamoto

VIII Organization

Michael Paulitsch
Philipp Peti
Taehyung Wang

Honeywell AES Centers of Excellence, USA
General Motors Europe, Germany
California State University Northridge, USA

Sponsoring Institutions

The Aerospace Cooperation
TTTech Computertechnik AG

Lecture Notes in Computer Science

Sublibrary 3: Information Systems and Application, incl. Internet/Web and HCI

For information about Vols. 1–4295
please contact your bookseller or Springer

- Vol. 4761: R. Obermaisser, Y. Nah, P. Puschner, F.J. Ramming (Eds.), *Software Technologies for Embedded and Ubiquitous Systems*. XIV, 563 pages. 2007.
- Vol. 4740: L. Ma, M. Rauterberg, R. Nakatsu (Eds.), *Entertainment Computing – ICEC 2007*. XXX, 480 pages. 2007.
- Vol. 4730: C. Peters, P. Clough, F.C. Gey, J. Karlgren, B. Magnini, D.W. Oard, M. de Rijke, M. Stempfhuber (Eds.), *Evaluation of Multilingual and Multi-modal Information Retrieval*. XXIV, 998 pages. 2007.
- Vol. 4723: M. R. Berthold, J. Shawe-Taylor, N. Lavrač (Eds.), *Advances in Intelligent Data Analysis VII*. XIV, 380 pages. 2007.
- Vol. 4721: W. Jonker, M. Petković (Eds.), *Secure Data Management*. X, 213 pages. 2007.
- Vol. 4718: J. Hightower, B. Schiele, T. Strang (Eds.), *Location- and Context-Awareness*. X, 297 pages. 2007.
- Vol. 4717: J. Krumm, G.D. Abowd, A. Seneviratne, T. Strang (Eds.), *UbiComp 2007: Ubiquitous Computing*. XIX, 520 pages. 2007.
- Vol. 4715: J.M. Haake, S.F. Ochoa, A. Cechich (Eds.), *Groupware: Design, Implementation, and Use*. XIII, 355 pages. 2007.
- Vol. 4714: G. Alonso, P. Dadam, M. Rosemann (Eds.), *Business Process Management*. XIII, 418 pages. 2007.
- Vol. 4704: D. Barbosa, A. Bonifati, Z. Bellahsene, E. Hunt, R. Unland (Eds.), *Database and XML Technologies*. X, 141 pages. 2007.
- Vol. 4690: Y. Ioannidis, B. Novikov, B. Rachev (Eds.), *Advances in Databases and Information Systems*. XIII, 377 pages. 2007.
- Vol. 4675: L. Kovács, N. Fuhr, C. Meghini (Eds.), *Research and Advanced Technology for Digital Libraries*. XVII, 585 pages. 2007.
- Vol. 4674: Y. Luo (Ed.), *Cooperative Design, Visualization, and Engineering*. XIII, 431 pages. 2007.
- Vol. 4663: C. Baranauskas, P. Palanque, J. Abascal, S.D.J. Barbosa (Eds.), *Human-Computer Interaction – INTERACT 2007, Part II*. XXXIII, 735 pages. 2007.
- Vol. 4662: C. Baranauskas, P. Palanque, J. Abascal, S.D.J. Barbosa (Eds.), *Human-Computer Interaction – INTERACT 2007, Part I*. XXXIII, 637 pages. 2007.
- Vol. 4658: T. Enokido, L. Barolli, M. Takizawa (Eds.), *Network-Based Information Systems*. XIII, 544 pages. 2007.
- Vol. 4656: M.A. Wimmer, J. Scholl, Å. Grönlund (Eds.), *Electronic Government*. XIV, 450 pages. 2007.
- Vol. 4655: G. Psaila, R. Wagner (Eds.), *E-Commerce and Web Technologies*. VII, 229 pages. 2007.
- Vol. 4654: I.-Y. Song, J. Eder, T.M. Nguyen (Eds.), *Data Warehousing and Knowledge Discovery*. XVI, 482 pages. 2007.
- Vol. 4653: R. Wagner, N. Revell, G. Pernul (Eds.), *Database and Expert Systems Applications*. XXII, 907 pages. 2007.
- Vol. 4636: G. Antoniou, U. Alßmann, C. Baroglio, S. Decker, N. Henze, P.-L. Patranjan, R. Tolksdorf (Eds.), *Reasoning Web*. IX, 345 pages. 2007.
- Vol. 4611: J. Indulska, J. Ma, L.T. Yang, T. Ungerer, J. Cao (Eds.), *Ubiquitous Intelligence and Computing*. XXIII, 1257 pages. 2007.
- Vol. 4607: L. Baresi, P. Fraternali, G.-J. Houben (Eds.), *Web Engineering*. XVI, 576 pages. 2007.
- Vol. 4606: A. Pras, M. van Sinderen (Eds.), *Dependable and Adaptable Networks and Services*. XIV, 149 pages. 2007.
- Vol. 4605: D. Papadias, D. Zhang, G. Kollios (Eds.), *Advances in Spatial and Temporal Databases*. X, 479 pages. 2007.
- Vol. 4602: S. Barker, G.-J. Ahn (Eds.), *Data and Applications Security XXI*. X, 291 pages. 2007.
- Vol. 4601: S. Spaccapietra, P. Atzeni, F. Fages, M.-S. Hacid, M. Kifer, J. Mylopoulos, B. Pernici, P. Shvaiko, J. Trujillo, I. Zaihayeu (Eds.), *Journal on Data Semantics IX*. XV, 197 pages. 2007.
- Vol. 4592: Z. Kedad, N. Lammari, E. Métails, F. Meziane, Y. Rezgui (Eds.), *Natural Language Processing and Information Systems*. XIV, 442 pages. 2007.
- Vol. 4587: R. Cooper, J. Kennedy (Eds.), *Data Management*. XIII, 259 pages. 2007.
- Vol. 4577: N. Sebe, Y. Liu, Y.-t. Zhuang, T.S. Huang (Eds.), *Multimedia Content Analysis and Mining*. XIII, 513 pages. 2007.
- Vol. 4568: T. Ishida, S. R. Fussell, P. T. J. M. Vossen (Eds.), *Intercultural Collaboration*. XIII, 395 pages. 2007.
- Vol. 4566: M.J. Dainoff (Ed.), *Ergonomics and Health Aspects of Work with Computers*. XVIII, 390 pages. 2007.
- Vol. 4564: D. Schuler (Ed.), *Online Communities and Social Computing*. XVII, 520 pages. 2007.
- Vol. 4563: R. Shumaker (Ed.), *Virtual Reality*. XXII, 762 pages. 2007.
- Vol. 4561: V.G. Duffy (Ed.), *Digital Human Modeling*. XXIII, 1068 pages. 2007.
- Vol. 4560: N. Aykin (Ed.), *Usability and Internationalization, Part II*. XVIII, 576 pages. 2007.

- Vol. 4559: N. Aykin (Ed.), *Usability and Internationalization*, Part I. XVIII, 661 pages. 2007.
- Vol. 4558: M.J. Smith, G. Salvendy (Eds.), *Human Interface and the Management of Information*, Part II. XXIII, 1162 pages. 2007.
- Vol. 4557: M.J. Smith, G. Salvendy (Eds.), *Human Interface and the Management of Information*, Part I. XXII, 1030 pages. 2007.
- Vol. 4541: T. Okadome, T. Yamazaki, M. Makhtari (Eds.), *Pervasive Computing for Quality of Life Enhancement*. IX, 248 pages. 2007.
- Vol. 4537: K.C.-C. Chang, W. Wang, L. Chen, C.A. Ellis, C.-H. Hsu, A.C. Tsoi, H. Wang (Eds.), *Advances in Web and Network Technologies, and Information Management*. XXIII, 707 pages. 2007.
- Vol. 4531: J. Indulska, K. Raymond (Eds.), *Distributed Applications and Interoperable Systems*. XI, 337 pages. 2007.
- Vol. 4526: M. Malek, M. Reitenspieß, A. van Moorsel (Eds.), *Service Availability*. X, 155 pages. 2007.
- Vol. 4524: M. Marchiori, J.Z. Pan, C.d.S. Marie (Eds.), *Web Reasoning and Rule Systems*. XI, 382 pages. 2007.
- Vol. 4519: E. Franconi, M. Kifer, W. May (Eds.), *The Semantic Web: Research and Applications*. XVIII, 830 pages. 2007.
- Vol. 4518: N. Fuhr, M. Lalmas, A. Trotman (Eds.), *Comparative Evaluation of XML Information Retrieval Systems*. XII, 554 pages. 2007.
- Vol. 4508: M.-Y. Kao, X.-Y. Li (Eds.), *Algorithmic Aspects in Information and Management*. VIII, 428 pages. 2007.
- Vol. 4506: D. Zeng, I. Gotham, K. Komatsu, C. Lynch, M. Thurmond, D. Madigan, B. Lober, J. Kvach, H. Chen (Eds.), *Intelligence and Security Informatics: Biosurveillance*. XI, 234 pages. 2007.
- Vol. 4505: G. Dong, X. Lin, W. Wang, Y. Yang, J.X. Yu (Eds.), *Advances in Data and Web Management*. XXII, 896 pages. 2007.
- Vol. 4504: J. Huang, R. Kowalczyk, Z. Maamar, D. Martin, I. Müller, S. Stoutenburg, K.P. Sycara (Eds.), *Service-Oriented Computing: Agents, Semantics, and Engineering*. X, 175 pages. 2007.
- Vol. 4500: N.A. Streitz, A.D. Kameas, I. Mavrommati (Eds.), *The Disappearing Computer*. XVIII, 304 pages. 2007.
- Vol. 4495: J. Krogstie, A. Opdahl, G. Sindre (Eds.), *Advanced Information Systems Engineering*. XVI, 606 pages. 2007.
- Vol. 4480: A. LaMarca, M. Langheinrich, K.N. Truong (Eds.), *Pervasive Computing*. XIII, 369 pages. 2007.
- Vol. 4471: P. Cesar, K. Chorianopoulos, J.F. Jensen (Eds.), *Interactive TV: A Shared Experience*. XIII, 236 pages. 2007.
- Vol. 4469: K.-c. Hui, Z. Pan, R.C.-k. Chung, C.C.L. Wang, X. Jin, S. Göbel, E.C.-L. Li (Eds.), *Technologies for E-Learning and Digital Entertainment*. XVIII, 974 pages. 2007.
- Vol. 4443: R. Kotagiri, P. Radha Krishna, M. Mohania, E. Nantajeewarawat (Eds.), *Advances in Databases: Concepts, Systems and Applications*. XXI, 1126 pages. 2007.
- Vol. 4439: W. Abramowicz (Ed.), *Business Information Systems*. XV, 654 pages. 2007.
- Vol. 4430: C.C. Yang, D. Zeng, M. Chau, K. Chang, Q. Yang, X. Cheng, J. Wang, F.-Y. Wang, H. Chen (Eds.), *Intelligence and Security Informatics*. XII, 330 pages. 2007.
- Vol. 4425: G. Amati, C. Carpineto, G. Romano (Eds.), *Advances in Information Retrieval*. XIX, 759 pages. 2007.
- Vol. 4412: F. Stajano, H.J. Kim, J.-S. Chae, S.-D. Kim (Eds.), *Ubiquitous Convergence Technology*. XI, 302 pages. 2007.
- Vol. 4402: W. Shen, J.-Z. Luo, Z. Lin, J.-P.A. Barthès, Q. Hao (Eds.), *Computer Supported Cooperative Work in Design III*. XV, 763 pages. 2007.
- Vol. 4398: S. Marchand-Maillet, E. Bruno, A. Nürnberger, M. Detyniecki (Eds.), *Adaptive Multimedia Retrieval: User, Context, and Feedback*. XI, 269 pages. 2007.
- Vol. 4397: C. Stephanidis, M. Pieper (Eds.), *Universal Access in Ambient Intelligence Environments*. XV, 467 pages. 2007.
- Vol. 4380: S. Spaccapietra, P. Atzeni, F. Fages, M.-S. Hacid, M. Kifer, J. Mylopoulos, B. Pernici, P. Shvaiko, J. Trujillo, I. Zaihrayeu (Eds.), *Journal on Data Semantics VIII*. XV, 219 pages. 2007.
- Vol. 4365: C.J. Bussler, M. Castellanos, U. Dayal, S. Navathe (Eds.), *Business Intelligence for the Real-Time Enterprises*. IX, 157 pages. 2007.
- Vol. 4353: T. Schwentick, D. Suciu (Eds.), *Database Theory – ICDT 2007*. XI, 419 pages. 2006.
- Vol. 4352: T.-J. Cham, J. Cai, C. Dorai, D. Rajan, T.-S. Chua, L.-T. Chia (Eds.), *Advances in Multimedia Modeling, Part II*. XVIII, 743 pages. 2006.
- Vol. 4351: T.-J. Cham, J. Cai, C. Dorai, D. Rajan, T.-S. Chua, L.-T. Chia (Eds.), *Advances in Multimedia Modeling, Part I*. XIX, 797 pages. 2006.
- Vol. 4328: D. Penkler, M. Reitenspiess, F. Tam (Eds.), *Service Availability*. X, 289 pages. 2006.
- Vol. 4321: P. Brusilovsky, A. Kobsa, W. Nejdl (Eds.), *The Adaptive Web*. XII, 763 pages. 2007.
- Vol. 4317: S.K. Madria, K.T. Claypool, R. Kannan, P. Uppuluri, M.M. Gore (Eds.), *Distributed Computing and Internet Technology*. XIX, 466 pages. 2006.
- Vol. 4312: S. Sugimoto, J. Hunter, A. Rauber, A. Morishima (Eds.), *Digital Libraries: Achievements, Challenges and Opportunities*. XVIII, 571 pages. 2006.
- Vol. 4306: Y. Avrithis, Y. Kompatsiaris, S. Staab, N.E. O'Connor (Eds.), *Semantic Multimedia*. XII, 241 pages. 2006.
- Vol. 4302: J. Domingo-Ferrer, L. Franconi (Eds.), *Privacy in Statistical Databases*. XI, 383 pages. 2006.
- Vol. 4299: S. Renals, S. Bengio, J.G. Fiscus (Eds.), *Machine Learning for Multimodal Interaction*. XII, 470 pages. 2006.

Table of Contents

Ubiquitous Computing Frameworks

An Efficient Method to Create Business Level Events Using Complex Event Processing Based on RFID Standards	1
<i>Byung-Kook Son, Jun-Hwan Lee, Kyung-Lang Park, Cheong-Ghil Kim, Hie-Cheol Kim, and Shin-Dug Kim</i>	
Physical/Cyber Objects Management Framework for Multiple-Area Detectable RFID	11
<i>Masayuki Iwai, Ryo Osawa, Suzuki Kei, Takuya Imaeda, and Hideyuki Tokuda</i>	
A Task Decomposition Scheme for Context Aggregation in Personal Smart Space	20
<i>Hoseok Ryu, Insuk Park, Soon J. Hyun, and Dongman Lee</i>	
Distributed k-NN Query Processing for Location Services	30
<i>Jonghyeong Han, Joonwoo Lee, Seungyong Park, Jaeil Hwang, and Yunmook Nah</i>	
Ontology Based Context Alignment for Heterogeneous Context Aware Services	40
<i>Seungkeun Lee</i>	
Community Computing Model Supporting Community Situation Based Strict Cooperation and Conflict Resolution	47
<i>Youna Jung, Jungtae Lee, and Minkoo Kim</i>	

Safety-Critical Systems

Advancements in Dependable Time-Triggered Communication	57
<i>Wilfried Steiner</i>	
On Distributed Real-Time Scheduling in Networked Embedded Systems in the Presence of Crash Failures	67
<i>Binoy Ravindran, Jonathan S. Anderson, and E. Douglas Jensen</i>	
Probabilistic Optimization and Assessment of Voting Strategies for X-by-Wire Systems	82
<i>Markus Kucera and Hans Mauser</i>	
Application of Safety Analyses in Model Driven Development	93
<i>Javier Fernández Briones, Miguel Ángel de Miguel, J.P. Silva, and Alejandro Alonso</i>	

Mission Modes for Safety Critical Java 105
Martin Schoeberl

Safety Property Analysis Techniques for Cooperating Embedded
Systems Using LTS 114
Woo Jin Lee, Ho-Jun Kim, and Heung Seok Chae

Validation of Embedded and Ubiquitous Systems

Testing Embedded Control Systems with TTCN-3: An Overview on
TTCN-3 Continuous 125
Ina Schieferdecker and Jürgen Großmann

Cross-Platform Verification Framework for Embedded Systems..... 137
*Ingomar Wenzel, Raimund Kirner, Bernhard Rieder, and
Peter Puschner*

Experimental Analysis on Time-Triggered Power Consumption
Measurement with DVS-Enabled Multiple Power Domain Platform 149
*Songah Chae, Doo-Hyun Kim, Changhee Jung, Duk-Kyun Woo, and
Chaedeok Lim*

A Framework for Hardware-in-the-Loop Testing of an Integrated
Architecture 159
Martin Schlager, Roman Obermaisser, and Wilfried Elmenreich

An Embedded Integration Prototyping System Based on Component
Technique 171
*Youngjin Jung, Jeongbae Lee, Jinbaek Kwon, Keewook Rim, and
Sangyoung Cho*

Ubiquitous Computing Applications

TMO Structuring of a Networked System for Seamless Streaming and
Tiled Display of High-Definition Movies 181
*Sheng Liu, K.H. (Kane) Kim, Sung-Jin Kim, Zhen Zhang,
Jongho Nang, Ki-Seok Choi, and Yongbin Kang*

Design and Experimental Validation of UAV Control System Software
Based on the TMO Structuring Scheme 192
*Hansol Park, Moon Hae Kim, Chun-Hyon Chang, Keechon Kim,
Jung-Guk Kim, and Doo-Hyun Kim*

Lifestyle Ubiquitous Gaming: Computer Games Making Daily Lives
Fun 202
*Eiji Tokunaga, Masaaki Ayabe, Hiroaki Kimura, and
Tatsuo Nakajima*

Speech Recognition System Using DHMMs Based on Ubiquitous Environment	213
<i>Jong-Hun Kim, Un-Gu Kang, Kee-Wook Rim, and Jung-Hyun Lee</i>	
Healthcare Information Management System in Home Environment	223
<i>Chang-Sun Shin, Su-Chong Joo, and Chang-Won Jeong</i>	
Effective Appliance Selection by Complementary Context Feeding in Smart Home System	233
<i>Taek Lee, Jiyong Park, and Hoh Peter In</i>	
Vector Graphic Reference Implementation for Embedded System	243
<i>Sang-Yun Lee and Byung-Uk Choi</i>	

Scheduling and Non Functional Properties

A QoS Routing Protocol for Mobile Ad Hoc Networks Based on a Reservation Pool	253
<i>Donghak Pyo, Sunggu Lee, and Min-Gu Lee</i>	
Exact Schedulability Analysis for Static-Priority Global Multiprocessor Scheduling Using Model-Checking	263
<i>Nan Guan, Zonghua Gu, Qingxu Deng, Shuaihong Gao, and Ge Yu</i>	
Soft Real-Time Task Response Time Prediction in Dynamic Embedded Systems	273
<i>Cássia Yuri Tatibana, Carlos Montez, and Rômulo Silva de Oliveira</i>	
Transparent and Selective Real-Time Interrupt Services for Performance Improvement	283
<i>Jinkyu Jeong, Euiyeong Seo, Dongsung Kim, Jin-Soo Kim, Joonwon Lee, Yung-Joon Jung, Donghwan Kim, and Kanghee Kim</i>	
An Approach for Energy-Aware Management in Ubiquitous Home Network Environment	293
<i>Hyung-Soo Mok, Sung-Yong Son, Jun Hee Hong, and Sanghoon Kim</i>	
On-Chip Bus Architecture Optimization for Multi-core SoC Systems ...	301
<i>Cheng-Min Lien, Ya-Shu Chen, and Chi-Sheng Shih</i>	
An Effective Path Selection Method in Multiple Care-of Addresses MIPv6 with Parallel Delay Measurement Technique	311
<i>Jungwook Song, Heemin Kim, and Sunyoung Han</i>	

Self-organization and Reconfiguration

Self-organizing Resource-Aware Clustering for Ad Hoc Networks	319
<i>Tales Heimfarth, Peter Janacik, and Franz J. Rammig</i>	

Intelligent Context-Awareness System Using Improved Self-adaptive Back Propagation Algorithm	329
<i>Sang-Hun Eo, Wei Zha, Byeong-Seob You, Dong-Wook Lee, and Hae-Young Bae</i>	
Towards an Artificial Hormone System for Self-organizing Real-Time Task Allocation	339
<i>Uwe Brinkschulte, Mathias Pacher, and Alexander von Renteln</i>	
On Self-aware Delay Time Based Service Request Optimization for Gateway Stability in Autonomic Self-healing Systems	348
<i>Junaid Ahsenali Chaudhry, Yonghwan Lee, Seungkyu Park, and Dugki Min</i>	
Algorithmic Skeletons for the Programming of Reconfigurable Systems	358
<i>Florian Dittmann</i>	
A Framework for Supporting the Configuration and Automatic Integration of Heterogeneous Location Sensors	368
<i>Yoo Chul Chung, Yangwoo Ko, Youngrock Cha, and Dongman Lee</i>	

Service Discovery and Development Platform

Searching Visual Media Service Providers Using ASN.1-Based Ontology Reasoning	378
<i>Youngkun Min, Bogju Lee, and Yunmook Nah</i>	
SharedSpace Based Service Discovery Mechanism and Its Implementation for Ubiquitous Environments	384
<i>Sangdo Park, Junhyeong Kim, and Paul Barom Jeon</i>	
A Study of Developing Virtual Prototyping by Using JavaBean Interface Tool and SystemC Engine	389
<i>Husni Teja Sukmana, Jeong B. Lee, Jong Il Kim, Young J. Jung, Jinbaek Kwon, Kee Wook Rim, and Young R. Lee</i>	
Configurable Virtual Platform Environment Using SID Simulator and Eclipse	394
<i>Hadipurnawan Satria, Baatarbileg Altangerel, Jinbaek Kwon, and Jeongbae Lee</i>	

Wireless Networks

An Energy-Efficient k -Disjoint-Path Routing Algorithm for Reliable Wireless Sensor Networks	399
<i>Jang Woon Baek, Young Jin Nam, and Dae-Wha Seo</i>	

Supporting Mobile Ubiquitous Applications with Mobility Prediction and Soft Handoff	409
<i>Marcello Cinque and Stefano Russo</i>	
Event-Driven Power Management for Wireless Sensor Networks	419
<i>Sang Hoon Lee, Byong-Ha Cho, Lynn Choi, and Sun-Joong Kim</i>	
Time Synchronization in Wireless Sensor Network Applications	429
<i>Y.S. Hong and J.H. No</i>	
GENSEN: A Topology Generator for Real Wireless Sensor Networks Deployment	436
<i>Tiago Camilo, Jorge Sá Silva, André Rodrigues, and Fernando Boavida</i>	
Energy-Aware Routing for Wireless Sensor Networks by AHP	446
<i>Xiaoling Wu, Jinsung Cho, Brian J. d'Auriol, and Sungyoung Lee</i>	
A Wireless System for Real-Time Environmental and Structural Monitoring	456
<i>Valerio Plessi, Filippo Bastianini, and Sahra Sedigh</i>	

Middleware Architectures and Virtualization

Integrated Notification Architecture Based on Overlay Against DDoS Attacks on Convergence Network	466
<i>Mihui Kim, Jaewon Seo, and Kijoon Chae</i>	
Making Middleware Secure on Embedded Terminals	477
<i>Yoshiharu Asakura, Atsushi Honda, Satoshi Hieda, Hiroshi Chishima, and Naoki Sato</i>	
Dynamic Translator-Based Virtualization	486
<i>Yuki Kinebuchi, Hidenari Koshimae, Shuichi Oikawa, and Tatsuo Nakajima</i>	
Mesovirtualization: Lightweight Virtualization Technique for Embedded Systems	496
<i>Megumi Ito and Shuichi Oikawa</i>	

Environment Interaction

Building a Customizable User Interface Framework Using Hyperlinks for Smart Devices	506
<i>Mitsuko Sato, Eigo Okada, and Yukikazu Nakamoto</i>	
An Efficient Location Index for the Semantic Search of Moving Objects	516
<i>Dong-Oh Kim, Jung-Su Shin, Hong-Koo Kang, and Ki-Joon Han</i>	

Model-Driven Development of Ubiquitous Applications for
Sensor-Actuator-Networks with Abstract State Machines 527
 Sebastian Schuster and Uwe Brinkschulte

Design and Implementation of Peripheral Sharing Mechanism on
Pervasive Computing with Heterogeneous Environment 537
 Wonhong Kwon, Han Wook Cho, and Yong Ho Song

A Review on System Architectures for Sensor Fusion Applications..... 547
 Wilfried Elmenreich

Author Index 561

An Efficient Method to Create Business Level Events Using Complex Event Processing Based on RFID Standards*

Byung-Kook Son, Jun-Hwan Lee, Kyung-Lang Park, Cheong-Ghil Kim,
Hie-Cheol Kim, and Shin-Dug Kim

Department of Computer Science, Yonsei University,
Seoul, Korea
{ssonkk, jhlee, lanx}@parallel.yonsei.ac.kr,
{Tetons, sdkim}@yonsei.ac.kr
School of Computer and Communication Engineering, Daegu University,
Daegu, Korea
hckim@daegu.ac.kr

Abstract. RFID systems should be designed to process a large number of RFID data in real time. Therefore, there have been much research and company studies regarding RFID data processing. One of methods is CEP (Complex Event Processing), which can provide a method to process RFID data efficiently. However, previous work is just focused on raw RFID data processing, such as data filtering, the elimination of duplicated data, and the aggregation of data. Also, it creates primitive events based on just one physical or logical reader. Therefore, processing overhead for complex events may increase. And it cannot provide business level events. Therefore, we propose a method that can reduce processing overhead and create business level events by using CEP. Proposed method provides two primitive events that are defined by using the relationship of two readers. Thus, when any pattern of events is matched for a specific complex event, business level events can be generated and execution time can be reduced comparing with other mechanisms without those events. And, execution time can be reduced by about 57% as compared to others.

1 Introduction

RFID (Radio Frequency Identification) systems are constructed as four major components, i.e., the tags with unique ID, the RFID readers that identify any tags by using RF frequency, the middleware that can process raw RFID data, and the applications. Recently, EPCglobal [1] leads to standards for the components of RFID systems such as, tag data, air interface for communication, RFID middleware, and so on.

RFID systems should be designed to process many data in real time. Those data is processed by the RFID middleware.

* This research was supported by the UPLUS project of Ministry of Commerce, Industry and Energy.