ICEIS 2002

FOURTH INTERNATIONAL CONFERENCE ON ENTERPRISE INFORMATION SYSTEMS

Proceedings

Volume 2

CIUDAD REAL, SPAIN · APRIL 3-6, 2002

HOSTED BY
THE SCHOOL OF INFORMATICS OF THE
UNIVERSITY OF CASTILLA-LA MANCHA

UCLM
UNIVERSIDAD DE CASTILLA-LA MANCHA

CO-ORGANIZED BY
THE SCHOOL OF TECHNOLOGY
OF SETÚBAL

Escola
Superior
Tecnologia
SETÚBAL

IN COLLABORATION WITH
AAAI

ICEIS

2002

ICEIS 2002

Proceedings of the Fourth International Conference on Enterprise Information Systems

Volume 2

Ciudad Real, SPAIN

April 3 – 6, 2002

Hosted by the
School of Informatics of the University of Castilla-La Mancha
Co-organized by the
School of Technology of Setúbal
in Collaboration with
AAAI

© Copyright 2002
ICEIS Press
All rights reserved
Reproduction or translation of any part of this work without permission of the copyright owner is unlawful. Requests of permission or further information should be addressed to ICEIS Press
Secretariat: secretariat@iceis.org

Edited by José Braz, Mario Piattini and Joaquim Filipe

ISBN: 972-98050-6-7
Depósito Legal Número: 176839/02
(Volume 1 and Volume 2)

Printed in Portugal
ICEIS Press / Escola Superior de Tecnologia de Setúbal
Campus do Instituto Politécnico de Setúbal
Rua do Vale de Chaves, Estefanilha
2914-508 Setúbal

produced using laser printers from XEROX and XETCOPY
THE DOCUMENT COMPANY
XEROX

BRIEF CONTENTS

BRIEF CONTENTS v

ORGANIZATION vi

INVITED SPEAKERS vii

SENIOR PROGRAM COMMITTEE ix

REGULAR PROGRAM COMMITTEE x

AUXILIARY REVIEWERS xiii

SELECTED PAPERS BOOK xiv

SPONSORING xv

FOREWORD xvi

CONTENTS xviii

ORGANIZATION

CONFERENCE CHAIR:

Joaquim Filipe, Escola Superior de Tecnologia of Setúbal, Portugal.

PROGRAM CO-CHAIRS:

Mario Piattini, E.S. Informática - Univ. de Castilla-La Mancha, Spain.

Bernadette Sharp, School of Computing, Staffordshire University, UK.

Slimane Hammoudi, École Supérieure d'Eléctronique de l'Ouest, France.

ORGANIZING COMMITTEE:

Mario Piattini , Ismael Caballero, Coral Calero, José Jesús Castro, Eduardo Fernández-Medina, Félix Óscar García, Marcela Genero, Luis Jiménez, Mar Jiménez, Luis Márquez, José Ángel Olivas, Macario Polo, Manuel Prieto, Francisco Ruiz, Manuel Ángel Serrano, Aurora Vizcaíno, from

Universidad de Castilla-La Mancha, Ciudad Real, Spain.

José Braz, José Cordeiro, Hugo Gamboa, Paula Miranda, Nuno Pina, Anibal Ponte, Sara Silva, from

Escola Superior de Tecnologia of Setúbal, Portugal.

INVITED SPEAKERS

KEYNOTE LECTURES

Giovanni Cantone, (University of Rome at Tor Vergata)
EXPERIMENTAL SOFTWARE ENGINEERING: Role and impact of measurement models on empirical processes

Thomas Greene, (MIT Laboratory for Computer Science, USA.)
ENTERPRISE INFORMATION SYSTEMS AND THE GLOBAL INFORMATION NETWORK: Change is certain, progress is optional

Oleg Gusikhin, (Ford Scientific Research Laboratory, USA)
ANALYTICAL FRAMEWORK FOR DATA INTEGRATION IN MANUFACTURING EXECUTION SYSTEMS

Antoni Olivé, (Polytechnic University of Catalunya, Spain)
SPECIFIC RELATIONSHIP TYPES IN CONCEPTUAL MODELING: The Cases of Generic and with Common Participants

TUTORIALS

Ilia Bider, (IbisSoft, Sweden)
BUSINESS PROCESS MODELING AS A METHOD OF REQUIREMENTS ENGINEERING

Ned Chapin, (InfoSci Inc., USA)
MAINTENANCE OF INFORMATION SYSTEMS

INVITED SPEAKERS

Qusay H. Mahmoud, (Simon Fraser University, Canada)
DEVELOPING ENTERPRISE APPLICATIONS USING JAVA

Raghavan Srinivas, (Sun Microsystems, USA)
NETWORK SECURITY CONCEPTS AND JAVA

CASE STUDIES

Carlos Basterra, (Oracle Ibérica, Spain)
ORACLE9I: THE PLATFORM FOR THE EBUSINESS

Carlos López Bravo, (InterSystems BV, Spain)
CACHE POST-RELATIONAL TECHNOLOGY

Ramiro Carballo, (GESEIN, Spain)
RISK MANAGMENT IN THE NEW ECONOMY: Estimation and Control of Projects for e-Business and Start-ups

Rodrigo de Salas Peña, (Getronic Grupo CP, Spain)
ICT INFRASTRUCTURES AND CUSTOMER INTERACTION

SENIOR PROGRAM COMMITTEE

Amaral, Luís, *University of Minho*, PORTUGAL

Baeza-Yates, Ricardo, *University of Chile*, CHILE

Bézivin, Jean, *University of Nantes*, FRANCE

Bonsón, Enrique, *University of Huelva*, SPAIN

Carvalho, João A., *University of Minho*, PORTUGAL

Cheng, Albert, *University of Houston and Rice University*, USA

Coelho, Helder, *FC - University of Lisbon*, PORTUGAL

Delgado, Miguel, *University of Granada*, SPAIN

Dietz, Jan, *Delft University of Technology*, THE NETHERLANDS

Dignum, Frank, *Utrecht University*, THE NETHERLANDS

Figueiredo, António, *University of Coimbra*, PORTUGAL

Greene, Thomas, *MIT*, UK

Guimarães, Nuno, *University of Lisbon*, PORTUGAL

Gupta, Jatinder, *Ball State University*, USA

Liu, Kecheng, *Staffordshire University*, UK

Luker, Paul, *De Montfort University*, UK

Lyytinen, Kalle, *University of Jyväskylä*, FINLAND

Manolopoulos, Yannis, *Aristotle University*, GREECE

Martins, José Legatheaux, *New University of Lisbon*, PORTUGAL

Matsumoto, Masao, *University of Tsukuba*, JAPAN

Odell, James, *James Odell Associates*, USA

Smirnov, Alexander, *St. Petersburg - SPIIRAS*, RUSSIA

Stamper, Ronald, *University of Twente*, NETHERLANDS

Tari, Zahir, *RMIT University*, AUSTRALIA

Toro, Miguel, *University of Sevilla*, SPAIN

Warkentin, Merrill, *Mississippi State University*, USA

Weigand, Hans, *Tilburg University*, THE NETHERLANDS

Welty, Christopher, *Vassar College*, USA

REGULAR PROGRAM COMMITTEE

Aguilar, Jesús, *University of Seville,* SPAIN

Albers, Patrick, *ESEO,* FRANCE

Alderson, Albert, *Staffordshire University,* UK

AL-Jadir, Lina, *American University of Beirut,* LEBANON

Antunes, Pedro, *University of Lisbon,* PORTUGAL

Aparício, Joaquim, *New University of Lisbon,* PORTUGAL

Barro, Senén, *University of Santiago de Compostela,* SPAIN

Belo, Carlos, *IT/IST - Technical University of Lisbon,* PORTUGAL

Bernus, Peter, *Griffith University,* AUSTRALIA

Bittel, Oliver, *FH Konstanz - University of Applied Sciences,* GERMANY

Boavida, Fernando, *University of Coimbra,* PORTUGAL

Brisaboa, Nieves, *Univ. de La Coruña,* SPAIN

Calero, Coral, *Univ. de Castilla-La Mancha,* SPAIN

Camp, Olivier, *ESEO,* FRANCE

Canós, José, *Polytechnic University of Valencia,* SPAIN

de Cesare, Sergio, *Brunel University,* UK

del Castillo, Ester, *UCLM,* SPAIN

Castro-Schez, José Jesús, *University of Castilla-La Mancha,* SPAIN

Castro, José Luis, *University of Granada,* SPAIN

Cernuzzi, Luca, *Universidad Católica "Nuestra Señora de la Asunción",* PARAGUAY

Chu, William Cheng-Chung, *TungHai University,* TAIWAN

Clarke, Rodney, *University of Wollongong,* AUSTRALIA

Claude, Chrisment, *IRIT/SIG,* FRANCE

Corchuelo, Rafael, *University of Seville,* SPAIN

Costa, Ernesto, *University of Coimbra,* PORTUGAL

Coulette, Bernard, *University of Toulouse 2,* FRANCE

Cox, Sharon, *University of Central England,* UK

Dolado, Javier, *Universidad del País Vasco,* SPAIN

Eardley, Alan, *Staffordshire University,* UK

REGULAR PROGRAM COMMITTEE

Emery, David, *Staffordshire University,* UK

Favela, Jesús, *CICESE,* USA

Ferreira, Paulo, *INESC-ID/IST - Tecnhical University of Lisbon,* PORTUGAL

Flory, Andre, *INSA of LYON,* FRANCE

Fred, Ana, *IST - Technical University of Lisbon,* PORTUGAL

Garbajosa, Juan, *Univ. Politécnica de Madrid,* SPAIN

González, Pascual, *University of Castilla-La Mancha,* SPAIN

Gough, Tom, *University of Leeds,* UK

Govaere, Virginie, *INRS,* FRANCE

Grönlund, Åke, *Umeå University,* SWEDEN

Gustavsson, Rune, *Blekinge Institute of Technology,* SWEDEN

Heng, Michael, *University of South Australia,* AUSTRALIA

Herrera, Francisco, *University of Granada,* SPAIN

Huang, Kaiyin, *Eindhoven University of Technology,* NETHERLANDS

Jaime, Arturo, *Univ. del País Vasco,* SPAIN

Jiménez Linares, Luís, *University of Castilla-La Mancha,* SPAIN

Joyanes, Luis, *Univ. Pontificia de Salamanca,* SPAIN

Karacapilidis, Nikos, *University of Patras,* GREECE

Labidi, Sofiane, *Federal University of Maranhao,* BRAZIL

León de Mora, Carlos, *University of Sevilla,* SPAIN

Libourel, Therese, *LIRMM,* FRANCE

Linna, Matti, *University of Vaasa,* FINLAND

Lopes, Gabriel Pereira, *Universidade Nova de Lisboa,* PORTUGAL

Lopes, João Correia, *University of Porto,* PORTUGAL

Madeira, Edmundo, *UNICAMP - University of Campinas,* BRAZIL

Malekovic, Mirko, *FOI - Zagreb University,* CROATIA

Mamede, Nuno, *INESC/IST - Tecnhical University of Lisbon,* PORTUGAL

Marcos, Esperanza, *Univ. Rey Juan Carlos,* SPAIN

Martins, Maria João, *IST - Technical University of Lisbon,* PORTUGAL

REGULAR PROGRAM COMMITTEE

Moghadampour, Ghodrat, *University of Vaasa,* FINLAND

Olivas, José Angel, *University of Castilla-La Mancha,* SPAIN

Olsina Santos, Luis, *Univ. Nacional de La Pampa,* ARGENTINA

Parets-llorca, José, *University of Granada,* SPAIN

Pastor, Óscar, *Valencia University of Technology,* SPAIN

Penzel, Thomas, *Hospital of Philipps-University Marburg,* GERMANY

Peters, Steef, *Vrije Universiteit Amsterdam,* THE NETHERLANDS

Pimentel, Ernesto, *University of Málaga,* SPAIN

Pires, Fernando Moura, *University of Évora,* PORTUGAL

Pirotte, Alain, *University of Louvain,* BELGIUM

Plodzien, Jacek, *Polish Academy of Sciences,* POLAND

Poels, Geert, *VLEKHO Business School,* BELGIUM

Polo, Macario, *University of Castilla-La Mancha,* SPAIN

Ramos, Pedro, *ISCTE,* PORTUGAL

Revenu, Marinette, *GREYC ISMRA,* FRANCE

Riquelme, José, *University of Seville,* SPAIN

Rodriguez, Pilar, *Universidade Autónoma de Madrid,* SPAIN

Rosa, Agostinho, *IST - Technical University of Lisbon,* PORUTGAL

Sahraoui, Houari A., *University of Montreal,* CANADA

Salem, Abdelbadeeh, *Ain Shams University,* EGYPT

Schoop, Mareike, *RWTH AACHEN,* GERMANY

Shankararaman, Venky, *University of Hertfordshire,* UK

Shao, Jianhua, *Cardiff University,* UK

Shi, Zhongzhi, *Chinese Academy of Sciences,* CHINA

Silva, Alberto, *INESC/IST - Technical University of Lisbon,* PORTUGAL

Silva, António, *INESC/IST-Technical University of Lisbon,* PORTUGAL

Silva, Miguel Mira da, *IST - Tecnhical University of Lisbon,* PORTUGAL

Soule-Dupuy, Chantal, *University of Toulouse 1 - IRIT,* FRANCE

Sun, Lily, *Staffordshire University,* UK

REGULAR PROGRAM COMMITTEE

Taniar, David, *Monash University,* AUSTRALIA

Toval, Ambrosio, *Univ. de Murcia,* SPAIN

Ultsch, Alfred, *University of Marburg,* GERMANY

Vasiu, Luminita, *Middlesex University,* UK

Verdier, Christine, *INSA of Lyon,* FRANCE

Vernadat, François, *EC EUROSTAT,* EU

Vila, Maria-Amparo, *University of Granada,* SPAIN

Wilson, David, *University of London,* UK

Yang, Hongji, *De Montfort University,* UK

ZongKai, Lin, *Chinese Academy of Sciences,* CHINA

AUXILIARY REVIEWERS

Baltrusch, Rob, *Griffith University,* AUSTRALIA

Boukadoum, Mounir, *University Of Quebec At Montreal,* CANADA

Bouktif, Salah, *University Of Montreal,* CANADA

Dahchour, Mohamed, *University Of Louvain,* BELGIUM

Davis, Kimberly, *Mississippi State University,* USA

Díaz, Juan, *Polytechnic University Of Valencia,* SPAIN

Elena, José, *University Of Seville,* SPAIN

Irastorza, Arantza, *Universidad Del Pais Vasco,* SPAIN

Jian, Feng, *Precomtech System Company,* CHINA

Katsaros, Dimitrios, *Aristotle University,* GREECE

Kegl, Balasz, *University Of Montreal,* CANADA

Kolp, Manuel, *University Of Louvain,* BELGIUM

Massart, David, *University Of Louvain,* BELGIUM

AUXILIARY REVIEWERS

Medina, Ignacio, *University Of Almeria,* SPAIN

Mothe, Josiane, *Irit/Sig,* FRANCE

Nanopoulos, Alexandros, *Aristotle University,* GREECE

Noran, Ovidiu, *Griffith University,* AUSTRALIA

Places, Aangeles, *University Of A Coruña,* SPAIN

Quix, Christoph, *Rwth Aachen,* GERMANY

Rahayu, Wenny, *La Trobe University,* AUSTRALIA

Risoto, Manuel, *University Of Sevilla,* SPAIN

Sanchez, Juan, *Valencia University Of Technology,* SPAIN

Teste, Olivier, *Irit/Sig,* FRANCE

Toro, Amador, *University Of Sevilla,* SPAIN

Huang, Kaidong, *Guangdong Overseas Chinese Trusted Investment Corporation,* CHINA

Terzis, Sotirios, *University Of Strathclyde,* UK

SELECTED PAPERS BOOK

A number of selected papers presented at ICEIS 2002 will be published by Kluwer Academic Publishers, in a book entitled Enterprise Information Systems IV. The selection will be made among the papers actually presented at the conference, based on a rigorous review by the members of the ICEIS 2002 program committee, and it will be validated by the conference program co-chairs.

SPONSORING

Sponsors

Fundacion Dintel

Gesein

Getronics

InterSystems

Oracle

Collaborators

Asociación de Doctores, Licenciados e Ingenieros en Informática

Asociación de Ingenieros en Informática

Asociación de Tecnicos de Informática

Asociación Profesional del Cuerpo Superior de Sistemas Y Tecnologias de la Informacion de la Administracion del Estado

Circulo de Usuarios Oracle de España

Colegio de Ingenieros Tecnicos del Principado de Asturias

Colegio Oficial de Ingenieros en Informática del Pais Vasco

Colegio Oficial de Ingenieros en Informática del Principado de Asturias

Colegio Oficial de Ingenieros en Informática de la Comunidad de Valencia

Collegis Oficials d´ Enginyeria en Informática de Catalunya

Ilustre Colegio de Ingenieros en Informática de la Región de Murcia

FOREWORD

This volume contains the proceedings of the Fourth International Conference on Enterprise Information Systems (ICEIS 2002), organised by the School of Informatics of the University of Castilla La-Mancha (Spain) in collaboration with the School of Technology of the Polytechnic Institute of Setúbal (Portugal).

Following the line started in 1999, ICEIS aims at becoming a major point of contact between research scientists, engineers and practitioners on the area of business applications of information systems. This year, four simultaneous tracks were held, covering different aspects related to enterprise computing, including: "Databases and Information Systems Integration", "Artificial Intelligence and Decision Support Systems", "Information Systems Analysis and Specification" and "Internet Computing and Electronic Commerce". All tracks focus on real world applications and highlight the benefits of Information Systems and Technology for industry and services, thus making a bridge between Academia and the Enterprise world.

Following the success of 2001, ICEIS 2002 also has a number of satellite workshops, related to the field of the conference. This year we collaborated in the organisation of the following four international workshops: PRIS-2002 (the 2nd workshop on Pattern Recognition in Information Systems), held in Alicante, and NDDL-2002 (the 2nd workshop on New Developments in Digital Libraries), SIS-2002 (the 1st workshop on Security in Information Systems) and WIS-2002 (the 1st workshop on Wireless Information Systems), these three held in Ciudad Real.

ICEIS 2002 has received about 220 paper submissions from more than 30 different countries, from all continents. Only 89 papers were published and presented as full papers, i.e. completed work (8 pages in proceedings / 30' oral presentations), although some more papers, reflecting work-in-progress or position papers, were accepted for short presentation or poster presentation. These numbers, leading to a "full-paper" acceptance ratio below 45%, show the intention of preserving a high quality forum for the next editions of this conference. Additionally, as usual in the ICEIS conference series, a number of invited talks, including keynote lectures, case studies and technical tutorials were also held. These special sessions, presented by internationally recognized specialists in different areas have definitely contributed to increase the overall quality of the Conference and to provide a deeper understanding of the Enterprise Information Systems field.

A short list of papers will be selected for a book, "Enterprise Information Systems IV", to be published by Kluwer Academic Publishers during 2002. It will be the fourth book in the series of ICEIS selected-papers books.

The program for this conference required the dedicated effort of many people. Firstly, we must thank the authors, whose research and development efforts are recorded here. Secondly, we thank the members of the program committee and the additional reviewers for their diligence and expert reviewing. Thirdly, we thank the invited speakers for their invaluable contribution and for taking the time to synthesise and prepare their talks. Fourthly, we thank the workshop

chairs whose collaboration with ICEIS is much appreciated. Finally, special thanks to the all the members of the organising committee in Ciudad Real and the steering committee in Setúbal, especially to Marcela Genero (UCLM-Ciudad Real) and Vitor Pedrosa (EST-Setúbal) for their help in solving so many details with the secretariat and preparation of the conference.

We wish you all an exciting conference and an unforgettable stay in the lovely city of Ciudad Real. We hope to meet you again next year in Angers (France) for the 5th ICEIS, details of which are in http://www.iceis.org.

Mario Piattini

UCLM/Ciudad Real

Joaquim Filipe

EST/Setúbal

CONTENTS

VOLUME I

INVITED SPEAKERS

KEYNOTE LECTURES

EXPERIMENTAL SOFTWARE ENGINEERING: ROLE AND IMPACT OF MEASUREMENT MODELS ON EMPIRICAL PROCESSES IS-3
Giovanni Cantone

ENTERPRISE INFORMATION SYSTEMS AND THE GLOBAL INFORMATION NETWORK: CHANGE IS CERTAIN, PROGRESS IS OPTIONAL IS-5
Thomas Greene

ANALYTICAL FRAMEWORK FOR DATA INTEGRATION IN MANUFACTURING EXECUTION SYSTEMS IS-7
Oleg Gusikhin

SPECIFIC RELATIONSHIP TYPES IN CONCEPTUAL MODELING: THE CASES OF GENERIC AND WITH COMMON PARTICIPANTS IS-9
Antoni Olivé

TUTORIALS

BUSINESS PROCESS MODELING AS A METHOD OF REQUIREMENTS ENGINEERING IS-13
Ilia Bider

MAINTENANCE OF INFORMATION SYSTEMS IS-17
Ned Chapin, (InfoSci Inc., USA)

DEVELOPING ENTERPRISE APPLICATIONS USING JAVA IS-21
Qusay H. Mahmoud

NETWORK SECURITY CONCEPTS AND JAVA IS-23
Raghavan "Rags" Srinivas

CASE STUDIES

ORACLE9I: THE PLATFORM FOR THE EBUSINESS IS-27
Carlos Basterra, (Oracle Ibérica, Spain)

CACHE POST-RELATIONAL TECHNOLOGY IS-33
Carlos López Bravo, (InterSystems BV, Spain)

RISK MANAGMENT IN THE NEW ECONOMY: ESTIMATION AND CONTROL OF PROJECTS FOR E-BUSINESS AND START-UPS IS-35
Ramiro Carballo, (GESEIN, Spain)

ICT INFRASTRUCTURES AND CUSTOMER INTERACTION IS-37
Rodrigo de Salas Peña, (Getronic Grupo CP, Spain)

DATABASES AND INFORMATION SYSTEMS INTEGRATION

PAPERS

DATA SOURCES SERVER 3
Pedro Pablo Alarcón, Juan Garbajosa, Agustín Yagüe, Carlos García

DESCRIPTORS AND META-DOCUMENTS FOR MONO-MEDIA AND MULTIMEDIA DOCUMENTS 11
Ikram Amous, Florence Sèdes

ORGANISING AND MODELLING METADATA FOR MEDIA-BASED DOCUMENTS 18
Ikram Amous, Anis Jedidi, Florence Sèdes

XML-BASED DOCUMENT TO QUERY A RELATIONAL DATABASE 26
Wilmondes Manzi de Arantes Júnior, Christine Verdier, André Flory

MEDIWEB: A MEDIATOR-BASED ENVIRONMENT FOR DATA INTEGRATION ON THE WEB 34
Ladjane S. Arruda, Cláudio S. Baptista, Carlos A. A. Lima

THE ROLE OF ENTERPRISE ARCHITECTURE FOR PLANNING AND MANAGING FUTURE INFORMATION SYSTEMS INTEGRATION 42
Thomas Birkhölzer, Jürgen Vaupel

FSQL: A FLEXIBLE QUERY LANGUAGE FOR DATA MINING 50
Ramón Alberto Carrasco, María Amparo Vila, José Galindo

PREDICATE-BASED CACHING SCHEME FOR WIRELESS ENVIRONMENTS 57
Pauline Chou, Zahir Tari

SEMI-AUTOMATIC WRAPPER GENERATION AND ADAPTION 65
Michael Christoffel, Bethina Schmitt, Jürgen Schneider

A SYSTEM FOR DATA CHANGE PROPAGATION INHETEROGENEOUS INFORMATION SYSTEMS 73
Carmen Constantinescu, Uwe Heinkel, Ralf Rantzau, Bernhard Mitschang

TEMPORAL DATA WAREHOUSING: BUSINESS CASES AND SOLUTIONS 81
Johann Eder, Christian Koncilia, Herbert Kogler

A FRAMEWORK TO ANALYSE MOST CRITICAL WORK PACKAGES IN ERP IMPLEMENTATION PROJECTS 89
José Esteves, Joan A. Pastor

INFORMATION ORGANIZER: A COMPREHENSIVE VIEW ON REUSE 99
Erik Gyllenswärd, Mladen Kap, Rikard Land

A PROCESS MODEL FOR ENTERPRISE-WIDE DESIGN OF DATA ACQUISITION FOR DATA WAREHOUSING 107
Arne Harren, Heiko Tapken

DATA INTEGRATION USING THE MONIL LANGUAGE 115
Mónica Larre, José Torres, Eduardo Morales, Sócrates Torres

DIDAFIT: DETECTING INTRUSIONS IN DATABASES THROUGH FINGERPRINTING TRANSACTIONS 121
Wai Lup Low, Joseph Lee, Peter Teoh

AN INTEGRATED OBJECT DATABASE AND DESCRIPTION LOGIC SYSTEM FOR ONLINE CONTENT AND EVENT-BASED INDEXING AND RETRIEVAL OF A CAR PARK SURVEILLANCE VIDEO 129
Farhi Marir, Kamel Zerzour and Karim Ouazzane

A MODEL FOR ADVANCED QUERY CAPABILITY DESCRIPTION IN MEDIATOR SYSTEMS 140
Alberto Pan, Paula Montoto, Anastasio Molano, Manuel Álvarez, Juan Raposo and Ángel Viña

USING FULL MATCH CLASSES FOR SELF-MAINTENANCE OF MEDIATED VIEWS 148
Valéria Magalhães Pequeno, Vânia Maria Ponte Vidal

PROPOSING A METHOD FOR PLANNING THE MATERIALISATION OF VIEWS IN A DATA WAREHOUSE 155
Alexander Prosser

DATA REPRESENTATION IN INDUSTRIAL SYSTEMS 163
Claudia Raibulet, Claudio Demartini

D-ANTICIP: A PROTOCOL SUITABLE FOR DISTRIBUTED REAL-TIME TRANSACTIONS 171
Bruno Sadeg, Samia Saad-Bouzefrane, Laurent Amanton

USING DATA MINING TECHNIQUES TO ANALYZE CORRESPONDENCES BETWEEN PARTITIONS 179
D. Sánchez, J.M. Serrano, M.A.Vila, V. Aranda, J. Calero, G. Delgado

A HIERARCHICAL APPROACH TO COMPLEX DATA CUBE QUERIES 187
Rebecca Boon-Noi Tan, Guojun Lu

IMPLEMENTATION OF FUZZY CLASSIFICATION QUERY LANGUAGE IN RELATIONAL DATABASES USING STORED PROCEDURES 195
Yauheni Veryha

AN XML-BASED VIRTUAL PATIENT RECORDS SYSTEM FOR HEALTHCARE ENTERPRISES 203
Zhang Xiaoou, Pung Hung Keng

IMPORTING XML DOCUMENTS TO RELATIONAL DATABASES 210
Ale Gicqueau

MANAGING UNCERTAIN TRAJECTORIES OF MOVING OBJECTS WITH DOMINO 218
Goce Trajcevski, Ouri Wolfson_ , Cao Hu, Hai Lin, Fengli Zhang, Naphtali Rishe

SHORT PAPERS

AN INTEGRATED APPROACH FOR FINDING ENROUTE BEST ALTERNATE ROUTE 226
M. A. Anwar, S. Hameed

DATA MODELING FOR THE PURPOSE OF DATABASE DESIGN USING ENTITY-RELATIONSHIP MODEL AND SEMANTIC ANALYSIS 235
Joseph Barjis, Samuel Chong

TOOLKIT FOR QOS MONITORING IN MIDDLEWARE 244
Peter Bodorik, Shawn Best, and Dawn Jutla

WEB APPLICATION MAKER 250
Miguel Calejo, Mário Araújo, Sónia Mota Araújo, Nuno Soares

USING PERSISTENT JAVA TO CONSTRUCT A GIS 257
Mary Garvey, Mike Jackson, Martin Roberts

VIRTUAL REALITY WEB-BASED ENVIRONMENT FOR WORKCELL PLANNING IN AN AUTOMOTIVE ASSEMBLY 263
Oleg Gusikhin, Erica Klampfl, Giuseppe Rossi, Celestine Aguwa, Gene Coffman, Terry Marinak

PERSISTENCE FRAMEWORK FOR MULTIPLE LEGACY DATABASES 269
Sai Peck Lee, Chin Heong Khor

INTRODUCING AN ENTERPRISE RESOURCE PLANNING (ERP) SYSTEM IN A HOSPITAL 275
Steve C. A. Peters

STATE-SENSITIVE DESIGN OF DATABASE TRANSACTIONS 282
Yoshiyuki Shinkawa, Masao J. Matsumoto

DESIGNING AN OBJECT AND QUERY CACHE MANAGEMENT SYSTEM FOR CODAR DATABASE ADAPTER 290
Zahir Tari, Abdelkamel Tari, Vincent Dupin

MODELING RELATIONAL DATA BY THE ADJACENCY MODEL 296
Jari Töyli, Matti Linna, Merja Wanne

THE MILLENNIUM INFORMATION SYSTEM (MIS) FOR EUROPEAN PUBLIC HEALTH AND ENVIRONMENT NETWORK (EPHEN) 302
Frank Wang, Ruby Sharma, Na Helian, Farhi Marir, Yau Jim Yip,

POSTERS

AN ELECTRONIC SCIENTIFIC NOTEBOOK: METADATA AND DATABASE DESIGN FOR MULTIDISCIPLINARY SCIENTIFIC LABORATORY DATA 307
Laura Bartolo, Austin Melton, Monica Strah, Cathy Lowe, Louis Feng, Christopher Woolverton

THE IMPACT OF CHANGE ON IT PROFESSIONALS 311
Matthew C. F. Lau, Rebecca B. N. Tan

ARTIFICIAL INTELLIGENCE AND DECISION SUPPORT SYSTEMS

PAPERS

SEMIQUALITATIVE REASONING FOR SOFTWARE DEVELOPMENT PROJECT BY CONSTRAINT PROGRAMMI 319
Pedro J. Abad, Antonio J. Suárez, Sixto Romero, Juan A. Ortega

INSURANCE MARKET RISK MODELING WITH HIERARCHICAL FUZZY RULE BASED SYSTEMS 325
R. Alcalá, O. Cordón, F. Herrera, I. Zwir

NEURAL NETWORKS AND WAVELETS FOR FACE RECOGNITION 334
Li Bai, Yihui Liu

SUPPORTING ENGINEERING DESIGN PROCESS WITH AN INTELLIGENT COMPLIANCE AGENT A WAY TO ENSURE A STANDARD COMPLIED PROCESS 341
Larry Y C Cheung, Paul W H Chung, Ray J Dawson

APPLICABILITY OF ESTIMATION OF DISTRIBUTION ALGORITHMS TO THE FUZZY RULE LEARNING PROBLEM: A PRELIMINARY STUDY 350
M. Julia Flores, José A. Gámez

GROUP DECISION MAKING BASED ON THE LINGUISTIC 2-TUPLE MODEL IN HETEROGENEOUS CONTEXTS 358
Herrera F., Martínez L.

USING ARTIFICIAL NEURAL NETWORKS TO PROVE HYPOTHETIC CAUSE-AND-EFFECT RELATIONS: A METAMODEL-BASED APPROACH TO SUPPORT STRATEGIC DECISIONS 367
Christian Hillbrand, Dimitris Karagiannis

SUPPORTING THE OPTIMISATION OF DISTRIBUTED DATA MINING BY PREDICTING APPLICATION RUN TIMES 374
Shonali Krishnaswamy, Seng Wai Loke, Arkady Zaslavsky

STRATEGIC POSITION OF FIRMS IN TERMS OF CLIENT'S NEEDS USING LINGUISTIC AND NUMERICAL INFORMATION THROUGH A NEW MODEL OF SOFM 382
Raquel Flórez López

A CASE-BASED EXPERT SYSTEM FOR ESTIMATING THE COST OF REFURBISHING CONSTRUCTION BUILDINGS 391
Farhi Marir, Frank Wang and Karim Ouazzane

DATA MINING MECHANISMS IN KNOWLEDGE MANAGEMENT SYSTEM 399
I-Heng Meng, Wei-Pang Yang, Wen-Chih Chen, Lu-Ping Chang

CONTROLLING AND TESTING A SPACE INSTRUMENT BY AN AI PLANNER 405
MD. R-Moreno, M. Prieto, D. Meziat, J. Medina, C. Martin

A TRAINING ENVIRONMENT FOR AUTOMATED SALES AGENTS TO LEARN NEGOTIATION STRATEGIES 410
Jim R. Oliver

A DENSITY-BASED APPROACH FOR CLUSTERING SPATIAL DATABASE 418
Abdel Badee Salem, Taha ElAreef, Marwa F. Khater, Aboul Ella Hassanien

SIMPLE DECISION SUPPORT SYSTEM BASED ON FUZZY REPERTORY TABLE 424
J.J. Castro-Schez, L. Jimenez, J. Moreno, L. Rodriguez

A MULTI-CRITERIA DECISION AID AGENT APPLIED TO THE SELECTION OF THE BEST RECEIVER IN A TRANSPLANT 431
Aïda Valls, Antonio Moreno, David Sánchez

NEURAL NETWORKS FOR B2C E-COMMERCE ANALYSIS SOME ELEMENTS OF BEST PRACTICE 439
Alfredo Vellido

PROOF RUNNING TWO STATE-OF-THE-ART PATTERN RECOGNITION TECHNIQUES IN THE FIELD OF DIRECT MARKETING 446
Stijn Viaene, Bart Baesens, Guido Dedene, Jan Vanthienen, Dirk Van den Poel

SHORT PAPERS

MEDICAL DATA BASE EXPLORATION THROUGH ARTIFICIAL NEURAL NETWORKS 455
Lucimar F. de Carvalho, Candice Abella S. Dani, Hugo T. de Carvalho, Diego Dozza, Silvia M. Nassar, Fernando M. de Azevedo

EVALUATING EMS VALUE - THE CASE OF A SMALL ACCOUNTANCY FIRM 460
Carlos J. Costa, Pedro Antunes

USING CELLULAR AUTOMATA IN TRAFFIC MODELING 467
Monica Dascalu, Sergiu Goschin, Eduard Franti

THE AEX METHOD AND ITS INSTRUMENTATION 473
Sabine Delaitre, Alain Giboin, Sabine Moisan

IMPROVING ACCESS TO MULTILINGUAL ENTERPRISE INFORMATION SYSTEMS WITH USER MODELLING CONTEXT ENRICHED CROSS-LANGUAGE IR 482
Alberto Díaz, Pablo Gervás, Antonio García

HIGH DIMENSIONAL DATA CLUSTERING USING SOFM AND K-MEANS ALGORITHMS 488
Tarek F. Gharib, Mostafa G. Mostafa, Mohammed F. Tolba

NATURAL LANGUAGE INTERFACE TO KNOWLEDGE MANAGEMENT SYSTEMS 494
Melanie Gnasa, Jens Woch

LEARNING TO TEACH DATABASE DESIGN BY TRIAL AND ERROR 500
Ana Iglesias, Paloma Martínez, Dolores Cuadra, Elena Castro and Fernando Fernández

KNOWLEDGE MANAGEMENT IN MANUFACTURING TECHNOLOGY AN A.I. APPLICATION IN THE INDUSTRY 506
Michael S.M., Deepak Khemani

AUGMENTED DATA MINING OVER CLINICAL DATABASES USING LEARNING CLASSIFIER SYSTEMS 512
Manuel Filipe Santos, José Neves, António Abelha, Álvaro M. Silva, Fernando Rua

USING MULTI-AGENT SYSTEM FOR DYNAMIC JOB SHOP SCHEDULING 517
Min-Jung Yoo, Jean-Pierre Müller

POSTERS

THE APPLICATION OF ARTIFICIAL NEURAL NETWORKS FOR HEAT ENERGY USE PREDICTION 526
Leszek Kiełtyka, Robert Kucęba

KNOWLEDGE-BASED IMAGE UNDERSTANDING A RULE-BASED PRODUCTION SYSTEM FOR X-RAY SEGMENTATION 530
Linying Su, Bernadette Sharp, Claude Chibelushi

A TAXONOMY FOR INTER-MODEL PARALLELISM IN HIGH PERFORMANCE DATA MINING 534
Ling Tan, David Taniar, Kate A. Smith

VOLUME II

INFORMATION SYSTEMS ANALYSIS AND SPECIFICATION

PAPERS

SOME REFLECTIONS ON IS DEVELOPMENT AS OPERATOR OF ORGANISATIONAL CHANGE 543
Ana Almeida, Licinio Roque

ANALYSIS OF THE RELATION BETWEEN THE PRESCRIPTIVE AND DESCRIPTIVE APPROACHES OF THE INFORMATION SYSTEM PLANNING 553
Jorge Luis Nicolas Audy

ANALYSING COMMUNICATION IN THE CONTEXT OF A SOFTWARE PRODUCTION ORGANISATION 562
M. Cecilia C. Baranauskas, Juliana P. Salles, Kecheng Liu

BUSINESS MODELLING WITH UML: DISTILLING DIRECTIONS FOR FUTURE RESEARCH 570
Sergio de Cesare, Mark Lycett, Dilip Patel

THE SEMANTICS OF REIFYING N-ARY RELATIONSHIPS AS CLASSES 580
Mohamed Dahchour and Alain Pirotte

UPDATING DATA IN GIS: HOW TO MAINTAIN DATABASE CONSISTENCY? 587
H. Kadri-Dahmani, A. Osmani

A PROPOSAL FOR THE INCORPORATION OF THE FEATURES MODEL INTO THE UML LANGUAGE 594
Ivan Mathias Filho, Toacy C. de Oliveira and Carlos J.P. de Lucena

ONTOLOGIES SUPPORTING BUSINESS PROCESS RE-ENGINEERING 602
Alexandra Galatescu, Taisia Greceanu

CONCEPTUAL ARCHITECTURE FOR THE ASSESSME NT AND IMPROVEMENT OF SOFTWARE MAINTENANCE 610
Félix García, Francisco Ruiz, Mario Piattini, Macario Polo

REUSABLE COMPONENT EXTRACTION FROM INTELLINGENT NETWORK MANAGEMENT APPLICATIONS 618
Dániel Hoványi

SEMANTIC AUGMENTATION THROUGH ONTOLOGY FOR XML INTEGRATION SERVER 627
Zaijun Hu

DESIGNING BUSINESS PROCESSES AND COMMUNICATION STRUCTURES FOR E-BUSINESS USING ONTOLOGY-BASED ENTERPRISE MODELS WITH MATHEMATICAL MODELS 635
Henry M. Kim, K. Donald Tham

USING ATOM3 AS A META-CASE TOOL 642
Juan de Lara, Hans Vangheluwe

FRAMEWORKS – A HIGH LEVEL INSTANTIATION APPROACH 650
Toacy C. de Oliveira, Ivan Mathias Filho and Carlos J.P. de Lucena

AUTOMATING THE CODE GENERATION OF ROLE CLASSES IN OO CONCEPTUAL SCHEMAS 658
Vicente Pelechano, Manoli Albert, Eva Campos, Oscar Pastor

A FUNCTIONAL SIZE MEASUREMENT METHOD FOR EVENT-BASED OBJECT-ORIENTED ENTERPRISE MODELS 667
Geert Poels

THE CONTEXT ENGINEERING APPROACH 676
Licínio Roque, Ana Almeida

SEQUENCE CONSTRAINTS IN BUSINESS MODELLING AND BUSINESS PROCESS MODELLING 683
Monique Snoeck

A TOOL FOR ASSESSING THE CONSISTENCY OF WEBSITES 691
Sibylle Steinau, Oscar Díaz, Juan J. Rodríguez and Felipe Ibánez

THE GOLD MODEL CASE TOOL: AN ENVIRONMENT FOR DESIGNING OLAP APPLICATIONS 699
Juan Trujillo, Sergio Luján-Mora, Enrique Medina

AN INTERNATIONAL STUDY OF BENCHMARKING SPREAD AND MATURITY 708
Mohamed Zairi, Majed Al-Mashari

TAMING PROCESS DEVIATIONS BY LOGIC BASED MONITORING 716
Ilham Alloui, Sorana Cîmpan, Flavio Oquendo

SHORT PAPERS

APPLYING DOMAIN MODE LING AND SECI THEORY IN KNOWLEDGE MANAGEMENT FOR INFORMATION SYST EMS ANALYSIS 725
Akihiro Abe

IF YOU WISH TO CHANGE THE WORLD, START WITH YOURSELF 732
Ilia Bider, Maxim Khomyakov

ON THE USE OF JACKSON STRUCTURED PROGRAMMING (JSP) FOR THE STRUCTURED DESIGN OF XSL TRANSFORMATIONS 743
Guido Dedene

A FRAMEWORK FOR THE DYNAMIC ALIGNMENT OF STRATEGIES 752
S. Hanlon, L. Sun

INFERRING ASPECTS OF THE ORGANIZATIONAL STRUCTURE THROUGH WORKFLOW PROCESS ANALYSIS 758
Cirano Iochpe, Lucinéia Heloisa Thom

A KNOWLEDGE OBJECT ORIENTED SYSTEM FOR HIGH THROUGHPUT COLLECTION AND ANALYSIS OF DATA 764
Huiqing Liu, Tecksin Lim

MANAGING ENTERPRISE COMMUNICATION NETWORKS TO IMPROVE THE REQUIREMENTS ELICITATION PROCESS 770
Juan M. Luzuriaga, Rodolfo Martínez, Alejandra Cechich

INTRODUCING BUSINESS PROCESS AUTOMATION IN DYNAMIC BANKING ACTIVITIES 776
Maria Nikolaidou, Dimosthenis Anagnostopoulos

INCORPORATING KNOWLEDGE ENGINEERING TECHNIQUES TO REQUIREMENTS CAPTURE IN THE MIDAS WEB APPLICATIONS DEVELOPMENT PROCESS 782
A. Sierra-Alonso, P. Cáceres, E. Marcos, J. E. Pérez-Martínez

HYPERCLASSES 788
Slim Turki, Michel Léonard

LINKING MOBILE NETWORK SERVICES TO INTERNET MAIL 795
Hans Weghorn, Carolin Gaum, and Daniel Wloczka

POSTERS

INTER-ORGANIZATIONAL WORKFLOW MANAGEMENT IN VIRTUAL HEALTHCARE ENTERPRISES 799
Tauqir Amin, Pung Hung Keng

SURVEY, ANALYSIS AND VALIDATION OF INFORMATION FOR BUSINESS PROCESS MODELING 803
Nuno Castela, José Tribolet, Arminda Guerra, Eurico Lopes

FD3: A FUNCTIONAL DEPENDENCIES DATA DICTIONARY 807
M. Enciso, A. Mora

BEYOND OBJECT ORIENTED DESIGN PATTERNS 811
Javier Garzás, Mario Piattini

MEDIATED COMMUNICATION IN GROUPWARE SYSTEMS 815
Luis A. Guerrero, Sergio Ochoa, Oriel Herrera, David A. Fuller

AN EXECUTION MODEL FOR PRESERVING CARDINALITY CONSTRAINTS IN THE RELATIONAL MODEL 819
Harith T. Al-Jumaily, Dolores Cuadra, Paloma Martínez

TOWARDS A NEW BUSINESS PROCESS ARCHITECTURE 823
Takaaki Kamogawa, Masao J.Matsumoto

REQUIREMENTS SPECIFICATION MODEL IN A SOFTWARE DEVELOPMENT PROCESS INSIDE A PHYSICALLY DISTRIBUTED ENVIRONMENT 830
Rafael Prikladnicki, Fernando Peres, Jorge Audy, Michael da Costa Móra e Antônio Perdigoto

INTEGRATED PLANNING OF INFORMATION SYSTEMS AND CONTINGENCY AND RECOVERY 835
Leonilde Reis, Luís Amaral

STEMMING PROCESS IN SPANISH WORDS WITH THE SUCCESSOR VARIETY METHOD. METHODOLOGY AND RESULT 838
Manuela Rodríguez-Luna

MODELLING AND PERFORMANCE ANALYSIS OF WORKFLOW MANAGEMENT SYSTEMS USING TIMED HIERARCHICAL COLOURED PETRI NETS 843
Khodakaram Salimifard, Mike Wright

USING SEMANTIC ANALYSIS AND NORM ANALYSIS TO MODEL ORGANISATIONS 847
Andy Salter, Kecheng Liu

DEVELOPING QUICK ITERATIVE PROCESS PROTOTYPING FOR PROJECT MANAGEMENT: LINKING ERP AND BPE 851
Ryo Sato, Kentaro Hori

USING HOT-SPOT-DRIVEN APPROACH IN THE DEVELOPMENT OF A FRAMEWORK FOR MULTIMEDIA PRESENTATION ON THE WEB 855
Khalid Suliman Al-Tahat, Dr. Sufian Bin Idris, Prof. Dr. T. Mohd. T. Sembok, Prof. Dr. Mohamed Yousof

INTERNET COMPUTING AND ELECTRONIC COMMERCE

PAPERS

MANAGING XML-LINK INTEGRITY FOR STRUCTURED TECHNICAL DOCUMENTS 863
Abraham Alvarez, Youssef Amghar, Richard Chbeir

USABILITY AND ACCESSIBILITY IN THE SPECIFICATION OF WEB SITES 871
Marta Fernández de Arriba, José A. López Brugos

STAGED IMPLEMENTATION OF E-BUSINESS NETWORKS THROUGH ERP 877
Colin G. Ash, Janice M. Burn

AN ENTERPRISE IT SECURITY DATA MODEL 885
Meletis A. Belsis, Anthony N. Godwin, Leon Smalov

INTERNET TECHNOLOGY AS A BUSINESS TOOL 892
Sebastián Bruque

ITHAKI: FAIR N-TRANSFERABLE ANONYMOUS CASH 900
Magdalena Payeras Capellà, Josep Lluís Ferrer Gomila, Llorenç Huguet Rotger

VIRTUAL MALL OF E-COMMERCE WEB SITES 908
M. F. Chen, M. K. Shan

RETHINKING THE STRATEGY OF AMAZON.COM 915
Michael S. H. Heng

THE DESIGN OF AN XML E-BUSINESS APPLICATIONS FRAMEWORK 922
I. Hoyle, L. Sun, S. J. Rees

E-COMMERCE BUSINESS PRACTICES IN THE EU 929
Hamid Jahankhani, Solomon A. Alexis

TOWARDS EXTENDED PRICE MODELS IN XML STANDARDS FOR ELECTRONIC PRODUCT CATALOGS 937
Oliver Kelkar, Joerg Leukel, Volker Schmitz

HIERARCHICAL VISUALIZATION IN A SIMULATION-BASED EDUCATIONAL MULTIMEDIA WEB SYSTEM 946
Juan de Lara, Manuel Alfonseca

NORMATIVE SERVICES FOR SELF-ADAPTIVE SOFTWARE TO SUPPORT DEPENDABLE ENTERPRISE INFORMATION SYSTEMS 954
A. Laws, M. Allen, A. Taleb-Bendiab

DIGITAL TIMESTAMPS FOR DISPUTE SETTLEMENT IN ELECTRONIC COMMERCE: GENERATION, VERIFICATION, ANDRENEWAL 962
Kanta Matsuura, Hideki Imai

AUTOMATIC VERIFICATION OF SECURITY IN PAYMENT PROTOCOLS FOR ELECTRONIC COMMERCE 968
M. Panti, L. Spalazzi, S. Tacconi, S. Valenti

A METHOD FOR WIS CENTERED ON USERS GOALS 975
Nathalie Petit

A SEMI-UNIVERSAL E-COMMERCE AGENT 981
Aleksander Pivk, Matjaz Gams

QUOTES: A NEGOTIATION TOOL FOR INDUSTRIAL E-PROCUREMENT 989
A. Reyes-Moro, J.A. Rodríguez-Aguilar, M. López-Sánchez, J. Cerquides, D. Gutierrez-Magallanes

AN AUTOMATED APPROACH TO QUALITY-AWARE WEB APPLICATIONS 995
Antonio Ruiz, Rafael Corchuelo, Amador Durán

IM@GIX 1001
Carlos Serrão, Joaquim Marques

PROFILE NEGOTIATION REQUIREMENTS IN A MOBILE MIDDLEWARE SERVICE ENVIRONMENT 1009
Markus Sihvonen

INTELLIGENT AGENT-BASED FRAMEWORK FOR MINING CUSTOMER BUYING HABITS IN E-COMMERCE 1016
Qiubang Li, Rajiv Khosla

SHORT PAPERS

THE "SHARED DATA APPROACH" TO THE INTEGRATION OF DYNAMIC BUSINESS ENTERPRISES 1023
Trevor Burbridge, Jonathan Mitchener, Ben Strulo

AN E-SERVICE INFRASTRUCTURE FOR INNOVATION EXPLOITATION AND TECHNOLOGY TRANSFER: THE DILEMMA PROJECT 1029
Anastasia Constantinou, Vassilios Tsakalos, Philippos Koutsakas, Dimitrios Tektonidis, Adamantios Koumpis

AN E-COMMERCE MODEL FOR SMALL AND MEDIUM ENTERPRISES 1035
F. J. García, I. Borrego, M. J. Hernández, A. B. Gil, M. A. Laguna

DISTRIBUTED ONLINE DOCTOR SURGERY 1042
Hamid Jahankhani, Pari Jahankhani

ACCESSING AND USING INTERNET SERVICES FROM JAVA-ENABLED HANDHELD WIRELESS DEVICES 1048
Qusay H. Mahmoud, Luminita Vasiu

E-PROCUREMENT IN A RURAL AREA 1054
Mike Rogers, Thomas Chesney, Scott Raeburn

A SYSTEM BASED ON PREFERENCES FOR AID TO THE PURCHASE DECISION 1058
Irene Luque Ruiz, Enrique López Espinosa, Gonzalo Cerruela García, Miguel Ángel Gómez-Nieto

DESIGN AND IMPLEMENTATION OF A MESSAGE SERVICE HANDLER FOR EBXML 1064
Eun-Jung Song, Ho-Song Lee, Taeck-Geun Kwon

DESIGN REQUIREMENTS FOR MOBILE AGENT SYSTEMS 1070
Luminita Vasiu, Alan Murphy

THIN SERVERS - AN ARCHITECTURE TO SUPPORT ARBITRARY PLACEMENT OF COMPUTATION IN THE INTERNET 1080
J.C. Diaz y Carballo, A. Dearle, R.Connor

MANAGING SECURITY IN ELECTRONIC BUSINESS 1086
Kaiyin Huang, Kaidong Huang

A GLOBAL MODEL OF ELECTRONIC COMMERCE 1092
Claudine Toffolon, Salem Dakhli

POSTERS

SRIUI MODEL: A DESIG N CENTRIC APPROACH TO USER INTERFACES FOR SHOPPING CARTS WITH EMPHASIS ON INTELLIGENCE 1099
C. Chandramouli

THE CONCEPTS OF GRATITUDE, DELEGATION AND AGREEMENT IN EC-ENVIRONMENTS 1103
Paulo Novais, Luís Brito, José Neves

INTEGRATING MOBILE AGENT INFRASTRUCTURES IN OPERATIONAL ERP SYSTEMS 1107
Apostolos Vontas, Philippos Koutsakas, Christina Athanasopoulou, Adamantios Koumpis, Panos Hatzaras, Yannis Manolopoulos, Michael Vassilakopoulos

XEON – AN ARCHITECTURE FOR AN XML ENABLED FIREWALL 1111
Andrew Blyth, D Daniel Cunliffe, Iain Sutherland

THE WEBOCRACY PROJECT 1117
Peter Burden

INTRODUCTION TO INFORMATION TECHNOLOGY AND ITS EFFECTS ON ORGANISATIONAL CONTROL 1122
Rahim Ghasemiyeh, Feng Li

LOGIC AND PROBABILISTIC BASED APPROACH FOR DOCUMENT DATA MODELING 1126
Mourad Ouziri, Christine Verdier

CONCEPTUAL ARCHITECTURE FOR THE ASSESSMENT AND IMPROVEMENT OF SOFTWARE MAINTENANCE

Félix García, Francisco Ruiz, Mario Piattini, Macario Polo
Alarcos Research Group, Escuela Superior de Informática, Universidad de Castilla-La Mancha, Paseo de la Universidad, 4, 13071, Ciudad Real (España)
Email: (fgarcia|fruiz|mpiattini|mpolo)@inf-cr.uclm.es

Key words: Software Process Assessment, Software Process Improvement, Maintenance Software, MOF, XMI.

Abstract: The management of software processes is a complex activity due to the great number of different aspects to be considered. For this reason it is useful to establish a conceptual architecture which includes all the aspects necessary to be able to manage this complexity. The fundamental element in all conceptual architecture is constituted by meta-data, which, organized in different levels of modeling, can be used to manage effectively the complexity of the software processes and especially the maintenance process (Pigosky, 1996). In this study we present a conceptual architecture of 4 levels to represent and manage the assessment and improvement of software process by means of the definition of the appropriate models and meta-models. This architecture is based on the standard MOF (Meta object Facility) proposed by the Object Management Group (OMG,2000). In particular this architecture includes all the necessary aspects for carrying out the assessment and improvement of the Software Maintenance Process (SMP) and allows us to represent the different data and meta-data used in its management by means of the modeling of concepts at different levels of abstraction: meta-models of generic processing, models of software processes, concrete software processes (in our case, that of the assessment of other processes) and instances of carrying out a specific process. As a support to this architecture we present MANTIS- Metamod, a tool for the modeling of software processes based on the concepts discussed previously. MANTIS- Metamod is a component of MANTIS, an integral environment for the management of the SMP, including its assessment and improvement.

1 INTRODUCTION

Until recently software construction was performed like an artistic task where success in projects depended principally on the "art" of the developers and not on projects being developed with an engineering arose, the principal objective of which is to obtain quality software products. A fundamental element which affects the quality of the products is the way of developing and maintaining them, that is to say the processes involved both in the development and the maintenance of the software. According to ISO 12207 norm, a process is a set of interrelated activities which transform inputs into outputs (ISO/IEC, 1995). A process defines who is doing what, when, and how to obtain a specific objective. Software processes are inherently complex. They involve many people, each with individual responsibilities and skills , and they produce or modify an ample range of elements (Becker & Webby, 1999).

Current efforts in the investigation of software processes focus fundamentally on their assessment and improvement. Software process assessment can be defined as the set of activities to evaluate the given process. The assessment aims to inspire the confidence that the product will be of the quality desired. With such an aim in mind, different standards have been proposed, such as CMM (SEI, 1995), BOOTSTRAP (BOOTSTRAP, 1993), SPICE, IEEE 730 (IEEE, 1998), etc, which provide a framework for the assessment of the quality of software processes. SPICE stands out especially among these initiatives, having formed the basis of ISO 15504 (ISO/IEC, 1998a).

In order to be able to apply plans for improvement in the software processes of an organization it is essential to carry out beforehand an assessment process of their quality. The

improvement of software processes is based on guaranteeing certain results from the process, and as such it is necessary, in the process of assessment, to take effective measures of certain indicators associated with the processes.

Given the importance of improvement and hence of the assessment of the quality of software processes, it is important to be able to treat all the concepts involved in these processes in an integrated way. To do so it is useful to establish a conceptual architecture with encapsulation layers which can be specified, designed and constructed independently. To achieve integration, different levels of abstraction must be defined, and hence it is useful to make use of the ideas put forward in the different standards concerning meta-modeling and the exchange of meta-data, among which the MOF (OMG, 2000) and XMI (OMG, 1999) stand out.

In this study we present a conceptual architecture of 4 levels, based on the standard MOF, for the effective quality assessment and improvement of software processes. This architecture is being used in MANTIS, an integral environment for the management of the software maintenance process . The elements considered at each level of abstraction are based on widely accepted proposals which will be discussed in the following sections.

The structure of the study is as follows: first we give a general description of the conceptual architecture proposed. In the next section we describe each of the levels and their mappings in detail. In section 4, we present a tool which automates the management of meta-data at different levels of abstraction, and finally, in section 5, we present conclusions and plans for future studies.

2 DESCRIPTION OF THE CONCEPTUAL ARCHITECTURE

The current study is within the framework of MANTIS (Ruiz et al. 2001) which attempts the definition and construction of an environment for the integral management of the SMP. MANTIS defines the way in which the SMP is organized, managed, measured and supported.

For the management of the SMP, MANTIS integrates, amongst other aspects, people (with certain skills and who carry out certain roles in the project), techniques (or methodologies) employed by the people, tools (which help them to meet the standards) and activities (in which teams participate, and which help them to meet significant milestones).

To achieve integration, 4 conceptual models are defined in MANTIS, based on the standard MOF (Meta Object Facility) for object oriented meta-modeling (OMG, 2000) proposed by the Object Management Group. MOF is a model for specifying, constructing, managing, exchanging and integrating meta-data in software systems allowing a flexible integration of systems. MOF describes an abstract modeling language in line with the core of the UML (OMG, 1999a). Table 1 shows the 4 levels of the architecture MOF and its adaptation to MANTIS.

Level	MOF	MANTIS
M3	MOF-model (Meta-Metamodel)	*MOF-model*
M2	Meta-model	Generic SMP metamodel
M1	Model	Process Software Assessment concrete models
M0	Data	Instances of Software Process Assessment (real-world concrete Software assessment projects)

Table 1: Conceptual levels in MOF & MANTIS

At level M0 are the results of the application of an assessment process to a maintenance project. That is to say, at this level there would be the results of a process from which it would be possible to establish its strong and weak points. The data handled at this level are instances of the concepts defined at level M1. The specific model used at level M1 is based on a specific model for assessment following ISO 15504, which will be discussed in more detail in the sections below. Level M2 corresponds to a generic meta-model of software processes. In this meta-model all the elements common to any type of process are defined. In our case, this meta-model must include abstract concepts from which it will be possible to derive the concepts handled in the assessment model. For example the generic concept "*Activity*" used in M2, would be instanced in the concepts "*Define the input of the Assessment*" or "*Perform the Assessment Process*" of level 1, which at level MO will correspond to the application of such activities in a specific organization, on a specific project.

At the final conceptual level of MANTIS, M3, the generic meta-data of software processes is represented in the form of model-MOF. A model-MOF is basically formed from two types of objects:

MOF-classes and MOF-associations (these are the main objects for us, although others do exist: packages for re-use, data-types etc.) Hence, all the concepts represented at level M2 are now considered as models of MOF-classes or MOF-associations. For example, "*Activity*", "*Actor*" or "*Attribute*" will be instances of the MOF class; and "*Activity uses Resources*" or "*Artefact_is_input_of_Activity*" are instances of MOF-association. For the effective representation of the meta-data which make up this conceptual architecture and above all to ensure their portability between tools in a Software Engineering Environment (SEI), which is what we are interested in MANTIS, we use XMI (XML Meta-data Interchange) (OMG, 1999b), a language based on XML (eXtensible Markup Language).

3 LEVELS AND MAPPINGS

3.1 M2 level: Generic Software Process Metamodel

At level M2 of conceptual architecture the generic meta-model of software processes is represented, from which concrete models of processes can be instanced. The meta-model of this level is based on the proposal of the IESE (Institut Experimentelles Software Engineering) (Becker, & Webby, 1999) which represents a generic schema for the modeling of software processes, in which a fundamental aspect of these processes is presented: the measurement. The main aspects to be taken into account when modeling processes are:

- how things are done,
- who does them and
- what is produced, used or modified during the activity.

In figure 1 the basic components which should be included in any model of processes are shown in more detail. As can be seen from figure 1,within the schema which represents the generic meta-model of software processes, three subschemas stand out:

- Software Process Modelling subschema,
- Measurement subschema,
- Human Resources subschema

3.1.1 Software Process Modeling subschema

This subschema is made up from the necessary constructors to define models of software processes. Every model of processes is made up of a set of activities, which in their return can include other activities. An activity is an abstraction of "how things are done". An activity is a step in a process which may contain anything from activities of software development or maintenance to project management or quality assessment activities. The superclass *entity* represents an abstraction of an element of a model of processes. The subclasses of entity are: *project, activity, artefact, resource, agent.* The same entity could be involved in more than one project.. Among the other classes which stand out in the meta-model are: the class *agent*, which is an abstract class that describes the human agent who does one or more activities; the class *resource*, which describes entities necessary for carrying out the project; and the class *artefact* which is an abstraction of the products which are modified, used or produced in a project. Another significant of this subschema is that using it we can represent the relationship between entities. The interrelationships between entities of the process are modeled using the class *relationship*. It is equivalent to association MOF, but with the difference that they can have a degree greater than 2 (ternaries, etc.) and that this class *relationship* models relations between instances of entities and not between instances of class MOF (the level of abstraction is different).

3.1.2 Measurement subschema

A fundamental element when modeling software processes is to be able to define a set of metrics which will then allow us to check how things are being done. For the software engineering to be considered as such, it is essential to be able to measure what is done. Therefore, we must include in the Generic SMP Meta-model the possibility of defining indicators when modeling processes. These indicators must allow us to check the quality of these processes in order to be able to apply improvement plans.

For this reason, in figure 1 we can clearly distinguish the subschema of the measurement which includes the aspects related to the measurement of processes. As seen in the subschema of the measurement, each element or the model can have certain attributes associated with it. Examples of attributes are: the duration of an activity, the number of derived errors, process indicators, (properties of a process). Each attribute can have a possible value or set of values associated with it, and in addition the calculation of the value of an attribute can be based on certain expressions. The same expression can be associated with various attributes. This subschema serves as an effective complement to the generic meta-model of software processes it makes possible the application at an inferior level of specific models of processes such as assessment and improvement.

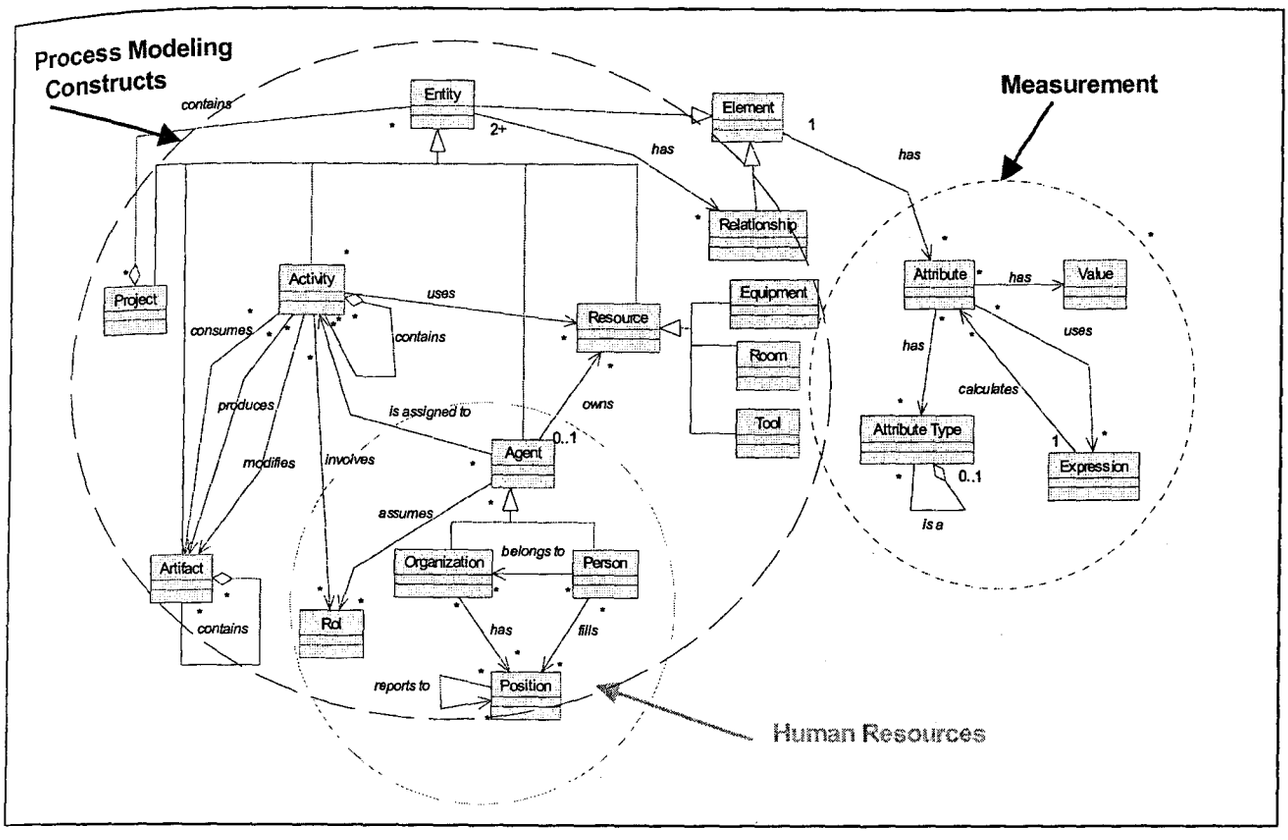

Figure 1: Generic Metamodel of software processes

3.1.3 Human Resources subschema

This subschema is outstanding in the meta-model since human resources are the key element for performing successfully software processes. With this schema we can model in detail who is performing the activities. In this subschema the following classes stand out:

Role: this is an abstraction of some abilities and necessary conditions to perform an activity. Each activity is associated with certain roles in the project and these roles can only be assumed by human resources.

Organization: this describes the context from the administrative point of view in which the software process occurs. Examples of organization are the software development team, the testing team or a software development company.

Person: this is an individual human agent, for example a programmer or a software engineer. A person can belong to several organizations such as in the case of a programmer who takes part in the development team and the testing team in the project. Besides, all people have a position in an organization, for instance the manager's position in the testing team.

Position: this describes a post in an organization. A person can perform several positions and a position can be performed by several people.

3.2 M1 Level: Software Process Assessment Model

The process model to consider in this level is based on the assessment model proposed in part 5 of ISO 15504 standard based on the first proposal of the SPICE project. SPICE is a major international initiative to support the development of an International Standard for Software Process Assessment. The main goal of this project, to develop a working draft for a standard for software process assessment and their documents have been carried through the international standardization process and have been published as ISO/IEC TR 15504. This norm defines a two dimensional reference model for describing processes through assessment of process attributes structured into capability levels (ISO/IEC, 1998b). The process dimension in which the measurable aims which each process should attain and its functional character are identified, and the ability dimension which is based on assessing and attributes the group associated with each process to determine its ability which is necessary for its management and its improvement.

ISO 15504 provides the guidance to perform a software assessment process and a method for continually improving processes. In M1 Level we focus on the guidance that ISO provides with regard

to the assessment process. The main activities that ISO identifies to assess a software process are the following:

Planning, Collecting data, Validating Data, Process Rating and Reporting. As a consequence of performing these activities, certain products are created (as shown in the software processes generic meta-model) amongst which the report stands out that shows the assessment result of a process (process profile).

In table 2 the correspondences are shown between the elements of software processes metamodel (constructors of process models) and the main elements of the assessment process defined in ISO 15504- part 3.

The basic concepts of all assessment processes are shown in brief in table 2. The assessment process implies:

- Defining process input
- Performing the process. This means performing the planning, collecting and validating the necessary data, assigning the process rating (levels that identify the process ability according to SPICE defined levels)
- Creating the appropriate reports and,
- Recording the relevant output

Assessment process output is formed by the process profile. In this artefact all data related to the assessment of a specific process are recorded.

With this model, the tools used in the lower level to perform specific assessment processes could exchange their data efficiently. These data can even be useful for improvement plans. The elements of this model could be formed into two groups:

Assessment Input Information, describes the purpose of the assessment, its range and its limitations.

Assessment Output Information, describes the structure of assessment processes shown in SPICE. It includes a process profiles group and ratings of ability levels for each process.

In figure 2 you can see the UML diagram corresponding to the structure of an assessment process output according to ISO 15504. As it can be observed, all necessary elements to record a software assessment process based on ISO 15504 standard are shown in the assessment results model. The key element of assessment process output is the *Process Profile* element that includes information about who performs the assessment process, strong and weak points of the process to assess, the level of process ability and especially the results of process indicators defined in SPICE (PA 1.1, PA 2.2, etc) and the ratings that have to be fulfilled by these indicators. The output of the assessment, in the form of a process profile, shows the adequacy ratings of the generic practices of the process, but it does not show why a particular practice was assigned a particular rating. Indicators help to identify what is present or missing from a process or work product and provide guidance to the assessor when assigning a rating of adequacy to a practice. The information provides an '*indication*' of the extent to which a practice supports the purpose of the process. The

M2 Classes		M2 instances (M1 Classes)
A	Activity	*Defining the assessment input* Perform the assessment process Planning Collect Data Validate Data Process Rating Reporting Record the assessment output
Art	Artifact	Process to Assess Process Profile
A contains A	Activity contains Activity	Perform the assessment process contains Planning Perform the assessment process contains Collect Data Perform the assessment process contains Validate Data Perform the assessment process contains Process Rating, *Perform the assessment process contains Reporting*
A consumes Art	Activity consumes Artifact	*Perform the assessment process consumes Process to Assess*
A produces Art	Activity produces Artifact	*Perform the assessment process produces Process Profile*

Table 2: Mapping between Generic SMP and Assessment Model

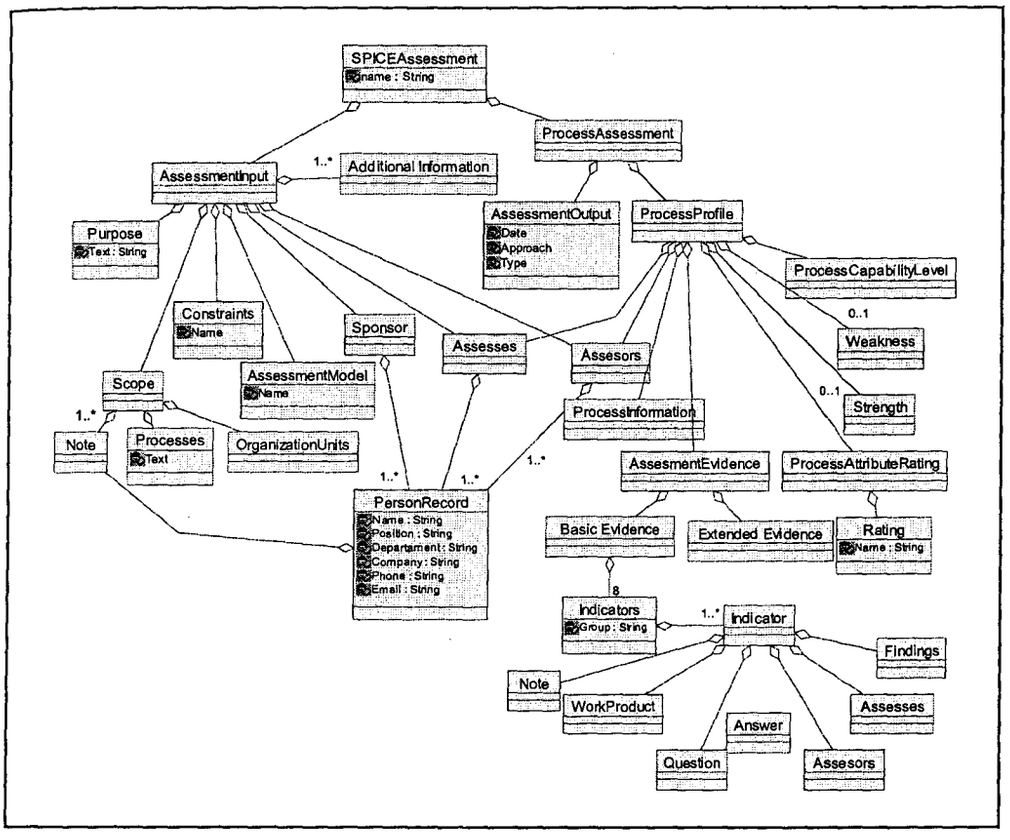

Figure 2: Structure of the SPICE assessment output

detailed information collected during the assessment about the presence or absence of specific indicators provides the valuable input into analysis and process improvement planning.

3.3 M0 Level: Concrete Data

At this level, there are the concepts related to the application of a specific assessment process following the guidelines of its assessment model defined in the higher level (M1). An example of this level is the following: '*Planning of the assessment process of the software maintenance process carried out in the Company Example S.A*'. Besides, it includes all data shown (according to the pattern indicated in the process profile) during the assessment process to control how the maintenance process is carried out in this company. These data correspond with the indicators defined in the higher level. For example if '*Maintenibility*' is defined as an attribute of process, this attribute will have a specific value in this level.

4 WORKING WITH ALL THE CONCEPTUAL LEVELS

With the aim of carrying out an effective management of metadata in the different abstraction levels, using an intuitive and easy form of working with the correspondences among different levels and to represent these meta-data in an open way for their exchange, MANTIS-METAMOD (Garcia et al, 2001) has been developed. The aim of MANTIS-METAMOD is to manage the meta-models definition (level 2 MOF) and models (level 1 MOF) and to represent them in an open way.

The following figure 3 shows how MANTIS-METAMOD displays the correspondence between the generic metamodel of software processes and the process assessment model appearing in the previous section.

To represent in an open way metadata, MANTIS-METAMOD uses a manager of a repository of metadata stored according to XMI Standard (OMG, 1999b). With the use of XMI it is possible the information about models and metamodels can be exchanged among tools that use

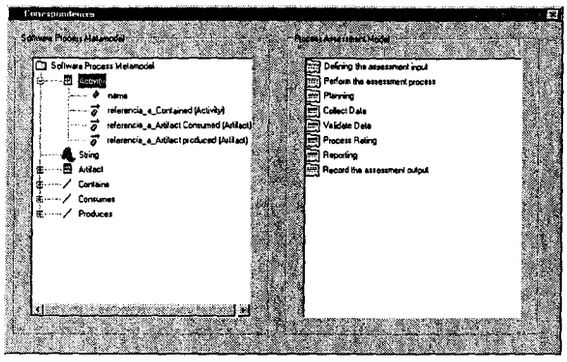

Figure 3: View of MANTIS-Metamod

this open format. This increases to a great extent the ability of integration with other tools and environments. With MANTIS-METAMOD has been possible:

- to represent the conceptual architecture mentioned before and
- to store it in a consistent way. It can be easily updated for changes in the process generic metamodel or in the assessment model.

The figure 4 is a scheme of the tool based on its storage layer and which sums up the previously mentioned concepts.

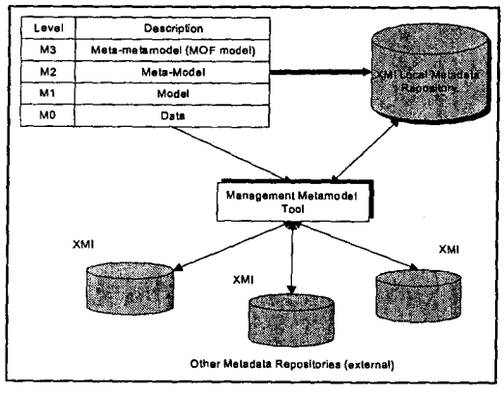

Figure 4: Mantis-METAMOD storage layer

5 CONCLUSIONS

In this work a conceptual architecture based on MOF standard for the effective management of the software assessment process has been shown. In this architecture the assessment model based on ISO 15504 has been integrated according to generic metamodel builders of software processes defined by IESE. This architecture has been used in the MANTIS environment to apply assessment concepts and process improvements to software maintenance.

The performance of a good assessment process is an essential aspect to apply improvement plans in the software processes of an organization. Therefore, the effective management of the assessment process is fundamental for its success when it is put it into practice. With the generic model of software processes defined in level 2 of MOF rank it is possible to define any model of software processes. Therefore several assessment models of software processes could be defined in which elements of previous versions are being refined, obtaining in each version a more effective assessment model. All these models can be processed in an integrated and consistent way since their elements are examples of the concepts defined in the generic meta-model of level 2. For an automatic management of models and meta-models according to these architecture, the tool MANTIS-METAMOD has been developed. With this tool, the models and meta-models defined in the form of XMI documents can be exported or imported. This makes possible the collaboration of MANTIS with any other meta-modeling tool based on MOF, permitting the sharing of different defined models and meta-models.

6 FUTURE AND RELATED WORKS

Very recently has been published the OMG SPEM (Software Process Engineering Metamodel Specification) (OMG, 2001). This document is an OMG Final adopted specification whose FTF recommendation and report will be published in July, 1, 2002. SPEM is based on the definition of the minimal set of process modeling elements necessary to describe any software development process. In general, all software process metamodel should include the three basic elements exposed in this paper: modeling constructs, human resources and measurement. In SPEM this elements are included and it would be very useful considering it as our generic software process metamodel (level 2) when this specification will become a standard.

Other work to take into account is the study of the possibility of using UML profiles in order to define the metamodels used in level 2. For example, SPEM is defined both as a metamodel (as the metamodel used in this work to model software processes) and as a UML profile.

Beside among our future studies is important to emphasize the need for:

- The implementation in MANTIS-METAMOD of the correspondence among the levels M1-M10 managing the relationship between the elements of the

processes model defined in M1 and its performance in level M0.

- Refining and improving the assessment model of software processing through the definition, testing and validation of a group of software process metrics.
- Integrating in conceptual architecture in level M1 an improvement model of the software maintenance process based on ISO 15504 which uses the results of the assessment process to improve the ability of an organization for maintenance when they carry out their processes (Niessink, 2000).
- Creation of tools in level M0 to collect and to manage automatically the performance of an assessment process and software processes improvement in an organization (Park & Kyung, 2001). For instance, using DTD's proposal of these authors to represent as XML documents the results of the assessment.

ACKNOWLEDGEMENTS

This work has been undertaken in collaboration with the company Atos ODS subsidized by the MANTIS project. MANTIS has been partially supported by the European Union and CICYT-Spain(1FD97-1608TIC).

REFERENCES

Becker-K., U., and Webby, R., A (1999): Comprehensive Schema Integrating Software Process Modeling and Software Measurement, Fraunhofer Institute, IESE report N° 047.99/E., v. 1.2, 1999.

BOOTSTRAP (1993): BOOTSTRAP: Europe's Assessment Method, in: David Card (Ed.), IEEE Software, pp. 93-95, July 1993.

García, F. , Márquez, L., Ruiz, F., Piattini, M., Polo, M (2001): A Tool for the Management of the Software Maintenance Process. Multiconference on Circuits, Systems, Computers and Communications (CSCW). July 2001.

IEEE (1998): IEEE 730. Standard for Software Quality Assurance Plans.

ISO/IEC (1998a): ISO IEC 15504 TR2:1998, part 2: A reference model for processes and process capability, ISO/IEC JTC1/SC7, 1998

ISO/IEC (1998b): ISO IEC 15504 TR2:1998, part 4: Guide to conducting assessment, ISO/IEC JTC1/SC7, 1998

Niessink, F. (2000): Perspectives on Improving Software Maintenance. PhD Thesis, Vrije Universiteit, Netherland. In http://www.opencontent.org/openpub/, 2000.

OMG (1999a): UML Unified Modeling Language, v 1.3, Jun-1999.

OMG (1999b): XML Metadata Interchange (XMI), v. 1.1, Oct-1999.

OMG (2000): Meta Object Facility (MOF) Specification, v. 1.3 RTF, Mar-2000. In http://www.omg.org.

OMG (2001): Software Process Engineering Metamodel Specification, December-2001. In http://www.omg.org.

Pigosky (1996): Practical Software Maintenance. Best Practices for Managing your Investment. Ed. John Wiley & Sons, USA 1996.

Park, J.; Kyung Wan, L. (2001); A XML-Based Approach to Software Process Improvement over the Internet.

SEI (1995): The Capability Maturity Model: Guidelines for Improving the Software Process,1995. In http://www.sei.cmu.edu/cmm/cmm.html

W3C (2000): Extensible Markup Language (XML) 1.0 (second edition), oct-2000. In http://www.w3.org

Hosted by

the School of Informatics of the University of Castilla-la Mancha

Co-Organized by

the School of Technology of Setúbal

Main Sponsors

Fundacion Dintel
Gesein
Getronics
InterSystems
Oracle

Collaborators

Asociación de Doctores, Licenciados e Ingenieros en Informática
Asociación de Ingenieros en Informática
Asociación de Tecnicos de Informática
Asociación Profesional del Cuerpo Superior de Sistemas Y Tecnologias de la Informacion de la Administracion del Estado
Circulo de Usuarios Oracle de España
Colegio de Ingenieros Tecnicos del Principado de Asturias
Colegio Oficial de Ingenieros en Informática del Pais Vasco
Colegio Oficial de Ingenieros en Informática del Principado de Asturias
Colegio Oficial de Ingenieros en Informática de la Comunidad de Valencia
Collegis Oficials d´ Enginyeria en Informática de Catalunya
Ilustre Colegio de Ingenieros en Informática de la Región de Murcia

Proceedings of the
4th International Conference on
Enterprise Information Systems ICEIS 2002
ISBN: 972-98050-6-7
http://www.iceis.org