## RESEARCH TRACKS

### Research Track 1: Multicast and Mobile Wireless Communication

**Differential SOAP Multicasting**

*Joe Tekli, Ernesto Damiani, and Richard Chbeir*

**Enhancing the Caching of Web Service Responses on Wireless Clients**

*Apostolos Papageorgiou, Marius Schatke, Stefan Schulte, and Ralf Steinmetz*

**Opportunistic Composition of Sequentially-Connected Services in Mobile Computing Environments**

*Christin Groba and Siobhán Clarke*

### Research Track 2: Security, Privacy, and Trust

**Defending Web Services against Denial of Service Attacks Using Client Puzzles**

*Suriadi Suriadi, Douglas Stebila, Andrew Clark, and Hua Liu*

**A Privacy-Preserving Approach for Web Service Selection and Provisioning**

*Anna Squicciarini, Barbara Carminati, and Sushama Karumanchi*
Finding K Optimal Social Trust Paths for the Selection of Trustworthy Service Providers in Complex Social Networks .................................................................41
  Guanfeng Liu, Yan Wang, and Mehmet A. Orgun

Research Track 3: Service Evolution
An Empirical Study on Web Service Evolution ...............................................................49
  Marios Fokaefs, Rimon Mikhaiel, Nikolaos Tsantalis, Eleni Stroulia, and Alex Lau
LoST: Local State Transfer—An Architectural Style for the Distributed Enactment of Business Protocols ........................................................................57
  Munindar P. Singh
Towards Privacy-Preserving XML Transformation .......................................................65
  Meiko Jensen and Florian Kerschbaum

Research Track 4: Automatic Service Composition
Dynamic Composition of Pervasive Process Fragments ..............................................73
  Adina Sirbu, Annapaola Marconi, Marco Pistore, Hanna Eberle,
  Frank Leymann, and Tobias Unger
Automatic Web Service Composition with a Heuristic-Based Search Algorithm .............81
  Pablo Rodriguez-Mier, Manuel Mucientes, and Manuel Lama
QoS-Aware Automatic Service Composition by Applying Functional Clustering...............89
  Florian Wagner, Fuyuki Ishikawa, and Shinichi Honiden

Research Track 5: Service Selection and Negotiation
Service Selection with Combinational Use of Functionally-Equivalent Services .................97
  Nobuaki Hiratsuka, Fuyuki Ishikawa, and Shinichi Honiden
WebNeg: A Genetic Algorithm Based Approach for Service Negotiation .......................105
  Khayyam Hashmi, Amal Alhosban, Zaki Malik, and Brahim Medjahed
Combining Configuration and Query Rewriting for Web Service Composition ................113
  Amin Mesmoudi, Michaël Mrissa, and Mohand-Saïd Hacid

Research Track 6: Business Process Management
A Multi-tenant Architecture for Business Process Executions .......................................121
  Milinda Pathirage, Srinath Perera, Indika Kumara, and Sanjiva Weerawarana
Refactoring and Publishing WS-BPEL Processes to Obtain More Partners .....................129
  Wei Song, Xiaoxing Ma, S.C. Cheung, Hao Hu, Qiliang Yang, and Jian Lü
Modeling and Executing Business Processes with Annotated Security Requirements in the Cloud ..................................................................................................137
  J. Damasceno, F. Lins, R. Medeiros, B. Silva, A. Souza, D. Aragão, P. Maciel,
  N. Rosa, B. Stephenson, and J. Li
<table>
<thead>
<tr>
<th>Research Track 7: Service Evaluation and Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Dou Wanchun, Lv Chao, Zhang Xuyun, and Jinjun Chen</em></td>
</tr>
<tr>
<td>Timed Web Services Analysis after Removing Complex Implicit Transitions ..........153</td>
</tr>
<tr>
<td><em>Emad Elabed, Emmanuel Coquery, and Mohand-Said Hacid</em></td>
</tr>
<tr>
<td>Runtime Monitoring of Data-centric Temporal Properties for Web Services ..........161</td>
</tr>
<tr>
<td><em>Guoquan Wu, Jun Wei, Chunyang Ye, Xiaozhe Shao, Hua Zhong, and Tao Huang</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research Track 8: Service Interoperability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has WS-I's Work Resulted in Ws-* Interoperability? ........................................171</td>
</tr>
<tr>
<td><em>Andreas Schöenberger, Johannes Schwalb, and Guido Wirtz</em></td>
</tr>
<tr>
<td>Retrieving Compatible Web Services ..............................................................179</td>
</tr>
<tr>
<td><em>Vasilios Andrikopoulos and Pierluigi Plebani</em></td>
</tr>
<tr>
<td>DIEGO: A Tool for DerIving chorEoGraphy-cOnforming Web Service Systems ..........187</td>
</tr>
<tr>
<td><em>Pablo Rabanal, José Antonio Mateo, Ismael Rodríguez, and Gregorio Díaz</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research Track 9: Service Ranking and Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative Filtering Based Service Ranking Using Invocation Histories ..........195</td>
</tr>
<tr>
<td><em>Qiong Zhang, Chen Ding, and Chi-Hung Chi</em></td>
</tr>
<tr>
<td>A QoS-Based Fuzzy Model for Ranking Real World Web Services ..........................203</td>
</tr>
<tr>
<td><em>Mohamed Almulla, Kawthar Almatori, and Hamdi Yahyaoui</em></td>
</tr>
<tr>
<td>An Effective Web Service Recommendation Method Based on Personalized Collaborative Filtering ..........................................................211</td>
</tr>
<tr>
<td><em>Yechun Jiang, Jianxun Liu, Mingdong Tang, and Xiaoqing (Frank) Liu</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research Track 10: Efficient Service Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-empirical Service Composition: A Clustering Based Approach ..........................219</td>
</tr>
<tr>
<td><em>Xianzhi Wang, Zhongjie Wang, and Xiaofei Xu</em></td>
</tr>
<tr>
<td>Efficient Multi-granularity Service Composition ...............................................227</td>
</tr>
<tr>
<td><em>Lina Barakat, Simon Miles, Iman Poernomo, and Michael Luck</em></td>
</tr>
<tr>
<td>On the Optimal Petri Net Representation for Service Composition ..........................235</td>
</tr>
<tr>
<td><em>Yin Wang, Ahmed Nazeem, and Ram Swaminathan</em></td>
</tr>
</tbody>
</table>
Research Track 11: Semantic Services

Composing Data-Driven Service Mashups with Tag-Based Semantic Annotations .......................................................... 243
  Xuanzhe Liu, Qi Zhao, Gang Huang, Hong Mei, and Teng Teng

A Learning Ontology Method for RESTful Semantic Web Services .......................................................... 251
  Yong-Ju Lee and Chang-Su Kim

Personalizing Access to Semantic Web Services .......................................................... 259
  Freddy Lécué

Research Track 12: Service Composition Planning and Testing

Identifying Optimal Composite Services by Decomposing the Service Composition Problem .......................................................... 267
  Zachary J. Oster, Ganesh Ram Santhanam, and Samik Basu

A Transaction Management Model Based on Compensation Planning Graph for Web Services Composition .......................................................... 275
  Lizhen Cui, Zongmin Shang, and Yuliang Shi

Metamorphic Testing for Web Services: Framework and a Case Study .......................................................... 283
  Chang-ai Sun, Guan Wang, Baohong Mu, Huai Liu, ZhaoShun Wang, and T.Y. Chen

Automatic Sampling of Web Services .......................................................... 291
  Mohammed AbuJarour and Sebastian Oergel

APPLICATIONS AND EXPERIENCES TRACKS

Applications and Experiences Track 1: Process Management

Modelling Collaborative Services for Business and QoS Compliance .......................................................... 299
  Jinhui Yao, Shiping Chen, Chen Wang, David Levy, and John Zic

Verifying OWL-S Service Process Models .......................................................... 307
  Yuzhang Feng and Markus Kirchberg

An Automatic Approach for Extracting Process Knowledge from the Web .......................................................... 315
  Hua Xiao, Bipin Upadhyaya, Foutse Khomh, Ying Zou, Joanna Ng, and Alex Lau
Applications and Experiences Track 2: QoS-Based Services Composition
A Framework for Building Privacy-Conscious DaaS Service Mashups .................................................................323
Mahmoud Barhamgi, Djamel Benslimane, Chirine Ghedira, Salah-Eddine Tbahriti, and Michael Mrissa
Composing Non-functional Concerns in Composite Web Services ..................................................................331
Benjamin Schmeling, Anis Charfi, and Mira Mezini
Adaptive Service Composition Based on Runtime Requirements Monitoring ..............................................339
Zhanlei Ma, Lin Liu, Hongji Yang, and John Mylopoulos

Applications and Experiences Track 3: Semantic Services Composition
Inferring Data Flow in Semantic Web Service Composition ..................................................................................347
Freddy Lécué
Web Service Composition Techniques in a Health Care Service Platform ..................................................355
Pengwei Wang, Zhijun Ding, Changjun Jiang, and Mengchu Zhou

Applications and Experiences Track 4: Semantic Services Discovery
Taxonomic Clustering and Query Matching for Efficient Service Discovery ....................................................363
Sourish Dasgupta, Satish Bhat, and Yugyung Lee
Toward Semantics Empowered Biomedical Web Services .............................................................................371
Jia Zhang, Ravi Madduri, Wei Tan, Kevin Deichl, John Alexander, and Ian Foster
A Hybrid Approach to Recommending Semantic Software Services .............................................................379
Liwei Liu, Freddy Lecue, and Nikolay Mehandjiev

Applications and Experiences Track 5: Requirements-Based Services Discovery
Web Service Selection for Resolving Conflicting Service Requests ..............................................................387
Guosheng Kang, Jianxun Liu, Mingdong Tang, Xiaoqing (Frank) Liu, and Kenneth K. Fletcher
Selection of Composable Web Services Driven by User Requirements ................................................................395
Zeina Azmeh, Maha Driss, Fady Hamoui, Marianne Huchard, Naouel Moha, and Chouki Tibermacine
AWSP: An Automatic Web Service Planner Based on Heuristic State Space Search ........................................403
Bin Wu, Shuiguang Deng, Ying Li, Jian Wu, and Jianwei Yin
Applications and Experiences Track 6: QoS-Based Services Discovery

Improving Web Service Discovery by a Functional and Structural Approach .........................................................411
Rodrigo Amorim, Daniela Barreiro Claro, Denivaldo Lopes, Patrick Albers, and Aline Andrade

CoWS: An Internet-Enriched and Quality-Aware Web Services Search Engine ..................................................419
Meng Li, Junfeng Zhao, Lijie Wang, Sibo Cai, and Bing Xie

A QoS-Aware Web Service Selection Algorithm Based on Clustering .................................................................428
Yi Xia, Ping Chen, Liang Bao, Meng Wang, and Jing Yang

Applications and Experiences Track 7: QoS-Based Services Composition

Efficient Heuristic Approach with Improved Time Complexity for Qos-Aware Service Composition .........................................................436
Adrian Klein, Fuyuki Ishikawa, and Shinichi Honiden

Non-cooperative Game Based QoS-Aware Web Services Composition
Approach for Concurrent Tasks ..................................................................................................................................444
Haifeng Li, Qing Zhu, and Yiqiang Ouyang

QoS-Aware Service Composition for Workflow-Based Data-Intensive Applications ...................................................452
Yin Li and Chuang Lin

Applications and Experiences Track 8: Services Negotiation and Management

A Hierarchical Approach to Service Negotiation .......................................................................................................460
Glenn Bruns and Mauricio Cortes

Automated State-Space Exploration for Configuration Management
of Service-Oriented Applications ..........................................................................................................................468
Mike Smit and Eleni Stroulia

Optimizing the Tradeoff between Discovery, Composition, and Execution Cost in Service Composition .........................................................476
Immanuel Trummer and Boi Faltings

Applications and Experiences Track 9: Services Engineering

Regression Testing as a Service ...............................................................................................................................484
Sheng Huang, Zhong Jie Li, Ying Liu, Jun Zhu, Yang Hua Xiao, and Wei Wang
A Multi-layered Approach for the Declarative Development of Data Providing Services ............................................................492
  
  Kevin P. Brown and Miriam A.M. Capretz

Transaction Similarity-Based Contextual Trust Evaluation in E-Commerce and E-Service Environments ........................................................................................................500
  
  Haibin Zhang, Yan Wang, and Xiuzhen Zhang

INDUSTRY TRACKS

Industry Track 1: Business Process Management

Design and Describe REST API without Violating REST: A Petri Net Based Approach .................................................................................................................................508
  
  Li Li and Wu Chou

Modeling Business Process of Web Services with an Extended STRIPS Operations to Detection Feature Interaction Problems Runtime ........................................................................516
  
  Jiuyun Xu, Kun Chen, Youxiang Duan, and Stephan Reiff-Marganiec

Rule-Based Run-Time Information Flow Control in Service Cloud .................................................................................................524
  
  Wei She, I-Ling Yen, Bhavani Thuraisingham, and San-Yih Huang

Industry Track 2: QoS Management

Progressive Reliability Forecasting of Service-Oriented Software .................................................................................................532
  
  Andrew G. Liu, Ewa Musial, and Mei-Hwa Chen

On the Use of Fuzzy Dominance for Computing Service Skyline Based on QoS .................................................................................................540
  
  Karim Benouaret, Djamal Benslimane, and Allel Hadjali

On the Verification of Behavioral and Probabilistic Web Services Using Transformation .................................................................................................548
  
  Giti Oghabi, Jamal Bentahar, and Abdelghani Benharref

Industry Track 3: Services Engineering

A Service-Oriented Framework for Hybrid Immersive Web Applications .................................................................................................556
  
  Lijun Mei, Yimin Wang, Qicheng Li, Jian Wang, and Ziyu Zhu

A Dynamic Resource Allocation Algorithm for Database-as-a-Service .................................................................................................564
  
  Jie Zhu, Bo Gao, Zhihu Wang, Berthold Reinwald, Changjie Guo, Xiaoping Li, and Wei Sun

Long-Term Benefit Driven Adaptation in Service-Based Software Systems .................................................................................................572
  
  Jun Na, Bin Zhang, Yan Gao, Li Zhang, and Zhi-liang Zhu
Industry Track 4: Services Assurance
An Attribute Assurance Framework to Define and Match Trust in Identity Attributes ...................................................................................................................................................580
Ivonne Thomas and Christoph Meinel
Fine-Grained Metrics of Cohesion Lack for Service Interfaces ............................................................................................................................588
Dionysis Athanasopoulos and Apostolos V. Zarras

Industry Track 5: Service Security and Trust
Automated Security Service Orchestration for the Identity Management in Web Service Based Systems ...................................................................................................................................................596
Robert Warscholfsky, Michael Menzel, and Christoph Meinel
A Subjective Probability Based Deductive Approach to Global Trust Evaluation in Composite Services ...................................................................................................................................................604
Lei Li and Yan Wang
Dynamic Identity Delegation Using Access Tokens in Federated Environments ..............................................................................................................................612
Hidehito Gomi

Industry Track 6: Services Monitoring and Testing
StreamWeb: Real-Time Web Monitoring with Stream Computing ...................................................................................................................................................620
Toyotaro Suzumura and Tomoaki Oiki
An Event-Based Reasoning Approach to Web Services Monitoring ...................................................................................................................................................628
Ehtesham Zahoor, Olivier Perrin, and Claude Godart
Test Case Prioritization for Audit Testing of Evolving Web Services Using Information Retrieval Techniques ...................................................................................................................................................636
Cu D. Nguyen, Alessandro Marchetto, and Paolo Tonella

Industry Track 7: Multicast and Mobile Wireless Communication
Differential Caches for Web Services in Mobile Environments ...................................................................................................................................................644
M.S. Qaiser, P. Bodorik, and D.N. Jutla
Providing Light Weight Distributed Web Services from Mobile Hosts ...................................................................................................................................................652
Feda AlShahwan, Klaus Moessner, and Francois Carrez
WS-Eventing SOAP-over-UDP Multicast Extension ...................................................................................................................................................660
David Gregorczyk
**Industry Track 8: Service Composition**

A History Record-Based Service Optimization Method for QoS-Aware Service Composition ................................................................. 666

*Lin Wenmin, Dou Wanchun, Luo Xiangfeng, and Jinjun Chen*

Identification of Semistructured Abstract Nonfunctional Properties for Automatic Service Composition ................................................................. 674

*Incheon Paik, Wuhui Chen, and Ryohei Komiya*

A Policy-Based Framework for Automated Service Level Agreement Negotiation ........................................................................................... 682

*Zan Xiao, Donggang Cao, Chao You, and Hong Mei*

**WORK-IN-PROGRESS TRACKS**

**Work-in-Progress Track 1: Service Communities and Privacy**

Implementation of Communities of Web Service Registries ................................................................. 690

*Mohamed Sellami, Walid Gaaloul, and Samir Tata*

Aggregated Privacy-Preserving Identity Verification for Composite Web Services .......................................................................................... 692

*Nan Guo, Tianhan Gao, Bin Zhang, Ruchith Fernando, and Elisa Bertino*

Privacy Preserving Personalized Access Control Service at Third Service Provider ........................................................................................ 694

*Xiuixia Tian, Chaofeng Sha, Xiaoling Wang, and Aoying Zhou*

Apply WS-Management to Manage Real Resources: MAPE Use Case Study ............................................................................................. 696

*ZhiHui Lu, Jie Wu, and WeiMing Fu*

CLAM: Cross-Layer Management of Adaptation Decisions for Service-Based Applications ............................................................................. 698

*Asli Zengin, Raman Kazhamiakin, and Marco Pistore*

Social-Based Web Services Discovery and Composition for Step-by-Step Mashup Completion ....................................................................... 700

*Abderrahmane Maaradji, Hakim Hacid, Ryan Skraba, Adnan Lateef, Johann Daigremont, and Noël Crespi*
Work-in-Progress Track 2: Service Recommendations and Reputation

NRDF: A Novel Collaborative Filtering Method for Service Recommendation ..............................................702
Huifeng Sun, Zibin Zheng, Junliang Chen, and Michael R. Lyu

Reputation-Driven Web Service Selection Based on Collaboration Network ..................................................704
Xilu Zhu, Bai Wang, and Shangguang Wang

Web Services Discovery and Composition: A Schema Matching Approach .....................................................706
Sana Sellami and Omar Boucelma

Data-Dependency Aware Trust Evaluation for Service Choreography ..............................................................708
Longtao Huang, Shuiguang Deng, Ying Li, Jian Wu, and Jianwei Yin

A Formal Model of Service Computing and Its Applications on Service Discovery ........................................710
Yingzhou Zhang, Wei Fu, Lei Chen, and Bihuan Xu

Work-in-Progress Track 3: Semantic Services and Integration

Ontology-Driven Query Expansion Using Map/Reduce Framework to Facilitate Federated Queries ................712
Neda Alipanah, Pallabi Parveen, Latifur Khan, and Bhavani Thuraisingham

Generating Workflow Models from OWL-S Service Descriptions with a Partial-Order Plan Construction ........714
Bochao Wang, Armin Haller, and Florian Rosenberg

Constructing Operation-Level Ontologies for Web Services ........................................................................716
Xumin Liu and Hua Liu

A Petri Net Based Hybrid Optimal Controller for Deadlock Prevention in Web Service Composition ........718
Jing Bi, Zhiliang Zhu, Haitao Yuan, Yushun Fan, and Ming Tie

An Event-Based Functionality Integration Framework ......................................................................................720
Zhenzhen Zhao, Sirsha Bhattarai, and Noel Crespi

Conformance Verification between Web Service Choreography and Implementation Using Learning and Model Checking ..........................................................................................................................722
Warawoot Pacharoen, Toshiaki Aoki, Athasit Surarerks, and Pattarasinee Bhattachakosol

A Framework for Ontology Evolution Management in SSOA-Based Systems ........................................724
Soumaya Slimani, Salah Baïna, and Karim Baïna
Work-in-Progress Track 4: Context-Aware and Mobile Wireless Services

A New QoS Prediction Approach Based on User Clustering and Regression .......................................................... 726
Yuliang Shi, Kun Zhang, Bing Liu, and Lizhen Cui

On-the-Fly Detection Approach of Control Dependency Deadlocks in BPEL ....................................................... 728
Deng Na, Li Desheng, Li Changbao, Chen Junliang, and Liu Chuanchang

An Abstract Transaction Model for Testing the Web Services Transactions ............................................................ 730
Rubén Casado, Javier Tuya, and Muhammad Younas

CloudDB AutoAdmin: Towards a Truly Elastic Cloud-Based Data Store ................................................................. 732
Sherif Sakr, Liang Zhao, Hiroshi Wada, and Anna Liu

A Web Service Performance Evaluation Approach Based on Users Experience ....................................................... 734
Changbao Li, Bo Cheng, Junliang Chen, Pingli Gu, Na Deng, and Desheng Li

Predicting Software Service Availability: Towards a Runtime Monitoring Approach .................................................. 736
Davide Lorenzoli and George Spanoudakis

Work-in-Progress Track 5: Quality of Service Analysis and Control

Mobility-Aware Selection of Mobile Web Services ...................................................................................................... 738
M. Adel Serhani and Abdelghani Benharref

An Event Driven Model for Context-Aware Service .................................................................................................... 740
Tong Mo, Weiping Li, Weijie Chu, and Zhonghai Wu

A Comprehensive Device Collaboration Model for Integrating Devices with Web Services under Internet of Things .............................................................................................................. 742
Feng Chen, Changrui Ren, Jin Dong, Qinhua Wang, Jinfeng Li, and Bing Shao

Improving Web API Discovery by Leveraging Social Information .............................................................................. 744
Romina Torres, Boris Tapia, and Hernán Astudillo

Service Evolution Management Based on Usage Profile ............................................................................................ 746
Marcelo Yamashita, Karin Becker, and Renata Galante

Multiple Representations of Web Services: Discovery, Clustering and Recommendation .............................................. 748
Mustapha Aznag, Mohamed Quafafou, Nicolas Durang, and Zahi Jarir

Author Index ............................................................................................................................................................... 750