

## DISTRIBUTED SYSTEMS RESEARCH LABORATORY

### Contact details

Name	Distributed Systems Research Laboratory
Acronym	DSRL
Logo	
Site	<a href="http://dsrl.coned.utcluj.ro">http://dsrl.coned.utcluj.ro</a> <a href="http://research.utcluj.ro/tl_files/research/Research%20Domain/Computer%20Science/2_Salomie.pdf">http://research.utcluj.ro/tl_files/research/Research%20Domain/Computer%20Science/2_Salomie.pdf</a>
Address	26-28 G. Baritiu Str., 400027, Cluj-Napoca, Romania
Faculty Department	<b>Faculty of Automation and Computer Science Computer Science Department</b>
Telephone	0264-202352, 0264-401443, 0264-401236
Fax	0264-401443
Director	Prof. Dr. Eng. Ioan Salomie
E-mail	<a href="mailto:Ioan.Salomie@cs.utcluj.ro">Ioan.Salomie@cs.utcluj.ro</a>



### Areas of expertise

**Context-awareness and Autonomic Computing** Study and develop systems that understand the context in which they evolve and automatically decide on the actions to be executed to adapt themselves to the context changes; Developing techniques for enacting autonomic self-\* features for dynamic and complex systems.

**Green Computing** Study and develop models, techniques and algorithms for increasing the energy efficiency of computer systems, datacentres, buildings and smart cities and reducing their carbon footprint.

**Bio-inspired Distributed Systems** Study and develop techniques and algorithms inspired from biological behavior and processes, governed by decentralized control, for solving NP hard problems and enacting self-\* features; Adapt and enhance bio-inspired meta-heuristics from Immuno-computing, Swarm Intelligence, and Evolutionary computing for selecting the optimal solution in decision making, service composition, business process optimization and energy-efficient data centres

**Service-oriented Distributed Systems** Study and develop methods and techniques for automatically composing web services such as semantically annotating services using a domain ontology, matching semantic service descriptions, clustering semantic services, discovering and composing semantic services and selecting the optimal composition solution.

**Knowledge Engineering** Study and develop complex systems involving planning and decision making using knowledge engineering. Researches targeted knowledge representation and processing, domain ontology building, methods for processing documents written in natural language and methods for data mining.

### Team

**Prof. Dr. Eng Ioan Salomie**, Assoc. Prof. Dr. Eng. Viorica Rozina Chifu, Assist. Prof. Dr. Eng. Tudor Cioara, Assist. Prof. Dr. Eng. Ionut Anghel, Assist. Prof. Eng. Cristina Pop, Assist. Eng. Marcel Antal, Eng. Claudia Pop, Eng. Dorin Moldovan, Teodor Petrican, Ciprian Stan

### Representative projects

**GEYSER**, “Green nEtworKed Data Centres as Energy ProSumErs in smaRt city environments”, EU FP7, ICT-2013.6.2: Data Centres in an energy-efficient and Environmentally friendly Internet, <http://www.geyser-project.eu> (2013-2016)

**Elders-UP!**, “Adaptive system for enabling the elderly collaborative knowledge transference to small companies”, EU FP7 – PNCDI/II, Active and Assisted Living Programme AAL-2013-6, <http://www.eldersup-aal.eu> (2014-2016)

**DIET4Elders**, “Dynamic Nutrition Behaviour Awareness System for the Elders”, EU FP7 – PNCDI/II, Active and Assisted Living Programme AAL-2012-5, <http://www.diet4elders.eu/> (2013-2016)

**GAMES**, “Green Active Management of Energy in IT Service centres”, EU FP7, ICT-2009-6.3: ICT for Energy efficiency, <http://www.green-datacenters.eu/> (2010-2012)

**MAESTRO**, “Ontology Driven Automatic Web Service Composition”, CNCSIS, PN II Ideas, (2007-2010)

**ArhiNet**, “Integrated System for developing semantically-enhanced archive content”, CNMP, Program 4, (2007–2010)

**FOOD-TRACE**, “Integrated IT system for traceability and quality control in food industry”, CEEX RO, (2006-

## Significant results

### The most representative publications of the past 5 years:

1. T. Cioara, I. Anghel, M. Antal, S. Crisan, I. Salomie - Data center optimization methodology to maximize the usage of locally produced renewable energy. SustainIT 2015: 1-8 <http://dx.doi.org/10.1109/SustainIT.2015.7101363>
2. M. Bertoncini, D. Arnone, T. Cioara, I. Anghel, I. Salomie, T. H. Velivassaki - Next Generation Data Centers Business Models Enabling Multi-Resource Integration for Smart City Optimized Energy Efficiency. e-Energy 2015: 247-252 <http://dl.acm.org/citation.cfm?id=2768522>
3. V.R. Chifu, C.B. Pop, and I. Salomie - Bio-inspired methods for business process mining and optimization, Lambert Academic Publishing, Germany, ISBN-13: 978-3-659-68458-6, 2015. <https://www.lap-publishing.com/catalog/details/store/es/book/978-3-659-68458-6/bio-inspired-methods-for-business-process-mining-and-optimization?search=Bianca>
4. V. R. Chifu, I. Salomie, E. Șt. Chifu, C. B. Pop, P. Poruțiu, M. Antal - Jigsaw inspired meta-heuristic for selecting the optimal solution in Web service composition, Soft Computing Applications, vol. 356 of the series Advances in Intelligent Systems and Computing, pp. 573-584, 2015. [http://link.springer.com/chapter/10.1007%2F978-3-319-18296-4\\_45](http://link.springer.com/chapter/10.1007%2F978-3-319-18296-4_45)
5. I. Anghel, M. Bertoncini, T. Cioara, M. Cupelli, V. Georgiadou, P. Jahangiri, A. Monti, S. Murphy, A. Schoofs, T. Velivassaki - GEYSER: Enabling Green Data Centres in Smart Cities. E2DC 2014: 71-86 [http://link.springer.com/chapter/10.1007/978-3-319-15786-3\\_5](http://link.springer.com/chapter/10.1007/978-3-319-15786-3_5)
6. I. Salomie, V. R. Chifu, C. B. Pop - Hybridization of Cuckoo Search and Firefly Algorithms for Selecting the Optimal Solution in Semantic Web Service Composition, book chapter in Cuckoo Search and Firefly Algorithm: Theory and Applications, vo. 516, 2014, pp. 217-243. [http://link.springer.com/chapter/10.1007%2F978-3-319-02141-6\\_11](http://link.springer.com/chapter/10.1007%2F978-3-319-02141-6_11)
7. V. R. Chifu, I. Salomie, C. B. Pop, A. Niculici, and S. Suaia – Exploring the selection of the optimal Web service composition through Ant Colony Optimization, Computing and Informatics Journal, Vol. 33, No. 5, 2014, pp.1047-1064 (ISI Journal). <http://www.cai.sk/ojs/index.php/cai/article/viewArticle/1095>
8. A. Kipp, T. Jiang, J. Liu, M. Fugini, I. Anghel, T. Cioara, D. Moldovan and I. Salomie - Energy-Aware provisioning of HPC services with virtualised web services – Evolutionary Based Solutions for Green Computing, Studies in Computational Intelligence Volume 432, 2013, pp 29-53, [http://link.springer.com/chapter/10.1007%2F978-3-642-30659-4\\_2](http://link.springer.com/chapter/10.1007%2F978-3-642-30659-4_2)
9. V. R. Chifu, C. B. Pop, I. Salomie, S. Suaia, A. Niculici, A. Negrean, and H. Jeflea - Optimising the semantic web service composition process using bio-inspired methods, International Journal of Bio-Inspired Computation, Vol. 5, No. 4, 2013, pp. 226-238 (ISI Journal). <http://dl.acm.org/citation.cfm?id=2508650>
10. B. Pernici, C. Cappiello, M. G. Fugini, P. Plebani, M. Vitali, I. Salomie, I. Anghel, T. Cioara, et al. - Setting energy efficiency goals in data centres: the GAMES approach – Energy Efficient Data Centers, Lecture Notes in Computer Science Volume 7396, 2012, pp 1-12, [http://link.springer.com/chapter/10.1007%2F978-3-642-33645-4\\_1#](http://link.springer.com/chapter/10.1007%2F978-3-642-33645-4_1#)
11. A. Kipp, T. Jiang, M.G Fugini, I. Salomie - Layered Green Performance Indicators, Elsevier, Future Generation Computer Systems, vol. 28, no. 2, 2012, pp. 478-489, <http://dx.doi.org/10.1016/j.future.2011.05.005>

### Significant solutions and technologies:

1. Green Cloud Scheduler as OpenNebula Ecosystem Component that consolidates the virtual machines in the cloud ([http://opennebula.org/software/ecosystem:green\\_cloud\\_scheduler](http://opennebula.org/software/ecosystem:green_cloud_scheduler)).
2. Context model and associated management techniques for programmatically representing smart environments.
3. Autonomic middleware for developing context aware applications.
4. Server level optimization controller for improving Data Centre (DC) servers' energy efficiency.
5. Energy consumption optimizer for DCs based on reinforcement learning, KPI/GPI indicators and greenness level assessment.
6. Multi-criteria energy efficiency optimizer in DCs through flexible energy loads, RES usage and DC interaction with the smart grid.

## The offer addressed to the economic environment

Research & development	Core research areas: information systems, software products, advanced information systems for e-services, optimization and decision making, artificial intelligence, bio-inspired computational intelligence. Development services in the following domains: ambient assisted living, green computing and systems, intelligent systems, bio-inspired distributed computing and systems, service oriented distributed computing and systems, autonomic computing and systems, distributed pervasive systems. Experimental prototypes that have been developed within the research projects to be implemented as commercial products.
Consulting	Consulting services for development of ambient assisted living systems, service oriented distributed systems, autonomic systems, pervasive distributed systems, green systems, intelligent and bio-inspired systems.
Training	Training courses in the following domains: programming techniques and languages, software engineering, web applications development, component-based and service-oriented distributed systems development.