SUMMARY AND NEXT STEPS

GENERAL CHAIR: ANCA DANIELA IONITA
PROGRAM CO-CHAIRS: GRACE A. LEWIS AND MARIN LITOIU
Keynote: Search-Based Optimization Techniques in the Context of SOA and Cloud Computing
Massimiliano Di Penta, University of Sannio, Italy

- Dynamic composition and binding in SOA
- Service Level Agreement and negotiation
- Automatic reconfiguration of applications
- Optimizing the deployment of load in cloud infrastructure
Search-Based Software Engineering (SBSE)
- Many possibilities – in testing, refactoring, prioritizing requirements
- Choose the best solution based on a **fitness function** (quantitative evaluation)

Techniques
- hill climbing, simulated annealing, genetic algorithms (roulette wheel solution, crossover and mutate operators)

SBSE in software maintenance
- Software clustering, software refactoring, automatic bug fixing, concept location (related to reverse engineering), regression testing
SBSE in SOA

- Automatic discovery, self-negotiation, composition, dynamic binding, self-healing / autonomic computing
- **Example: SLA negotiation** (automatic or partially automatic approaches)
  - Heuristics to generate SLA proposals
  - Fitness for getting feedback about them
  - Negotiation types: bargaining, tendering, auction, combined
  - Aggregating QoS attributes
  - Multi-objective negotiation
  - Automatic vs. human-centric
    - Ask humans; learn the fitness function from the humans
SBSE in SOA Advantages
- easy to use, flexibility, good performance

Challenges for applying SBSE for SOA and CLOUD
- Determine automatic behavior at run-time
- Load balancing
- Run-time replacement of failing behavior
- Run-time repairing and patching

Open problems
- Humans are not in the loop
- Convergence of some algorithms is not guaranteed
- Time needed to find a solution (for run-time applications)
• Structuring SOA migration
  ○ Pre-planning using concept-refining methodology to choose approach, tools, etc.
  ○ A defined process that reflects a decade of best practices in the literature

• The next step in migration: workflow automation
  ○ Moving workflow outside of application boundaries to do end-to-end workflow management on systems-of-systems

• The value of case studies
  ○ Used by all three papers to illustrate their contributions
A Structured Legacy to SOA Migration Process and its Evaluation in Practice
Ravi Khadka, Amir Saeidi, Slinger Jansen and Jurriaan Hage (Utrecht University, The Netherlands)

• **Background**
  - > 100 academic papers on legacy to SOA migration
  - 2 categories: migration feasibility; supporting technology

• **A complete migration process**
  - Technological, organizational and business perspectives
    - Migration planning
    - Implementation and management
  - Six-phases that cover both planning and execution
A Structured Legacy to SOA Migration Process and its Evaluation in Practice
Ravi Khadka, Amir Saeidi, Slinger Jansen and Jurriaan Hage (Utrecht University, The Netherlands)

- **Challenges**
  - Business-IT alignment
  - Componentization
  - Infrastructure engineering
  - Automated toolsets
  - Determine optimal granularity
  - Service versioning

- **Evaluation**
  - A migration process in a bank

- **Discussion**
  - Legacy system understanding: technical, or business and process perspectives?
  - Bottom-up and top-bottom approaches
Problems

- Processes evolve continuously: structuring and automation
- The size of systems – business processes at large scale – workflows in systems of systems are hidden
- Processes going through many applications – up to 200

Automated processes in a very large scale context

- Towards a centralized workflow platform
- Combine SOA and BPM for a system of systems

Global platform

- New York, London, Zurich, Singapore
Platform-Based Approach for Automation of Workflows in a System of Systems
Tarmo Ploom (Credit Suisse AG, Switzerland), Axel Glaser (PostFinance AG, Switzerland) and Stefan Scheit (Telstra Corporation, Australia)

• Plans for the future:
  ○ increase scalability
  ○ leverage Credit Suisse SOA
  ○ transform to software product line approach

• Discussion topics
  ○ Problems with databases
  ○ Micro-flows and macro-flows
  ○ Activities become smaller in time while the automation increases
  ○ Emergence of SOA platforms
Overhauling Legacy Enterprise Software Applications with a Concept Refinement Process Model
Daniel Knight, Gregory Knight and Nasseh Tabrizi (East Carolina University, Greenville, USA)

- Concerns:
  - Concept refinement - PRIOR to the development process for transforming legacy applications
  - High level understanding
  - Analyze research trends and technologies
  - Identify, conceptualize and analyze remedies and solutions
  - Rapid prototyping for a selected solution

- Discussion
  - Rewrite or reengineering the existing system? – in the prototype phase – reusing existing functionality
  - Does it pertain to the development process (very early aspects of it) ?
  - Case study – migrate a 10 years old system – 6 people involved - a prototype of a mobile application - timeline: 2 months
Reuse
- Reuse existing classes and methods in an existing object-oriented system as web services in a service-oriented architecture
- Build the reused services into new business processes

Web services maintainability
- RESTful vs. SOAP-WSDL

Maintenance of Web services tests
- Automatic Web Service Change Management
- Efficient regression testing of web services by selecting the relevant test cases to construct a reduced test suite from the existing one, built for a previous version of Web services
Bottom-up approach to collecting Web services

Code mining: C++, C#, Java

Generate WSDL interfaces, SOA diagram, documentation and test scripts

Reuse services into new S-BPM business processes

- Generated BPEL process

Conclusions and discussion

- Using existing code – quick, cheap, not extensively used
- Legacy classes – potential services
- Identify methods that include a business rule
- A GUI software is not a candidate for a Web service
Comparative Evaluation of the Maintainability of RESTful and SOAP-WSDL Web Services
Ricardo Ramos de Oliveira, Robson Vinícius Vieira Sanchez, Júlio Cezar Estrella, and Renata Pontin de Mattos Fortes (Universidade de São Paulo, São Carlos - SP, Brazil), and Valério Brusamolin (Centro de Telemática, Curitiba - PR, Brazil)

Experiment with students
- University of Sao Paulo, Brazil
- Variables, e.g. programming language

• Analysis results for adaptive maintenance:
  - Modifiability sub-characteristics
  - Time spent on web services maintenance
  - RESTful web services are better on the server side –
  - SOAP-WSDL web services better on the client-side

• Discussion
  - What is the cause for this difference at the server side? WSDL is more rigid than REST.
  - Metric: Cyclomatic complexity
A Tool-Supported Approach to Perform Efficient Regression Testing of Web Services
Animesh Chaturvedi and Atul Gupta (Indian Institute of Information Technology, Jabalpur, India)

- Problems with regression testing
  - detect changes in WSDL (XSD) or at code level
- Construct a reduced test suite based on the old one
  - Delete, insert and modify operations
  - New reduced test suite
- Cost metrics proposed
  - Number of operation in WSDL / changes / code lines
  - Effort required
- Case studies
  - Eucalyptus, Amazon WS, Bible WS, currency converting WS etc.
Why migrate to cloud environments?
- Business agility — deployment and configuration
- Focus on higher-value activities
- Cost — from capital expenditures to operating expenditures

Remains challenging
- Not all applications and all data are meant for the cloud
- Not all applications and all data are ready for the cloud

Top 10 Enterprise Applications for Public Cloud
1. Development and testing
2. Development platform services
3. Training servers
4. One-time big data projects
5. Websites
6. Customer relationship management
7. Project management, expense reporting and time management
8. Email
9. Human resources
10. Cloud-based anti-spam and anti-virus services

Delegating Data Management to the Cloud: A Case Study in a Telecommunications Company
Qing Gu, Patricia Lago and Simone Potenza (VU University, The Netherlands)

- Availability, reliability, data integrity
  - Another potential benefit: energy efficiency
- Delegating data management to the Cloud
  - Determine energy waist due to data management
  - Value of energy metrics
  - Industrial case study: Dutch telecommunications provider
- Data classification criteria:
  - Retention
  - Frequency of usage
  - Modification
- Discussion: adding privacy to the criteria
Cloud Modernization Assessment Framework: Analyzing the Impact of a Potential Migration to Cloud
Juncal Alonso, Leire Orue-Echevarria, Marisa Escalante (Tecnalia, Spain), Jesús Gorroño-goitia (Atos, Spain) and Domenico Presenza (Engineering, Italy)

- ARTIST project
  - transforming legacy code to SaaS
  - Model-driven reverse engineering
- Pre-migration phase
  - Maturity assessment, technical & business feasibility analysis
  - Assess the risks of migration to Cloud
    - Cost, ROI, effort estimations
- Case study: Java PetStore
Invited Presentation: Tales of Empirically Understanding and Providing Process Support for Migrating to Clouds
M. Ali Babar (Lancaster University, United Kingdom)

- Case studies in industrial and academic environments
  - Topics: decision support, processes, architecture
  - IT University of Copenhagen – the first migration to Cloud in the Danish Public Sector – e-mail system
  - Tools as a Service (TaaS) – large scale distributed teams of software developers

- Challenges
  - Location specific – domain and legal experts
  - Strategy for moving back
  - Migration education – lack of knowledge and skills
• Autonomic support for Cloud systems
• Architectural issues
• Towards multi-clouds
Architectural elements for autonomic computing

- Dynamic composition at run-time
- Resource availability is unpredictable
- Administration difficulty: missing the documentation
- The run-time architecture - conforming to the design one
- IBM approach: MAPE-K

Validation:

- digital home services
- Use case: pervasive health domain / Orange Labs – determine abnormal tracks indicating behavioral changes, which are signs of serious problems

Cilia Framework
Invited Presentation: Supporting Software Evolution to the Multi-cloud with a Cross-Cloud Platform
Mike Smit (Dalhousie University, Canada)

- Types of migration
  - From in-house to cloud resources
  - From one provider to another / or to multiple others

- X-Cloud Application Management Platform
  - Platform that enables developers to deploy and manage applications on cloud systems
  - Application-driven interfaces and language instead of specific provider terminology
  - Pattern-based deployment service
  - Built on stream processing
Invited Presentation: Supporting Software Evolution to the Multi-cloud with a Cross-Cloud Platform
Mike Smit (Dalhousie University, Canada)

- **Case studies:**
  - 3 Tiers Web application
    - Load average and response time
    - Management logic throughput
  - Smart Applications on Virtual Infrastructure (SAVI)
    - Pan-Canadian network of researchers and systems
• **PaaS Migration: Architectural Concerns and Patterns**
  - Statelessness and data externalization are solutions for elasticity and performance
  - Relational to NoSQL – data migration and verification
  - Skill shortage can pose significant problems

• **Monitoring Adaptive Service-Level Agreements**
  - Monitoring infrastructure must adapt according to the changes in underlying environment
  - Multi-source monitoring for adaptive SLA following the evolution of the Cloud infrastructure
PaaS Cloud Migration — Migration Process, Architecture Problems and Solutions
Claus Pahl and Huanhuan Xiong (Dublin City University, Ireland)

- **Layers**
  - Consultation
  - Infrastructure assessment and requirements
  - Software development
  - Provisioning

- **A basic solution, then a scalable one**

- **Techniques**
  - Stateless programming
  - Databases for state management
  - Data externalization for resiliency

- **Test case:** 10 servers, 1000 users
Adaptive SLA Monitoring of Service Choreographies Enacted on the Cloud
Antonia Bertolino, Antonello Calabrò and Guglielmo De Angelis (Istituto di Scienza e Tecnologie della Informazione “A. Faedo”, Italy)

- Orchestration and choreography
- Adaptation of the monitoring infrastructure to keep track of the environment evolution
- Functional and non-functional service monitoring (check the SLA)
- Multi-source monitoring
MESOCA 2013 – NEXT STEPS

- Introduction and summary slides will be on the web site: http://www.sei.cmu.edu/community/mesoca2013/
- Presenters, please send us your presentations in PDF format so I can put them on the web site.
- Extended versions of selected accepted papers will be considered for publication in the Journal of Systems and Software by Elsevier!
- Get ready for MESOCA 2014!
Co-located with ICSM 2014 in Victoria, British Columbia, Canada, September 20 - 26, 2014

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Program Chairs: Muhammad Ali Babar, Mike Smit

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Increase size of the event

SEE YOU NEXT YEAR! TELL YOUR FRIENDS!