Reuse and Migration of Legacy Systems to Interoperable Cloud Services- The REMICS project

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Project facts

- REMICS is a research project (STREP) accepted in the Objective 1.2 of FP7 Call 5 (Internet of Services, Software and virtualization).

- Aims at migration of legacy systems into Cloud services based on service-oriented architectures

- REMICS runs from September 2010 for 3 years.

- The budget is 4.5 Meuro

- Partners are:
  - SINTEF (Coordinator) (Norway),
  - Softeam, NetfectiveTechnology (France)
  - DI Systemer (Norway)
  - Fraunhofer (Germany)
  - ESI, DOME Consulting and Solutions (Spain)
Problem to be addressed

- Legacy systems are sometimes (most of the times) of substantial value for companies:
  - They still function for the users’ needs;
  - They capture important business logic;

- However:
  - Legacy systems are often difficult to reuse due to platform, documentation and architecture obsolescence.
  - **Legacy systems are facing critical issues:**
    - Need for change with no capability to do so ($; retirement of resources, compliance, technical obsolescence)
  - The risk of manual rewriting or replacement by ERP is high,
  - The cost of replacing them with systems designed from scratch is often too high.
  - New technologies arise such as Cloud Computing and Software as a Service that promise better performance or cost saving that motivate organizations to change there is and possibly modernize their applications:
    - Cloud is a solution to new applications !
    - What about my legacy application ?
Challenges

The oldness degree of technologies to be reversed:
- How to adapt them to the SaaS (SaaS, IaaS, PaaS) and cloud paradigms?
- How to handle interoperability?
- How to operate (control, supervise, bug identification and correction, ease of deployment)?
  - SaaS: no capability to modify the system!
  - Iaas, PaaS: what/how/at what speed can you deploy fix/evolution packages and control components?

The absence of knowledge:
- How to extract business value information?

QoS must be preserved:
- Performance of heavy loaded and critical applications
  - X 000 users
  - X 000 screens, XX 000 batch
  - XX To of data
- How to reuse legacy systems in automated testing of the new SaaS?
- Size of systems: 1 to 30 Million LOC

Cost of the migration process:
- How to plan a progressive migration process?
  - Legacy system may have been built in 10 to 25 years
- How to train people in new technologies
  - Change management for application users
  - Change management for developers (MDE and cloud technologies)
Steps in Remics approach
Recover

- Analyse feasibility of the modernization strategies and select one or multiple:
  - Automatic extraction
  - Computer assisted extraction
  - Annotation driven extraction
  - Refactoring at the PIM level
  - Paradigm change:
    - Cobol reports = batch and printer; OO report: BI tools for instance or RIA UI components
    - Usually code is migrated to XML type of data vs algorithmic

- We plan to use the OMG KDM standard and extend it when necessary.
  - Ex: “level” attributes for segment and rubric in Cobol

- Recover business value information:
  - requirements, processes, rules, non-functional properties etc.
  - Separation of concern
    - Business code vs technical code
    - UI/service/Batch/Report/data

- Use automated reverse engineering methods as much as possible;
- Develop models (business, components, test specifications etc.) that will be used further.
Migrate

- The purpose is to start from the legacy models and refactor them to build a new SOA by applying methods such as decomposition, component wrapping and replacements.

- Some components or services may be replaced by newly discovered ones.
Compose and develop new services

- The legacy system may be enhanced by adding new services or services may be composed in new ways.

- Model-driven interoperability helps in adapting services using mediators. (Ref. Paper on Flora-2 interoperability mappings at MDI)

- Mediators or mediation services take input data in one format and provide it in another format.

- We plan to extend SoaML with data format models and behavioral model for mediation.
Validate

- The recovered architecture should correspond to the legacy system
- and must provide the same or better QoS, business goals, coverage, etc.
- Recovered models should be used in the validation process based on model-based testing techniques.
- The original system can act as a test oracle since requirements may not be well captured.
Control and supervise

- The goal is managing applications by observing them and performing corrective actions.
  - Legacy cobol are critical application with nearly 0 defects and optimized performance: ie a 25 years old application example
    - 10 years development/evolution
    - 5 years tuning and optimization
    - 10 years without any change
    - Resources quit the system
    - Mainframe operation excellence
    - Cost for defects is extremly high (Millions USD)

- Models@runtime for self-manageability is one possible technique to use.
  - However: what is feasible within Cloud Architecture? Does Cloud provider has APIs available to do so?

- OO IDE have extra capabilities vs legacy
  - Branch coverage at runtime
  - Code refactoring
  - UML impact analysis

- Cloud: elastic access to cpu and memory
Technological approach: main points

- Model-driven techniques & Models everywhere:
  - A large set of metamodels and several dedicated extensions.
  - In particular, the PIM4 Cloud Computing, model-driven Service Interoperability, KDM extensions and Models@Runtime extensions are intended to support the REMICS methodology for service cloud architecture modelling.

- Open source Metamodels and Models with an emphasis on Open Models for standards.

- Two pilot cases:
  - DI systems from Norway with ERP/accounting
  - DOME consulting from Spain within the tourism section
Expected impacts

- REMICS will preserve and capitalize on the business value engraved in legacy systems to gain:
  - Scalibility, flexibility brought by Service Clouds,
  - lower the cost of service provision,
  - shorten the time-to-market.

- REMICS research will provide innovations in advanced model driven methodologies, methods and tools in Software as a Service engineering.

- REMICS will provide standards-based foundation service engineering and will provide a suite of open ready-to-use metamodels that lowers barriers for service providers.
Remics and standards
Extending SOAML
Demonstration

- Netfective/Blu Age example:
  - Cobol Example:
    ![BLU AGE Agile Model Transformation](image)
  - AGL Example:
    ![BLU AGE Agile Model Transformation](image)
Demonstration

- Netfective/Blu Age example:

  - Sample UML/SOA Organization:
Demonstration

- Netfective/Blu Age example:

  Modernized code quality: Cobol To Java EE migration, first iteration (3 weeks prototype) of a 37 years old COBOL application (3 millions line of code)