ReDSeeDS: Requirements based reuse of complete software cases

The major objective of ReDSeeDS project is fulfilling the promise of comprehensive software reuse by bringing it to the level of requirements linked with precise model-based solutions. Project's participants from seven European countries aim at extending significantly and integrating existing technologies to provide a comprehensive software development framework.

Software development industry, while being the key driver of modern economy has an unacceptably high level of failures, caused to large extent by high complexity (interdependencies and variability) of requirements. Software development industry has significant problems with managing this complexity – with keeping track of changes and reusing knowledge from previous projects. The main barrier in overcoming these problems is lack of widely accepted and easy to apply mechanisms for expressing and reusing coherent solutions to problems formulated as user requirements.

Software reuse – a promise yet to be fulfilled

The main objective of the project is thus to create an open framework consisting of a scenario-driven development method (precise specification language and process for the “how-to”), a repository for reuse and tool support throughout. The basic reuse approach will be case-based, where a reusable case is a complete set of closely linked (through mappings or transformations) software development technical artefacts (models and code), leading from the initial user’s needs to the resulting executable application. A new problem description in the form of a requirements model can be matched with previous requirements models. The solution information (models and code) of the most similar problem can then be taken for reuse and adapted to even only partially developed requirements. Unlike for other approaches, the effort associated with preparing reusable solutions with this framework is kept to the minimum.

The primary ambition of this project is to enable a comprehensive reuse from requirements over architecture and design to code, which is currently not done in practice.

To develop the ReDSeeDS framework, the project will combine and enhance state of the art in the areas of requirements engineering, meta-modelling, model transformation and querying and inference techniques. This combination, while innovative by itself, will enable a completely new approach to software development based on this form of case-based reuse. Such approach should be an enabling factor for starting a true reuse-oriented software development community, based on openly available case
query engines and solutions validated in practice. The major objective of this project is to enable a comprehensive reuse from requirements over architecture and design to code, which is currently not done in practice. For this purpose, the new or modified software cases must be stored with minimum effort and the retrieval of software cases must be well integrated into a software development platform. In order to do so, we aim at extending significantly and integrating existing technologies to provide a framework including a case specification and retrieval language with a comprehensible methodology and tool support.

ReDSeeDs gives very important new possibilities of optimizing spendings for software development.

It can be argued that this project combines several areas of research never combined before in such a coherent way. General mechanisms of reusable asset libraries are combined with advances in requirements engineering, model transformation and querying. This combination gives a necessary synergy to create a system that facilitates efficient reuse of knowledge in software engineering. Advances in all the mentioned areas strengthen each other: for example, advancing precise requirements models gives necessary means to advance case based reasoning for software, advancements in model transformations give the possibility of enhancement of query and reasoning technologies etc.

Potential impact

The area where this project can have significant impact is software acquisition and maintenance on the public budget levels. The European governments and local authorities spend billions of Euro in this area, and these figures grow systematically as new government initiatives emerge.

ReDSeeDs gives very important new possibilities of optimizing spendings for software development. It includes means for improvement in software acquisition procedures. An important means to enhance capability maturity in this area is efficient management of requirements – not only on a level of single organization (like a local self-government authority) but more globally on a level of problem domain areas (like e-government applications for self-government authorities). This means that a single organization (be it governmental, public or private) would have means to reuse the knowledge about business processes and possible software requirements from other such organizations or from a central consultancy authority. This would be possible by applying publicly (openly) available ReDSeeDS frameworks for various problem domains. This has a significant potential for strengthening the European community by giving it means to reuse knowledge about public administration processes served by software systems, throughout different states. On the other hand it would not compromise the ability to maintain distinctions between various states in the European community, as these distinctions could be reflected through differences in user requirements for different states.

The above would be accomplishable by the requirements-driven characteristics of the ReDSeeDs framework. The organization could formulate its initial requirements using the ReDSeeDS language, and then a similar case (or cases) would be retrieved from a publicly available ReDSeeDS engine. After that, tenders can be invited for the development of the required system. The bidding companies would offer to build a system which is a modification of a currently existing one. Moreover, the difference between the new and reused system would be clearly marked by the ReDSeeDS engine. This would give good means to calculate the costs of preparing changes, which should be significantly smaller than with traditional approaches.

It has to be stressed that the potential impact would also relate to commercial IT and software development organizations throughout Europe. Such organizations could use ReDSeeDS to optimize their development efforts through reusing past cases thus shifting from a “workshop” to “factory” levels of producing software. This factory would work by supplying it with an initial sketch of user requirements, which could be quickly matched with an existing case and also quickly redeveloped to fulfil the new or modified requirements. This could give significant new possibilities for software development companies to operate on the global European market.

The ReDSeeDS participants divide into 3 groups:

- **Project board, coordinator and technical support** responsible for general high-level management and organisation of development framework (Infovide, Warsaw Univ. of Technology)
- **Senior Users** are responsible for the specification of the needs of all those who will use the final product (Algoritmusystemos, PRO DV Software AG, C/S IT Ltd)
- **Senior Supplier** represents the interests of those designing, developing and implementing the project products (Heriot-Watt Univ., Univ. of Koblenz-Landau, Fraunhofer, HITeC e.V., Univ. of Latvia; Vienna Univ. of Technology).