Short Seminars on MDE Technologies
International Experiences

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Abstract: Model Driven Engineering (MDE) gives new insights into software engineering and software development. This approach is quite new and it still is the subject of discussion concerning its efficiency and usefulness. However, MDE approach becomes more and more popular among researchers and developers. That is why it is being introduced into curricula by many universities. MDE proposes a new way of software modelling. This causes a need for introduction of new ways of teaching and sharing knowledge. One of such method is short seminars dedicated to MDE technologies. The paper discusses their idea, describes three seminars conducted under three different frames and its usefulness. Some lessons learnt from this seminars are highlighted.

1 INTRODUCTION

Software engineering is well developed area of computer science which has stable position in the university education programmes. However, education in the software engineering area is focused mainly on traditional way of projects development based on UML diagrams and paper documentation. Popular approach is also dedicated to agile methodologies. Also additional online courses are available for students in those two areas.

Education of Model Driven Engineering (MDE) (Balasubramanian, 2009) is a challenge because MDE is quite new area in the scope of software engineering (Gómez-López, 2011). Software engineering is seen as a well defined branch with stable background. This opinion is supported also by the industry. Model Driven Engineering, however, gains more and more popularity among both universities and enterprises. MDE gives new insights into software engineering and defines new way of software development (Kent, 2002; Żyła, 2011).

New notations and model definitions, however, requires from academic teachers and students understanding new approach of application modelling (Almendros-Jimenez, 2009). Moreover, there are some confusions among researchers and developers concerning MDE efficiency and usefulness in practise. On the other hand more and more universities introduce to their curricula MDE related courses. That is why new ways of teaching and spreading knowledge about MDE is needed.

MDE is quite new approach. That is why it is recommended to share knowledge in this scope in international consortia and projects. It is important to share knowledge about MDE in projects, especially international because it gives opportunity to gain new experiences in MDE education and research.

International seminars are examples of such activity. As a part of internalization process, they play a significant role in the modern higher education. What is more, they provide also the way of complementing a study program.

Students and teachers participating in such activities have opportunity to develop and spread knowledge, discuss their ideas, start new projects, taking part in different education and research programs. Such meetings usually have light, students friendly form of lecturers, laboratories and discussion panels.

Participation in classes gives opportunity to familiarize with new technologies, tools and research. What is more, it enables to discuss ideas, share observations and confront different kind of approaches applied in foreign countries.

International seminars, as a part of internalization programs, constitutes also an occasion to improve soft skills. Participants check their language skills, improve it and break cultural

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barriers. They can also experience new ways of teaching.

2 SEMINARS BACKGROUND

Short seminars on MDE technology was realized in three different frames:

- ERAMIS EU Tempus project – ERAMIS project means the European-Russian-Central Asian Network of Master's degrees "Informatics as a Second Competence". The project is aimed into increasing cooperation between European and Russian and Central Asian partners (Adam, 2012). The project was realized between January 2010 and June 2013. The list of partners contains 18 institutions (mainly universities) from France, Poland, Spain, Germany, Finland, Kyrgyzstan, Kazakhstan and Russia (Miłosz, 2013). One of them is the Lublin University of Technology (LUT).
- Seminar SYRCoSE – the international seminar: 7th Spring/Summer Young Researchers' Colloquium on Software Engineering held in Kazan, Russia on May 30 and May 31, 2013 (SYRCoSE, 2013). The main goals of the colloquium are to help young researches to meet each other, to get more information on work of their colleagues, to exchange experience and to practice in presenting their results at international forum. The topics of the colloquium include modelling of computer systems, software development, testing and verification, parallel and distributed systems, information search and data mining, image and speech processing, software engineering education. The SYRCoSE 2013 colloquium is organized by Institute for System Programming of Russian Academy of Science, Saint-Petersburg State University and Kazan State Technical University named after A.N. Tupolev.
- Bilateral cooperation between Lublin University of Technology, Lublin, Poland and al-Farabi Kazakh National University, Almaty, Kazakhstan. Realizing the agreement were organized scientific internships for Master students from Kazakhstan in LUT. More than 30 students had such internships.

One of tasks in ERAMIS project was training sessions for academic teachers from Russia and Central Asia universities. This training sessions were organized by EU countries universities in Russia and Central Asia. During this seminars different courses were provided (Mercelon, 2013).

During the SYRCoSE the invited lecture on the MDE subject has been presented by Dr. Marek Miłosz (SYRCoSE, 2013).

Seminars are the one of very important activities performed during the two weeks long scientific internship for Master students from al-Farabi Kazakh National University in LUT. Other activities of internships are: working with scientific databases for preparing state of the art in Master thesis subject, preparation papers for publication, taking part (with presentation) in seminars of Computer Science Institute of LUT, and consultations with LUT professors.

The same seminars on MDE technology were provided in different conditions, projects and for different receivers. This allowed accumulated the rich international experience of the seminars providing.

3 PEDAGOGICAL APPROACH

During seminars two complementary courses on MDE approach were conducted. They were titled: "Model Driven Engineering and WebML" and "WebML in practice. Using the WebRatio".

Both courses were conducted in English with translation to Russian if needed. They were dedicated to university students and academics teachers. Students were able to gain new knowledge in the area of software engineering and MDE. For academic teachers courses were occasion to share and discuss new subject and teaching techniques including courses structure, content as well as tools and software.

3.1 Courses Structure

The goal of the course "Model Driven Engineering and WebML" is to provide knowledge about MDE as a way to develop software by creating and transformation models on different level of abstractions and areas. The last transformation is a code generation. General idea of MDE and domain specific language – Web Modelling Language (WebML) – to it implementation in practice are introduced.

Main objectives of the MDE course are:

- to show students the fundamentals of MDE and WebML.
- to show students the layer of web application modelling and developing.
- to show students the methodology of web applications developing using the WebML.

Students' background needed contains requirements

regarding:
- basic knowledge about web application and its developing,
- knowledge about relational databases and Entity Relationship Diagrams.

The goal of the course "WebML in practice. Using the WebRatio" is to provide students theoretical and practical skills in WebRatio modelling. It was designed to present students the main components which may be used to create a project and the use of best practices for the implementation of application features. The course describes the WebML which is graphical notation useful in designing Web application. It provides a way of expressing the complete structure of the application including content, navigation and presentation. The developing environment WebRatio is also presented and trained. The complete web application is also developed by students during the course.

Main objectives of the course are:
- to show students the fundamentals of web applications development based on WebML using WebRatio,
- to present students models used in WebRatio,
- to show students how to use WebML units in practice,
- to present students how to develop complete web application and integrate it with database.

Students' background needed contains requirements regarding:
- programming in general.
- object oriented programming;
- web applications modelling;
- relational databases designing and using, entity relationship diagrams;
- some knowledge about HTML and CSS.

The course is composed of two parts: theoretical lecture and practical lessons.

3.2 Courses Content

The content of the course "Model Driven Engineering and WebML" has provided as lessons, in the following areas:
- MDE as a general idea, models and transformations, standards.
- WebML as a language of MDE of web applications.
- Structure of web application.
- Web Data Modelling - data patterns, derivation, WebML Object Query Language (OQL).
- Web application development model.

The Model Driven Architecture (MDA, 2013) is the standard presented by the Object Management Group. It has been presented in details as a initial idea of MDE. Three different models: Computation Independent Model (CIM), Platform Independent Model (PIN) and Platform Specific Model (PSM), as well as transformations between modes discusses in the course. Some needs, specifics features and advantages of the web applications development are discussed. The solution is appointed: the WebML – a language for high-level design and develop of web application intensive using of data (WebML, 2013). WebML and WebRatio tool are a very good example of the practical application of the MDE idea.

The five models used by WebML (ie.: structure, derivation, composition, navigation, presentation and personalisation) and its transformation are explained in details. The data model, its structure design and development, as well as data structure patterns and Object Query Language are presented during the lessons.

The "WebML in practice. Using the WebRatio" course is divided into two sections. The first one contains theoretical lecture introducing basics of web applications development with WebRatio, using of WebRatio including data model and application model and features of web application developed with WebML and BPMN (White, 2009). The course discusses also using of WebML operation units and links as well as managing data with content units (webml.org, webratio.com).

WebML models and units are also explained, presenting usage of particular unit sets (page/alternative, links, content units, operation units, session units, service units, control flow units, utility units, BPMN units). The lecture gives students also orientation in data managing rules including database connection and data model construction. What is more, the lecture introduces students into usage and features of WebRatio – a modelling and software developing tool.

The second part of the course is dedicated to practical activities using WebRatio (Brambilla, 2010; Kęsik, 2011). Students run example applications and develop their own. They learn to use WebML operation units and links in practice as well as managing data with content units. Students also design and create a database and fill it with data. Database connection is also established using WebRatio. Managing application users and their views is also performed.

The example application students develop is small CRM - Customer Relationship Management system. It is an application dedicated to the

registration and control of the company's customers, especially dealing with:

- a registry of client companies,
- the contacts within the company,
- the responsible commercial sales manager operators,
- history of the purchases made by customers,
- the events organized by sales managers.

A database is designed for the application (fig. 1). The application contains data of all client companies and their known staff employees (contact information). Single company can have may contacts registered as well as it has its products and purchase details stored. What is more, events including description, date and contact details is managed.

The application regards two types of users, with the following features:

- Commercial officer. He manages companies details and its contacts, defines relationships between them, organize purchases as well as views, creates and edits events.
- Administrator. He can search, view, insert, edit, delete companies, contacts and events. He also manages products and the product list.

Main functionalities of the application regards:

- Company Search - user can search for one or several companies using one or more attributes (such as name, nationality, address, sales manager reference).
- Create new or modify existing company - user can select particular company from a list and modify its data or he can insert and save all data related to the new company.
- Contact search - user can search multiple contacts with defined attributes (name, phone, role in company).
- Create new or modify existing contact – user can modify one or more contact after selecting them from a list and changing data. He can also insert data of new contact and save it in the application.
- Login - this functionality is required for each user, they are identified by username and password and they will have access to features related to their category

Examples models of the application is presented at the fig. 2.

3.3 Software Used

Software used during the course “WebML in practice. Using the WebRatio” includes:

- WebRatio Enterprise or Personal - a WebML CASE tool supporting Agile development and design of data-intensive Web applications. WebRatio supports the automatic generation of code and it bases on Entity Relationship and WebML specifications. It is integrated in the Eclipse IDE and it is complementary with the Java/JSP 2.0.
- PostgreSQL database – a package and GUI tools dedicated to relational database PostgreSQL.
- Database connection drivers – needed to establish connection between the WebRatio environment and PostgreSQL database.

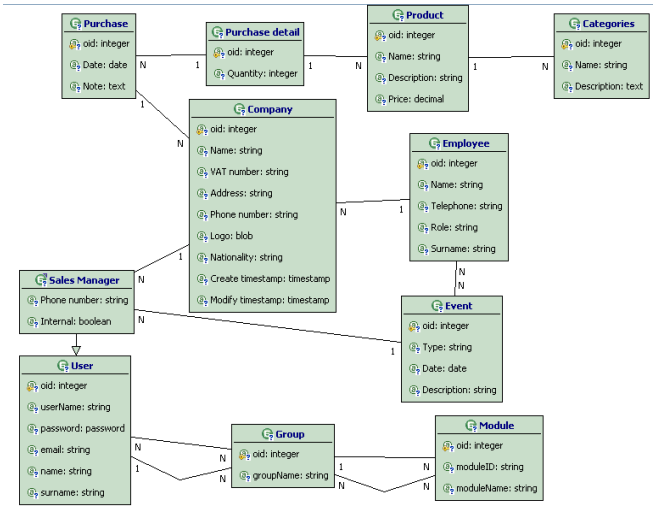

Figure 1: The database model of the application.

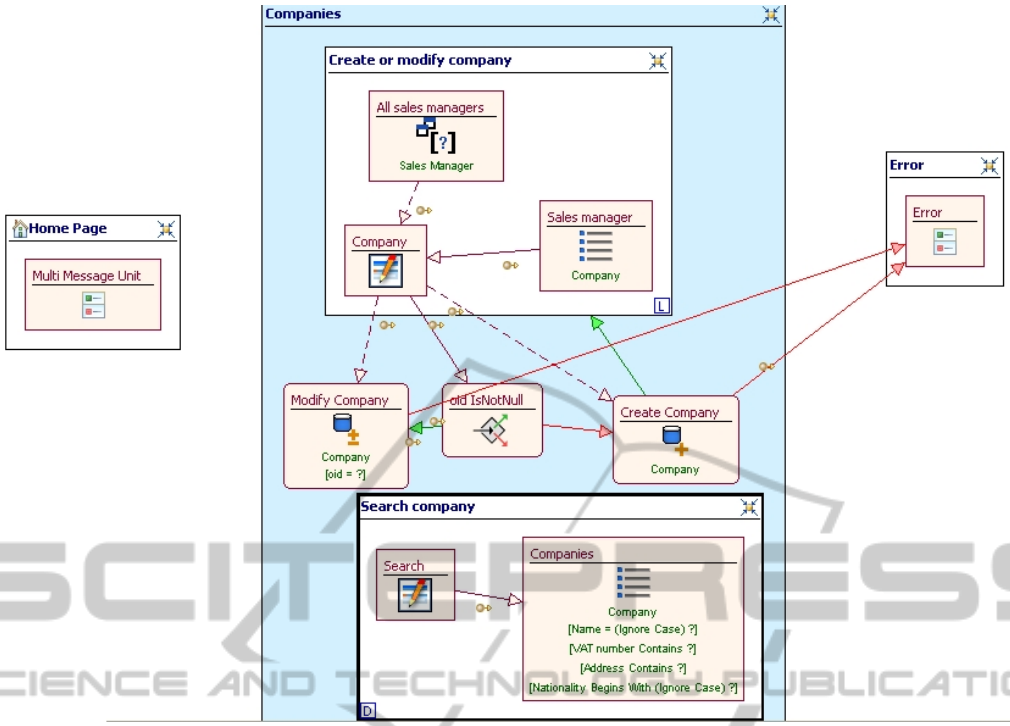

Figure 2: The fragment of the hypertext model of the application.

4 LESSONS LEARNED FROM MDE SEMINARS

Experiences from MDE contain a set of observations and conclusions.

One of the most important aspects is background of participates. Seminars are non-regular lessons and often knowledge and skills of participants are diversified. This causes necessity of maintaining an appropriate balance and adjusting the level of difficulty. Despite the previously defined minimal requirements students had different levels of knowledge.

Non-adjusted knowledge level and different area of interests in computer science were often directly connected with low motivation problems.

Language problem is another important factor which needs to be regarded during preparing and conducting international seminars. Different, diversified level of language skills makes seminars much more difficult to conduct. Language difficulties can also be connected with insufficient knowledge background. What is more, students who know every-day English can face a language problems if they do not know technical expressions. If translation is needed, the time consumed during a seminar is nearly doubled. This problem was addressed previously (Miłosz, 2012; Merceron, 2013).

Cultural problems also need to be faced. It is easier to force cultural barriers if seminar participants are similar aged students. It is much harder to break such problems if in a seminar participate both, students and teachers. In such case formal academic relations are clearly visible. They make participants to feel less comfortable and casually.

Seminars conducted abroad, in Russia and Central Asia, faced also software configuration problem. General software requirements are demanding, it needs WebRatio environment working, web server and database needs o be configuring and working. Administration requirements are usually needed to run all tools – this also might be a problem.

5 CONCLUSIONS

Short seminars on MDE technology is a promising way of sharing knowledge about MDE among students and academic teachers. This approach shows the ability of rapid web application development based on WebML and BPMN.

Although traditional programming methods of software development gives more freedom to develop and manage the content, WebRatio gives great alternative to develop database application.

However, short seminars on MDE are useful and fulfill its role well only if some basic requirements are met. First of all proper preparation is needed, including software, teaching materials and exercises. What is more, students selection should be performed to standardize the level of students skills and knowledge.

Our experiences show that short seminars constitutes a great opportunity do start education on MDE scope.

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REFERENCES

Adam J-M., Lujan-Mora S., Merceron A., Miłosz M., Toppinen A.: European-Russian-Central Asian Network of Master's degree "Informatics as a Second Competence". *Proceedings of EDUCON2012 - IEEE Global Engineering Education Conference*, Marrakesh, Morocco, 17-20 April 2012, 722-729, 2012.

Almendros-Jimenez J. M., Iribarne L.. UML Modeling of User and Database Interaction. *The Computer Journal, 52(3)*:348–367, 2009.

Balasubramanian K., Schmidt D., Molnár Z., Lédeczi A.: System Integration Using Model-Driven Engineering, Designing Software-Intensive Systems: *Methods and Principles*, 2009.

Brambilla M., Butti S., Fraternali P.: WebRatio BPM: A Tool for Designing and Deploying Business Processes on the Web, WEB ENGINEERING, *Lecture Notes in Computer Science, 2010, Volume 6189/2010*, 415-429, 2010.

Gómez-López M., Reina-Quintero A., Gasca R.: Model - Driven Engineering for Constraint Database Query Evaluation, MELO 2011 - *Model-Driven Engineering*, 2011.

Kent S.: Model driven engineering. Integrated formal methods. *Lecture Notes in Computer Science, 2002, Volume 2335: 286-298*, 2002.

Kęsik J., Żyła K.: Usability comparison of WebRatio and Symfony for educational purposes, *Proceedings of Electrotechnical Institute, issue 247*, 2011.

MDA - The Architecture of Choice for a Changing World, 2013, http://www.omg.org/mda/

Merceron A., Luján-Mora S., Adam J.-M., Bardou D., David J., Miłosz M.: Training Sessions in a Master Degree "Informatics as a Second Competence". *Proceedings of 2013 IEEE Global Engineering Education Conference* (EDUCON), Berlin, Germany, March 13-15, 190-199, 2013.

Miłosz M., Adam J-M., Lujan-Mora S., Merceron A.: Lessons Learned from Academic Teachers Training in TEMPUS ERAMIS Project. *Proceedings of 15th International Conference on Interactive Collaborative Learning*, ICL 2012, September 26-28 2012, Villach, Austria, p. 4, 2012.

Miłosz M.: The Tempus Project ERAMIS. *Actual Problems of Computer Science*, 1(3), 91-95, 2013.

SYRCoSE: Spring/Summer Young Researchers' *Colloquium on Software Engineering*, 2013, http://syrcose.ispras.ru/, 2013.

The Web Modeling Language http://www.webml.org.

Web Ratio: The Tailor Of BPM Applications: http://www.webratio.com/Portal/casestudies_pdf/WebRatio_TheTailorOfBPMApplications.pdf.

WebML.org - The Web Modeling Language resources: web models and hypertext models, 2013, http://webml.org/webml/page33.do?UserCtxParam=0&GroupCtxParam=0&ctx1=EN.

White, S. A.: Business Process Modeling Notation (BPMN) Version 1.0. Business Process Management Initiative BPMIorg May, 2009. Retrieved from http://www.omg.org/spec/BPMN/1.2.

Żyła K., Kęsik J.: BPMN and WebML solution for web app-aided flow of dokuments, *New materials and IT technologies in production engineering*, 114-125, 2011.