The structure of SETT-Net

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Abstract—**SETT-Net is an international Web-based network designed to enable training and teaching of a joint software engineering course. It consists of a Centre Point at the Humboldt University in Berlin and four National Centres: in Bulgaria, Germany, Macedonia, and in Serbia and Montenegro. The network is free for all lecturers and students at the participating schools in the project. Parts of the contents are password protected. This paper presents the network structure, and the contents of the main site and the national sites, as well as the first experience of its application.**

Index Terms— **Distance Learning, International Multilingual Virtual Classroom Network, Software Engineering.**

I. INTRODUCTION

THE intention of SETT-Net is to enable the usage of shared training and teaching resources for the software engineering course. The network is a result of the project "Software Engineering Education and Reverse Engineering", which was launched in 2001. The project is being supported by DAAD (German academic exchange services) and conducted under the auspices of the Stability Pact for South-Eastern Europe. Initially, the project involved four schools in four countries. Meanwhile, several other institutions have joined the project, which now unites nine schools from seven universities in four countries.

In two years, the project has achieved two very important goals. As first, it has initiated the introduction of the software engineering course in South-Eastern Europe at undergradute or at graduate level. A prerequisite for its introduction was the reconstruction of the computing curricula in the region. Reconstruction has already started or even finished at three schools in Serbia and Montenegro. Secondly, a joint course on software engineering has been prepared, together with the corresponding training and teaching materials [6].

The preparation of the basic course started in 1995 at the Humboldt University in Berlin for the purposes of the renewed SE course [1,4]. During the first five years, training materials, slides, case studies, exercises and examinations have been continually accumulated. Nowadays, the course materials are stable and of desirable quality, which was the first prerequisite for their further application at other schools.

II. BASIC STRUCTURE OF THE NETWORK

In software engineering education, there are examples of cooperative work across universities [2]. Furthermore, the Web provides presentation and delivery of mu ltimedia contents, and enables interactivity. As a consequence, virtual classrooms are replacing traditional classrooms every day [3]. They enable on-line learning and bring together many students no matter the place and time.

There was a strong motivation to create an international network of virtual classrooms. At first, encouraging was the collaboration established during the project. Second, the experience in software engineering education at Berlin school was found very valuable for all current and potential lecturers. Third, after several years of application, the prepared materials have been approved and Web-based. Finally, important was the (at least) acceptable hardware and software infrastructure at South-East European schools, and the experience of some schools in distance learning.

The network consists of a *Centre Point* at the Humboldt University in Berlin and four *National Centres* at the:
- Humboldt University in Berlin, Germany,
- University of Novi Sad in Novi Sad, Serbia and Montenegro,
- University "Sts Cyril and Methodius" in Skopje, Macedonia
- University "Paisii Hilendarski" in Plovdiv, Bulgaria.

The network is free for all lecturers and students at the participating schools in the project. Parts of the contents are password protected.

The *Centre Point* is the heart of the whole network. From the very beginning, it has been completely Web-based, which encouraged its transformation into a virtual classroom network. The main goal of the network site [5] is to present the syllabus for the software engineering course, the lecture materials in portable and printable format, both for the lecturers and for the students, and information about the past, current and future activities concerning the project. Furthermore, it contains links to the National Centres. Finally, the Centre Point contains links to the most relevant sites dealing with the software engineering, with its education and with the important meetings related to the topic.

The Centre Point as a focal point of the network:

- Sends information and the joint training and teaching resources to the National Centres,
- Supervises and co-ordinates their work,
- Receives new lecture materials from partner institutions,
- Enables centralized communication between the National Centres, and
- Updates and fills in new information.

Additionally, the Centre Point is intended to contain several other links, as follows: bi-directional communication Centre Point ↔ National Centre, user and mailing list, site traffic indicator, links to national pages, news, important meetings, and others.

Most of the links at the Centre Point are links coming directly from the existing software engineering education site at the Humboldt University in Berlin [4]. The links that are relevant for the network are: the overview of the course (basic principles, course syllabus and topics), the elements of the course (slides, case studies, and assignments), the software engineering links including F.A.Q, and the Discussion Forum (Fig. 1.).
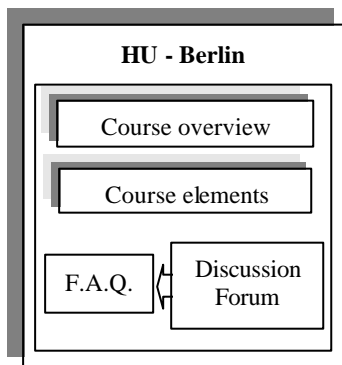

Fig. 1. Organization of the contents at the Centre Point

The process of transforming this Web site into a virtual classroom is in progress. It concerns with two very important aspects:

- The frequency of changes of the contents that determines the dynamism
- The level of interactivity of its Web site.

All the contents at the Centre Point are in fact dynamic (Fig. 2.). However, the frequency of changes concerning the teaching and training materials is not often, and therefore it can be treated as static. All other elements are dynamic. This aspect highly affects the transformation of the network into a virtual classroom network. The method for its effective and correct mapping from central to national level will be selected during the project meeting in Berlin in May 2003.

Currently, the interactive element has not been included yet, mainly because of the concentration of the efforts to the creation of the teaching and training materials. In future, the interactivity will be added into the case studies, the assignments, and particularly the exams. They will include self-testing and e-testing modules.
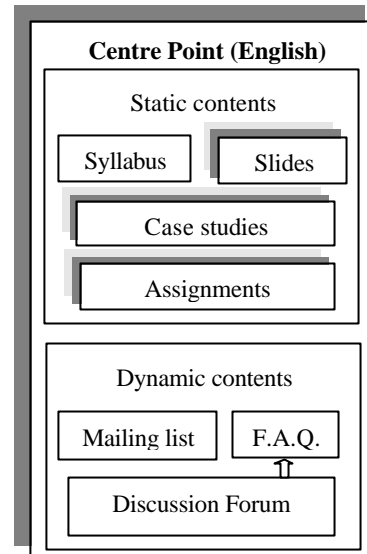

Fig. 2. Division of the contents in relation to the frequency of changes

The Centre Point is connected with four national sites, called *National Centres*. Basically, National Centres are mirror sites, but at the same time they are independent units of the whole network. The present mirror site at the Humboldt University in Berlin is physically a virtual mirror site. It presents only the contents that are relevant for the SE course, including several small links, like the announcements of the guest lecturers. The contents are in German.

At the National Centres, independent are the syllabus, the selection of the materials relevant for the course, the assignments, the place, the time, the list of lecturers and students, and some other elements concerning the national course. Additionally, National Centres have the possibility to insert individual links. For example, it is announced that some of the national sites will have e-chat facilities on a local level, or specific e-testing components.

Similarly to the Centre Point, the dynamic access and interactivity at the National Centres will also be enabled. Some of these elements will be inherited from the Centre Point, and passed from the mirror site, while others will be only at a local level.

At the centre site, all materials are presented in English. Consequently, the contents at the mirror sites are in English. The mirror of the English contents at the National Centres was discussed during the second project workshop. The main objectives of its presence are to help relieve the Berlin server of some of the traffic, and the need of a local access to all materials related to the network. Furthermore, it facilitates translation, because the framework remains unchanged.

At local level, the English contents are coupled with the translated materials presented in the official language of the country. The only difference between the different language presentations is in fact their textual database. The system for automatic replacement of the textual data into the training materials is one of the tasks that will be of interest in near future. At the moment it is only discussed, so the replacement

is still made manually. However, textual data of the inserted figures will always be made manually, by making a patch over the existing textual box.

Similarly to the Centre Point, which is arranged to be transformed into a virtual classroom, the national sites have the same feature. At the National Centres, dynamic and/or interactive will be:

- The National Discussion Forum,
- The user lists,
- The individual assignments and deadlines,
- The solutions of the assignments,
- The list of results,
- The bi-directional lecturer/student communication,
- The national indicator of site traffic, and other.

At the moment, the Centre Point is mainly static, since the contents can be filled in and changed locally. The Discussion Forum, which is expected to be added soon will be dynamic. Mirroring of this link is still discussed, because its on-line modifications are a serious problem. If the problem with the dynamic on-line mirror of the Discussion forum is solved, then it will also be a part of the mirror site. Otherwise, the global discussions concerning the project will be performed only in Berlin.
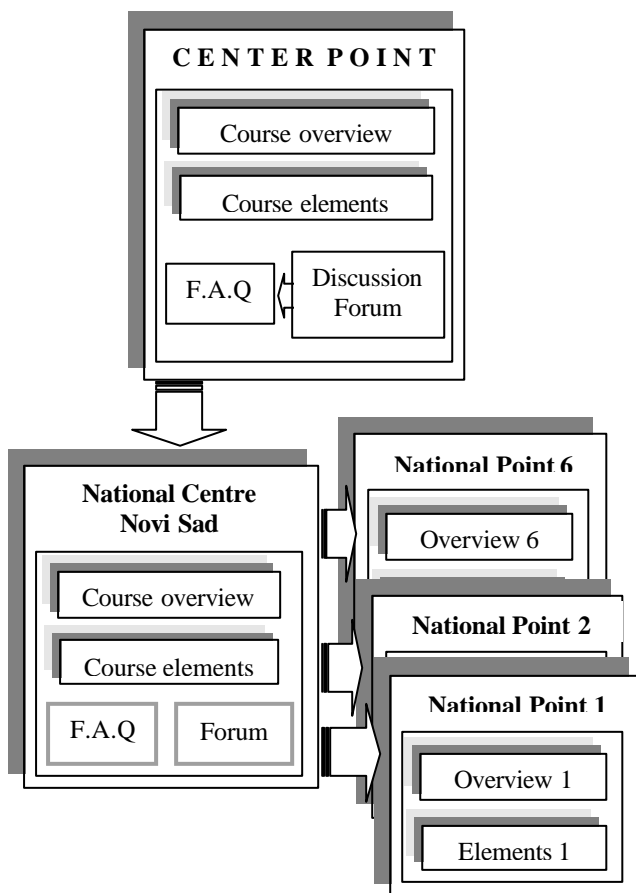

Fig. 3. The hierarchical structure of the network

The role of the National Centre in Novi Sad is specific and more challenging. In fact, this point is a National Centre of six to seven National Points (Fig. 3). It has a role of a by-pass between the Centre Point and the National Points. This junction is the only site with the right to update the contents of the National site dependently on the changes initiated by the Centre Point. Representatives of other National Points can also initiate modification of the contents at the National Centre, but in such case it will have to be validated by the Project Board. The contents approved by the Board will be exposed at the National Centre and then passed on to the mirror sites. Such centralization is not very practical, but at the stage when the most schools have limited experience in the field, it is the most appropriate.

With this national network, all Serbian universities and almost all schools responsible for Computing and Computer Science training will be covered. The network will enable a better communication in the field of software engineering and will be a good starting point for the credit transfer in Serbia and Montenegro.

III. FIRST EXPEREINCE OF THE NETWORK USAGE

Supported and supervised by the Humboldt University in Berlin, the network currently connects three South-East European countries and many schools. Its goal is to define a framework for all potential joint courses within participating schools. All that courses will be in line with the European standards, thus the project will be a good basic to establish the European Credit Transfer System in this region.

Besides the Humboldt University, as a part of the software design course, the University of Novi Sad started using selected lectures and slides based on the joint project in fall 2002. For the purposes of the course, the link towards the Centre Point and a local copy of selected parts was established. The local part includes assignements and student projects that are an adaptation of the same tasks exsistiong in the joint SE course.

The experience obtained during one semester is the first verification of the concept of the network for the software engineering course.

There was also a valuable feedback of this first lecture course concerning the contents of the slides and concerning methodological problems, which led to improvements of the original course material. It was found out that several topics need an extension or a modification.

For example, the topic on software process models will be considerably extended and better illustrated with the appropriate statistical data on the different phases and usage of process models. The topic on cost estimation will be upgraded to the current version of function point method. This way the topic will not just give an overview of the basic principles, but it will also explain the practical methodology that can be applied almost immediately. The topic on requirement analisys will be extended with an illustrative comparison of the current and the previous version of the requirement specifications of the course case study - this example will illustrate the possible changes of the requirements in practice.

The course was also offered to the industry in order to evaluate the quality of the course, and to acquire more about their opinion in software engineering. Selected members from software companies were active participants in the course together with the regular students. It turned out that the experienced software developers were very interested in the course, since software engineering activities are still not very well practiced in the average software companies.

Unexpectedly, some topics have gained greater interest in industry than they did among the regular students, such as the software process models and the project management. This information gives us a clearer picture on the main problems of the software development practice in South-Eastern Europe (or at least in Novi Sad). As it was expected, assignments were as a rule done slightly better by the industry people. This important feedback will be used in the further development of the course.

IV.   CONCLUSIONS AND WORK TO BE DONE

The network for software engineering training and teaching initiated by the project "Software Engineering Education and Reverse Engineering" is the first international educational network in South-Eastern Europe. At the moment, its transformation into a virtual classroom network is in the initial stage.

Many tasks have already been done, but there is still a lot to do. A distribution of assignments has been made during the last project workshop. The participants from the Humboldt University Berlin with the assistance of the other partners will prepare the remaining Power Point slides in English. They will also add the notes that assist the better reproduction of the lectures. Translation process, in the beginning only from German into English, in addition to the adaptation and the improvement of the English slides, will be made at the National Centres and at the Faculty of Electrical Engineering in Belgrade. The development of the case studies will also be done at the National Centres, in particular in Plovdiv and in Novi Sad. When the lecture materials become stable, their translation from English to Bulgarian, Macedonian and Serbian will be made manually at the National Centres.

As far as the Centre Point is hosted in Berlin, the basis for the future mirror sites must be enabled at the Humboldt University. The static part of the network will mainly be done by the Novi Sad group. The dynamic part of the network will be created in Skopje. The first task of this group is the Discussion forum that will be hosted in Berlin. The first version of the Discussion forum will soon appear at the third workshop announcement, which is scheduled for the last week of August 2003.

The estimated duration of all these tasks is about one year. It can be done only if most activities are carried out in parallel. Previous experience in this project promises that the deadline will not be broken.

The current results of the project and the network concept have been presented to the colleagues from the participating schools and wider. It is worth noting that some institutions in the region are interested to join the network, while others are interested to implement the same concept for their courses. Both facts are encouraging for the further development of the network, but also for the promotion of the same concept for all other computing courses.

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