Free Technology Academy: a European initiative for distance education about Free Software and Open Standards*

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ABSTRACT

More and more people and organisations embrace Free Software (FS) and Open Standards (OS). However a lack of knowledge holds back their massive adoption. The Free Technology Academy will address this by setting up a virtual campus offering course modules on these topics to become a showcase of a virtual campus based on FS, OS and the use of Open Educational Resources. This distance learning programme will enable IT professionals, students, teachers and decision makers to upgrade knowledge and acquire relevant skills on free technologies. The FTA is realised by an international consortium and welcomes other interested parties to join the network.

Categories and Subject Descriptors

K.3.1 [**Computer Uses in Education**]: Distance Learning; K.3.2 [**Computers and Information Science Education**]: Curriculum, Accreditation

General Terms

Standardisation, Design, Documentation

*Free documentation about the FTA project will be published at `http://www.ftacademy.eu`.

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Keywords

Virtual Campus, Free Software, Open Standards, Distance Education, Open Educational Resources

1. INTRODUCTION

Software has become a strategic societal resource in the last few decades. The emergence of Free Software (FS) and Open Standards (OS) is drastically changing the economics of software development and usage.

In contrast to most proprietary software, Free Software [15] –also known as "Libre Software" or "Open Source Software" [20]–, allows the code to be used freely, which means that it can be used, copied, studied, modified and redistributed without restrictions. Free Software offers, thus, the freedom to learn and to teach without engaging in dependencies on any single technology provider. This freedom of choice is considered a basic condition for an autonomous person in the Information Society. Open Standards [24] are the basis of interoperability. They enable the unencumbered flow of information and knowledge and the freedom of competition as users do not depend any longer on formats and specifications which are controlled by one company.

The expansion of Free Software and Open Standards has brought together a continually growing global community of developers, by offering solid quality products which have not gone unnoticed in business, government and academic circles. Big players have brought free software into their business models, and many more SMEs provide professional services around Free Software. The European Commission and many national, regional and local governments have started adopting open standards and show a preference for FS and OS to cover their IT needs.

Although there is a growing interest in free technologies (which comprise Free Software and Open Standards), still a limited number of IT professionals, teachers and deci-

sion makers have sufficient knowledge and expertise in these fields. This is particularly problematic since these are crucial actors in promoting and implementing free technologies.

In order to tackle this problem, a distance learning programme under the name Free Technology Academy (FTA) is being developed by a European consortium. This distance learning programme will consist of specific modules to enable IT professionals, students, teachers and decision makers to upgrade knowledge and acquire relevant skills and competences on free technologies. Students interested in getting a master degree will be able to complete their study and get a degree at one of the universities engaged in the FTA.

The FTA's main goals are twofold. First, to set up a virtual campus offering course modules on Free Software and Open Standards with teaching staff from the participating institutions; and second, to become a showcase of a virtual campus based on FS, OS and the use of Open Educational Resources, in order to promote its use in other institutions.

To this end a virtual campus will be created where open educational materials will be made available and users will be able to follow specific modules. Educational materials in the FTA will be released under free licences in line with the philosophy of the free knowledge and the Open Educational Resources movement. The educational content necessary to complete the curriculum will be developed using the SELF Platform [21], a tool for the collaborative development of educational materials. These materials will comply with dominant Open Standards such as SCORM, thus enabling the seamless exchange with other educational platforms.

The FTA is organised by the FTA Consortium led by the Free Knowledge Institute [1] in collaboration with the Universitat Oberta de Catalunya [8], the Open University Netherlands [5] and the Instituto Superior de Ciencies do Trebalho e da Empresa in Portugal [2].

In addition, organisations outside the consortium are invited to participate in the FTA and possibly join the international partner network. Reasons for joining can be, for example, to obtain learning experience in setting up a campus project in general and the University Campus framework in particular, to participate in the co-development of course materials or exploit them for other courses, to translate courses and/or localise them for different contexts, or to contribute existing courses which can be offered as distance learning in an international scale.

The start up of the FTA will take two years. In the first year, the focus will be on: 1) building up the virtual campus; 2) selecting, adapting and translating the initial course modules; 3) developing examination and certification materials; and 4) selecting and preparing teaching staff. In the second year, a pilot will be run with a selected group of users and promotional activities will be developed (such as informative lectures and a communication campaign) in order to attract a sufficient number of students for the third year.

This paper is organised as follows. In Section 2 the campus platform is described. Section 3 presents de different modules of the FTA and their competences. In Section 4 the certification and recognition process for the FTA courses are summarised. Section 5 presents pilot implementation of the FTA. Finally, the most relevant concluding remarks are drawn in Section 6.

2. THE UNIVERSITY CAMPUS PROJECT

The choice of platform has taken up significant efforts in e-learning projects. Typically, choosing a platform represents a future commitment, as its high installation, configuration and learning costs need to be offset.

Nowadays, different Free Software tools are becoming available for teachers and students as e-learning facilities. Blogs, wikis, personal portfolios, audio and video tools, among others, can be used as efficient knowledge acquisition tools. However, when it comes to selecting any of them, institutions do not only consider the installation and training needed for their use, but some developments are required to integrate these e-learning tools into a Learning Management System (LMS). Therefore, choosing an e-learning platform will determine the road map to the development of an institution to a large extent, and will often compel to maintain a clear direction with regard to the tools and resources to be used. The type of questions raised by the choice of a platform has evolved in parallel with the evolution of the e-learning sector. As a reaction to this situation, an evolution from e-learning products towards e-learning frameworks has been taking place in the recent years. The majority of products do not only offer a certain feature, but allow their extension by the addition of new tools, reprogramming or adapting parts, or accessing a programming API. For example, Moodle [3] offers a complete API for programming new activities or changing certain behaviour.

A framework offers a set of APIs, which are mechanisms to incorporate plug-ins, and other elements which enhance both the extensibility and personalisation of the platform. Frameworks can solve the problems about integration with third party tools. But with this approach, the loose coupling degree [11, 12] is not enough to facilitate a correct interoperability between systems and tools. In fact, a framework does not allow to break certain dependencies, such as the programming language which must be used or the usage of specific code libraries, programming and design rules. As an example, let us assume an e-learning framework platform in Java. The integration solution should be Java programmes and follow the guidelines set by the platform. Using frameworks, the achievement of interoperability often requires time and in-depth knowledge.

The University Campus Project (UC) [9] is a solution designed for virtual learning which provides the common functions of an LMS, but which also offers a mechanism of interoperability such that external tools can be executed and integrated into the Moodle and Sakai [7] platforms (through OKI), bringing added value to the functionality offered by such platforms. OKI [4] is a commitment to providing e-learning services with a standard interoperability layer which allows connections to many tools and systems like LMS, Content Management Systems (CMS), academic management databases, repositories and others.

The UC project began under the assumption that the next step to achieve a real interoperability between platforms would rely on adopting a service oriented model. OASIS [6] defines a Service Oriented Architecture (SOA) as a "paradigm for organising and utilising distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectations" [19]. In SOA, the system is modelled around a set of modules with a public functionality and responsibility and a set of mechanisms which allow the interaction between the ser-

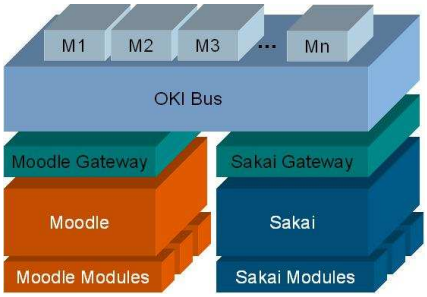

Figure 1: Architecture by layers

vices. When these services implement a very clear-cut interface, it is possible to isolate the interaction mechanisms in a unique layer (see OKI Bus layer below), facilitating the control of the loose coupling across the systems. If a loose coupling is desired, the layer can be implemented using web services. This is the case with the UC project, in which heterogeneous tools (Java and PHP) interact with some services of a heterogeneous platform: Moodle (PHP) or Sakai (Java).

The best way to illustrate the above is to think about a system of blocks or pieces that fit together as illustrated in Fig. 1. Each piece is a black box which performs an activity within its limits and is invisible to the others [23]. The tools connect to the system using the base services, which act as a bridge and a link. Each tool has its own internal architecture and the most appropriate technology to solve its business logic. In turn, the learning platform tools we want to use should have an OKI gateway. An OKI gateway is an adapter which translates the requests of the base services using the tools into calls to the specific platform's API. To integrate a new platform, the corresponding OKI gateway must be used. The final piece to take into account is the OKI Bus. This component is a middle layer responsible for the communication between the tools and the platform.

This architectural model has been constructed with the objective to allow the use of any e-learning platform as the core system. The current implementation about Moodle and Sakai has to get along with very different platforms as an evidence of the capacity of interoperability of the system. The decision to choose very different platforms is not arbitrary –Moodle is a PHP program with a very clear-cut and directed architecture; Sakai is a Java product with an architecture based on J2EE, Hibernate and Spring–.

The UC project offers a portfolio of e-learning tools that endow added value to the project and which are contributed by several universities. Some of these tools have already been used successfully at each university and have been brought to the project because of their success and stability; other tools offer an added value as they are innovative; others offer specific features or cover specific pedagogical methodologies. In short, the UC project should be seen as a set of applications which fulfil a specific need in the field of e-learning and which can be integrated on the most widely used e-learning platforms.

The FTA campus will be based on the UC project: Moodle/Sakai as LMS plus a suite of e-learning tools coming from both the UC portfolio and the Free Software community, and added to the base platform through UC mechanisms and middleware. Moodle/Sakai and these tools will adjust to the needs of FTA. The FTA campus will cover all basic needs including virtual classrooms, forums, chat, messaging, question banks and video conference. It will be able to use learning materials which have been stored in the SCORM standard format, allowing for the exchange of OER and a large number of sources.

3. CURRICULUM BUILDING

The FTA Campus will provide with a set of distance learning courses or modules which comply with the Shareable Content Object Reference Model (SCORM, [10]) standard, enabling the seamless exchange with other educational platforms.

SCORM is a collection of standards and specifications for web-based e-learning developed by the Advanced Distributed Learning Initiative (ADL), launched by the Department of Defense (DoD) of the United States and the White House Office for Science and Technology Policy (OSTP). SCORM describes a Content Aggregation Model (CAM) and a Runtime Environment (RTE) for instructional objects to support adaptive instruction based on learner's goals, preferences, prior performance and other factors. SCORM also describes a sequencing and navigation model for dynamic presentation of content based on learner needs. In SCORM a Learning Management System (LMS) is a suite of functionalities to deliver, track, report on and manage learning content, learner progress and learner interactions. LMS is a server-based environment that has the capacity for managing and delivering content to learners. SCORM does not define the LMS but the interface points between instructional content and LMS environments. In the FTA project, the Campus platform [9] will be used to deliver SCORM contents to the students.

The materials, worked on by UOC and ISCTE, constitute a part of their continued commitment to master programmes in Free Software. The SELF Platform [21] will be used as a collaborative authoring environment to adapt and develop the FTA materials. This provides the following advantages: on-line collaboration of various authors, delivery in SCORM format, free distribution of materials and an open production cycle which can be supervised by the FTA Scientific Council. The FTA educational modules are focused on Free Software and Open Standards and, more specifically, the following topics will be covered by them:

- Module 1: Concepts of Free Software and Open Standards
- Module 2: GNU/Linux Operating System
- Module 3: Network technologies
- Module 4: Web applications development
- Module 5: Economical models
- Module 6: Legal aspects of the Information Society
- Module 7: Software development
- Module 8: Case studies

Materials for modules 1 and 2 are already available in the UOC Master programme in Free Software (MFS [25]). These materials have been translated into English and are being ported to the SCORM format on the SELF Platform. These courses can thus be incorporated in the FTA campus after the necessary updating. Materials for modules 3 and 4 are already available in the MFS in Spanish and Catalan and

will be translated into English after the necessary updating and adaptations. Materials for modules 5, 6 and 7 will be built upon existing materials from the UOC and ISCTE. Finally, materials for module 8 will be developed with existing case studies from all partners on FS implementations in industry, education and government.

The specific competences to be developed in each of these educational modules are summarised below.

1. Know the fundamental and introductory aspects of Free Software (Module 1).
2. Know the main Open Standard formats for different types of contents. (Module 1).
3. Use the GNU/Linux operating system at user level (Module 2).
4. Manage GNU/Linux systems (Module 2).
5. Configure and manage networking services in Free Software environments (Module 3).
6. Configure and manage services and advanced networking protocols such as wireless networks, broadcast systems, voice over IP, real-time applications, ad-hoc networks and sensor networks (Module 3).
7. Install and configure a web server (Module 4).
8. Know the languages and standards of the web (Module 4).
9. Design and implement web applications (Module 4).
10. Know and apply the business models of Free Software and their associated economical aspects (Module 5).
11. Know and apply the legal and exploitation aspects related to the use of the Free Software (Module 6).
12. Design and programme applications with Free Software tools and resources (Module 7).
13. Work with the different virtual cooperative environments for Free Software development (Module 7).
14. Know how to reuse and search source code to build new applications (Module 7).
15. Compare real cases of implantation of Free Software systems and plan new implantation cases (Module 8).
16. Analyse the more relevant Free Software projects (Module 8).

All educational materials used in the FTA are Open Educational Resources as defined in the licensing guidelines of the SELF Project [22]. This means that all the modules are being published under licenses such as the GNU Free Documentation License (GFDL) [16] or the Creative Commons Attribution-Share Alike (CC-BY-SA) [13] license, which allow them to be used, modified and distributed without any restriction. Although the complete set of modules will be delivered in June 2010, the first four modules will be ready by December 2009. This will enable the start of the first phase of the pilot at the beginning of 2010.

4. CERTIFICATION AND RECOGNITION

The Free Technology Academy is not an institution granting supranational degrees; in fact, the legal framework for such an institution is lacking. Instead, the FTA is a collection of programmes offered by a consortium of universities, each university providing a separate version that conforms to the regulations in its own country. Notwithstanding the Bologna process, requirements differ across Europe: for instance, the number of ECTS credits composing a master programme is not uniform, and neither are the rules for accreditation. In some countries universities with a certain level of accreditation have the freedom to define their own master programmes, in other countries each programme proposal must be reviewed by an independent inspection body before achieving the right to grant degrees.

A particular difficulty occurs in the Netherlands, where there is a very strict separation between universities on the one hand and schools for professional higher education on the other. The latter are called *hogescholen*, usually call themselves 'professional universities' in English, but are forbidden to use the word *universiteit* in Dutch. The *hogescholen* are not allowed to award the titles *Master of Arts* and *Master of Science*; they may, however, confer other titles like *Master of Informatics*. In practice, the latter is more of a theoretical possibility, as government financing for such programmes is absent and as a result they are not widely known or accepted in society. Accreditation criteria for a M.Sc. programme, however, specify that the curriculum should be geared towards scientific research and not be a preparation for some profession (other than those of doctor or lawyer, which have traditionally a separate status). Hence a Dutch master programme should be based on learning outcomes related to research, and the final thesis should be an independently conceived scientific paper.

Notwithstanding the difficulties presented by national differences, it is desired that the programmes gathered under the aegis of the FTA not diverge too widely. This will ensure that the qualifications and learning outcomes achieved by FTA participants are recognised by all participating universities, so that FTA learners having completed certain modules at one university may receive full credit for this at any of the others. Where necessary, this will be achieved through bilateral agreements between the partners. A necessary step is to establish descriptions of the various modules in terms of standardised knowledge units and competences and, wherever possible, links to international frameworks such as the European e-Competence Framework [14] or the ACM/AIS/IEEE-CS Computing Curricula [17]. Ultimately, an international joint master programme in Free Software is expected to be the end result, but this will not be realised in the immediate future.

In order to establish the common standards necessary for mutual recognition of learning outcomes, the FTA Board will establish a joint Scientific Council with recognised international specialists to oversee Quality Assurance procedures at the participating universities. Aspects include curricula, faculty competences, student performance, learning facilities, outcomes assessment and examination processes.

There will be a network of associate partners: institutions of higher education, schools, vocational education and training organisations, ICT companies and governmental institutions. This network will assure that the modules that have been developed actually reach environments where their content satisfied a real societal and/or market need. In developing and extending the network, special attention will be given to sectors where an increasing demand for the skills covered by the FTA modules, for instance in situations where the use of Free Software and Open Standards is promoted by government (e.g. [18]).

5. PILOT PROGRAMME

Once the FTA campus has been implemented, the campus

and its course modules will be set up, run and evaluated in a pilot programme. Course materials, learning spaces and tools will be put in place, validation and mutual recognition mechanisms will be applied and staff will be prepared. In short: all teams within the project will show and test their results with the first groups of learners.

The Pilot programme is split in five different phases. In the first phase the course modules will be imported and virtual classrooms will be prepared with the necessary tools. Staff will be selected and prepared and the presentation layer of the campus will be fine-tuned. The FTA consortium will seek sufficient people interested to participate as learners in one or more of the course modules that will be run in the pilot. In the following three phases, the pilot programme will be run, offering in each phase two modules that will run in parallel. Learners will receive accounts on the campus platform and will be guided through the course programme by student coaches. Guest speakers from the field will be invited to join and provide expert talks and will share their vision and experience through online guest lectures. During the course programme learners will perform exercises and tests to make sure the a learner did indeed acquire the desired learning outcomes.

In the fifth phase, the programme will be evaluated in order to fine-tune the programme and the campus. An evaluation report with results and recommendations will be published at the end. All results of the pilot and its evaluation should help in consolidating the FTA Campus and run subsequent course modules.

6. CONCLUDING REMARKS

The expansion of Free Software and Open Standards in the last few decades has arisen the need of qualified IT professionals, teachers and decision makers with sufficient knowledge and expertise in these fields. The Free Technology Academy is a European initiative to set up a virtual campus offering course modules on these topics and to become a showcase of a virtual campus based on FS, OS and the use of Open Educational Resources.

The challenges of this project are 1) the building of curriculum for the education of this topics, developed using the existing standards to be compatible with different existing platforms for e-learning (such as Sakai or Moodle); 2) the development of a virtual campus solution to incorporate additional educational tools (through the University Campus project); and 3) the implementation of a pilot programme of the FTA enrolling students from different countries and origins in order to test the developed solutions. Finally, the accreditation of the recognition of the FTA courses will be undertaken at the local level by the members of the FTA consortium.

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Note

All the URLs provided in the list of references have been checked as of April 2, 2009.

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