Virtual European School - An Infrastructure to Deliver High-quality Contents to Second-level Schools

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1 INTRODUCTION

The Virtual European School (VES) is an ongoing European project - funded by the Educational Multimedia Task Force Initiative of the European Union - with the aim to develop a comprehensive on-line resource of teaching material for secondary school education.

The system will be fed by a group of smaller publishing houses from different European countries (Austria, Italy, Greece, Great Britain) specialised in educational material.

Pedagogically, the VES project aims to reduce instructors' hesitation towards using computers as teaching assistants, by offering an innovative delivery system containing a large variety of material supporting various pedagogical concepts.

JOANNEUM RESEARCH (Austria) and Systema Informatics (Greece) are responsible for designing and implementing the system which is based on Internet technologies and consists of interconnected servers in each participating region. The VES system is developed in close collaboration with educators in order to evaluate contents and architecture. More than 100 schools will be able to participate in the user trials.

VES will be an open system, in economic, legal and technical terms. This will allow the consortium to market the system after the end of the project but will also allow new partners to enter in the commercial phase. More detailed information on the project is available on its public web-site `http://www.ves.eu.org`.

2 REQUIREMENTS

VES was designed under various pre-conditions of the different user groups. All these requirements were gathered and documented as a special task in the project and include the following items:

- VES has to support the storage of any kind of multimedia content. The content has to be searchable and viewable through standard web browsers. There should be no limitations either in file formats or layout of the content itself.
- Teachers want to pre-select content for their pupils and structure and comment on it according to their didactic preferences.
- The system shall act as a bridge between the participating countries and should therefore offer a communication platform for teacher and pupils.
- VES offers valuable content to its users. The system has to preserve intellectual property and usage rights for the content units being accessed by the users. Additionally, the system has to provide billing mechanisms as the users will finally have to pay for the services offered.

3 FUNCTIONALITIES

3.1 Overall Architecture

VES is a system based on Internet technologies, which can distribute all kinds of electronic content from publishers among teachers and pupils in several countries. Each participating country runs a localised server of the VES system, offering access to the contents of all servers. These servers are connected with the national school networks. All educational material is stored in a multimedia database with multi-lingual annotations for each unit. Additionally, a three-dimensional multi-user virtual environment (DVE) will be developed to provide pupils with a powerful tool for gathering and exchanging knowledge. The users exploit the VES services via the Internet, using standard web

browsers. Publishers can upload and maintain their content themselves by connecting to their national VES server.

Basic components of the national server are a web server, a communication platform (distributed virtual environments, chat service, newsgroups, e-mail), a media server and the VES database. The database is replicated within all national VES servers, which makes content searchable at all sites.

Most of the services offered by the VES system will not be free in the commercial system. At the beginning a subscription-based system will be implemented. However, the system will not be limited to that form of billing, other billing mechanisms like "pay per view" are investigated for future use.

3.2 Multimedia Content Units

All multimedia content in VES is organised in "content units" which represent a piece of information not divisible anymore without losing its economic or didactic significance. The idea of VES is to provide really small pieces of information which can be grouped together into so-called composite units (see below). Publishers are not restricted to the creation and design of their content units by the system. The VES system supports storage of any kind of multimedia content. VES has no restrictions concerning the file formats, however, some guidelines preparing content units are offered.

According to the method of presentation and distribution to the user, VES differentiates following classes of content types:

On-line content: all content types and formats which are directly exploitable by the users through their web browsers and associated plug-ins or helper applications.

Downloadable content: all content types which have to be downloaded to the local computer of the user to be installed and executed from the local hard disk.

External content: content types which are not stored in the VES system but are available on other media (e.g. CD-ROM, DVD …) or servers.

3.3 Composite Units

Composite units are structured pieces of information composed of content units and optionally of other composite units. Composite units are used to provide a uniform navigation facility within VES and allow to make use of a content unit in more than one arrangement. This fosters high re-usability and modularity within VES and gives the added value for its users. Composite units are similar to a table of contents in a book and will be created either by the publishers or dynamically by teachers and pupils through searching processes. Composite units may not just contain links to content units but also to other composite units. The different levels are implemented by using recursion. In order to maintain data consistency, entries within composite units will be removed automatically when the related content unit is deleted by a publisher.

Teachers can use composite units in order to pre-select content for pupils and structure this kind of content. These structured pieces of information can be offered to pupils later on.

3.4 Metadata

In order to provide a uniform search possibility, each content and composite unit contains a standardised textual description called "metadata". VES stores a standardised set of metadata for each content unit in a database. Since content can be searched in all participating countries, all searchable metadata stored within VES is at least bilingual (native language and English).

Most of the VES metadata are based on categories and attributes of Dublin Core and the ARIADNE EC project. This guarantees international information interchange to other systems and reusability of content units. The basic categories of attributes which were necessary to fulfill the user requirements are listed below (some representative attributes are in brackets):

- General information on the content unit itself (e.g. identifier, title, author, publisher, ...)
- Semantics of the content unit (e.g. keywords, abstract, ...)
- Pedagogical attributes (e.g. discipline, kind of material, pupils' age, kind of use, ...)
- Technical characteristics (e.g. file format, size, ...)
- Conditions for use (e.g. reserved rights, price, ...)

- Meta-metadata (meta-author, meta-validator, ...)

For search purposes mainly the attributes within the categories "general information", "semantics" and "pedagogical attributes" are used. These attributes give information on the content unit and enable teachers to decide whether these data are usable for a particular purpose.

3.5 Searching and Retrieving Information

Retrieving content in different ways is one of the most important features of VES, because only a powerful but also transparent searching/browsing facility can guarantee efficient usage of the system. The VES database can either be searched by using a full text search or by browsing. Basically, VES will provide search interfaces for pupils and teachers, offering the same functionality. In the initial phase of VES database investigation, searching is supported by a series of wizards guiding and navigating the user in the abundance of VES content, allowing him/her to filter out irrelevant, inappropriate and educationally confusing hits.

Since there are content units which will be restricted to be accessed by teachers only, some results can just be obtained by teachers. Basically, two different search results can be retrieved: content units or composite units. These different types are appropriately visualised in the user interface so that the users can easily recognise the kind of content found. Depending on the type (on-line, downloadable, external), the content units and composite units can then be viewed by using appropriate methods.

3.6 Virtual Reality Technologies within VES

It is evident that VES, apart from the role as an electronic educational repository, is pursuing the role of an educational meeting place for pupils and teachers. 3D multi-user virtual environments - also referred to as distributed virtual environment (DVE) or shared virtual worlds - will be developed, providing pupils with a powerful tool for learning and exchanging knowledge. The VES architecture caters in three distinct cases for the utilisation of such virtual reality technologies:

- In the definition of a content unit, allowing a virtual world to become a content unit.
- In the promotion of the utilisation of shared virtual worlds to act as tools for collaborative learning, acting as content units themselves.
- In the VES communication suite, by allowing an enhanced chat facility in the form of a teacher-to-pupil avatar discussion.

The first two options concern the VES content suppliers (publisher), the third builds an integral part of the VES system. The idea of implementing a virtual reality based MUD (multi-user domain), being exploited by teachers and pupils, is underlining the VES system environment. In the planning of the VES-MUD, special sessions are envisaged for teacher-pupil communication. VES is intended to give the floor for on-line learning sessions for pupils. The society of VES teachers will deal with the learning issues “raised on demand” by organising autonomous shared virtual chat worlds, identified by the "Discussion Subjects" and the "Language Used″. The shared virtual world environments will be designed and developed with Superscape and Blaxxun tools.

4 OUTLOOK

According to the project plan the first prototype system will be available by the beginning of 1999 and will be tested by three selected schools in each participating country. The results of this first evaluation phase will be used to refine and tune the system. The next step will be the "pilot system" where approximately 100 schools will have access to the system. During this phase also the exact business model for offering the VES services will be finished.