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## THE CONCEPT OF DEVELOPING E-LEARNING REPOSITORY – METADATA AND GROUP WORK

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**Abstract.** This article describes how a build-in mechanism in LMS/LCMS (Learning Management System/Learning Content Management System) and Open Source software are used for creating the content repository in the **CENAR** project (Centrum Edukacji Niestacjonarnej Akademii Rolniczej – in Polish, Distance Education Centre at University of Agriculture – in English). The CENAR project aims at constructing the model of knowledge repository based on the metadata standards. It describes the educational course contents using IMS Learning Object Metadata (LOM) specification. In the article a universal solution in a form of XML document is proposed. It supports development of e-learning materials and implementing them in different LMS/LCMS. In order to filter information content in the XML repository Stack-Based Query Language (SBQL) is used. This is a new object-oriented query language based on Stack-Based Approach (SBA). Finally implementing the results of the **Rural-eGov** (Training SMEs of Rural Areas in using e-Government Services) Leonardo da Vinci project is elaborated.

**Keywords:** metadata, e-learning, Atutor, Moodle, ReloadEditor, SBQL, database

### 1. INTRODUCTION

Development of distant education systems disclosed drawbacks related to creation of educational courses – expenditures of new courses are larger and larger but the effects do not correspond to costs.

The serious problem is the fact of existence of courses in the same subjects and created by various authors enjoying eminent authority but their availability is confined due to the lack of information flow. Creating a mechanism which would facilitate formation of a new course from already existing material and then rendering it accessible for a large group of users is considered on various levels – description, storage and availability. The information describing educational contents in the most cases is based on the IMS specification. In the presented repository project called CENAR, the repository structure represents the IMS LOM standard, metadata description is in the XML format and data storage takes place in the database management system SBQL (Stack-Base Query Language) – the stack-based approach.

### 2. WHY METADATA

The contents must be designed in such a way that it could be used many times and must be so packed that its localization and automatic systematization in the in-coming catalogue publication could be made. One of the approaches to achieve this aim is using metadata. What are metadata?

The metadata themselves are often called the data about data or the information about information. Actually metadata are the structural information which describes, explains and locates data or facilitates recovery, use or management of information source. In Fig. 1 we present an example of metadata, this example shows that the language used for the description of metadata is very simple and intuitive.

```
<metadata>
  <lom>
    <general>
      <title>
        <langstring xml:lang="pl">Weryfikacja
        protokołów kryptograficznych</langstring>
      </title>
      <language>pl</language>
      <language>en</language>
    <description>
      <langstring xml:lang="pl"> Weryfikacja
      protokołów kryptograficznych </langstring>
      <langstring xml:lang="en"> Verification of
      Cryptographic Protocols </langstring>
    </description>
    </general>
    .....
  </lom>
</metadata>
```

Fig.1 Example of metadata

At present there are many schemas of metadata and sets of elements. Many organizations deal with the frameworks for metadata. These are, among others, Dublin Core (DC), Metadata Encoding and Transmission standard (METS),

metadata Object Description Schema (MODS) or IMS Learning object Metadata (IMS LOM)

### 3. MODEL LOM AND TOOLS FOR EDITING THE METADATA

To create a database of knowledge over the years acceptance of specification and standards ensuring access, exchange and use of educational modules from different producers results from the need:

- To popularise educational contents
- To render contents of both basic materials and complex course accessible
- To ensure portability between educational platforms
- To apply modules many times
- To create on-line training

The above needs are taken into account in the specification Learning Object Metadata (LOM). LOM was elaborated by the organization IEEE Learning Technology Standards Committee (LTSC) and included in the standard IEEE 1484.12.1-2002. The metadata schema is hierarchical and includes over 60 elements, determines their interrelations and types of stored value. These metadata are included in the tuck in list form on which the user can make necessary modifications. The list is divided into nine categories (Fig. 2)

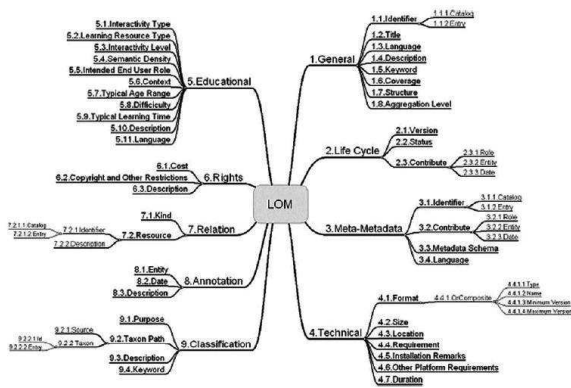


Fig. 2 Specification LOM [1]

### 4. CREATING REPOSITORY FOR EXAMPLE LAFOURCADE'S COURSE

The best way to present the process of repository preparation is a specific example. Pascal Lafourcade from ETH Zurich developed an exemplary course in the Moodle system (Fig. 3). It was the first time he used this system. Only a very short time was necessary for creating his course in this system. Moreover the proposed interface is friendly designed, very intuitive and convivial to use. It allows the author to produce documents in different common formats like PDF, PS, HTML. This experience is a good demonstration of the expansion of Moodle and explain that Moodle is one of the most popular LMS/LCMS systems.

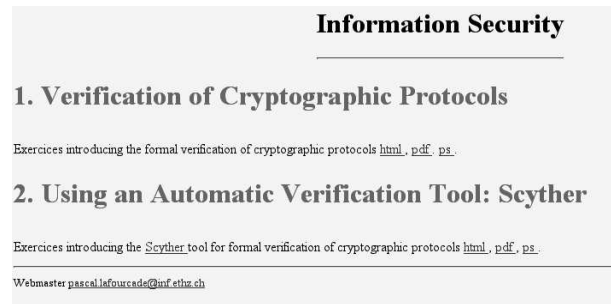


Fig.3 Lafourcade's Course

However so far it has not got tools for formation and export of metadata. Therefore the procedure of metadata edition by means of external tool has been presented. For this aim the tool ReloadEditor was applied. ReloadEditor is application of Java, therefore it is not ascribed to a specific operation systems. It can be installed on both platforms Microsoft Windows, Linux or MacOS. The only requirement is to install the package Java Runtime Environment (JRE). Starting the Editor there are formed automatically the files including the basic data:

- imsmanifest.xml – the manifest of contents package including all stored information
- imscp\_v1p1.xsd – the local copy of the content package in the format XMLSchema
- imsmdv1p2p2.sd – the local copy of metadata in the format,
- ims.xml.xsd – the local copy of the document XMLSchema.

Fig.4 and Fig. 5 presents the example of editor and edition fields. [3]

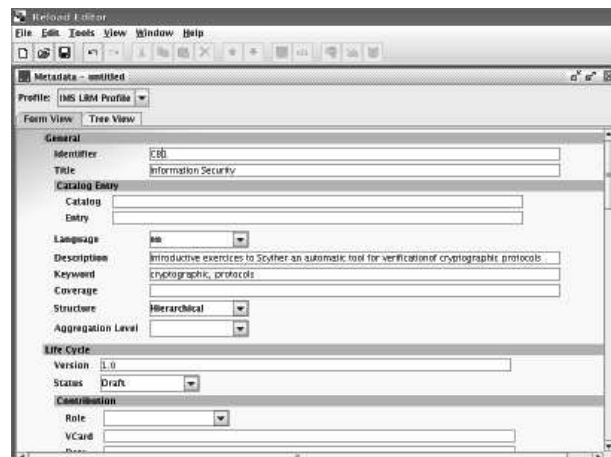


Fig.4 ReloadEditor - FormView

The system ATutor presents a different approach to export and exchange of educational contents. ATutor is Canadian LMC/LCMS system, not as popular as Moodle, but after getting familiar with it, arousing interest. It has a module structure composed of modules of distant education team work, improvement for the disabled etc. As one of a very few systems ATutor is able to export data according to

IMS specification. Edition takes place directly in the system, it exports the course edited at the moment (Fig.6).

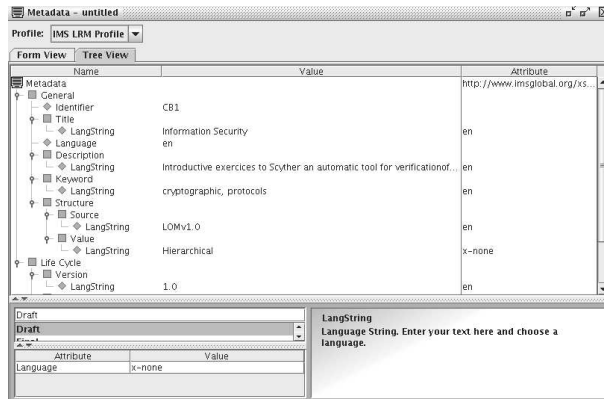


Fig. 5 ReloadEditor - TreeView



Fig.6 Export content with ATutor

As a result of the above procedure we obtain Content Package in the standard form imsmanifest.xml enabling creation of generally accessible database containing all information about existing educational courses (Fig.7).

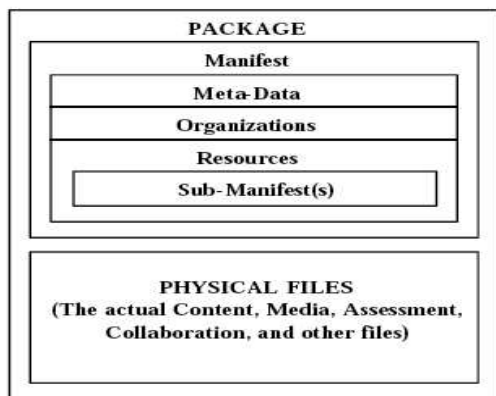


Fig. 7 Content Package concept

In the project the innovative solution in the field of database which is Stack-Base Query Language (SBQL) – the database using Stack-Base Approach (SBA) is applied. It can be successfully used for the repositories XML.

Moreover, this system is friendly for programmers (example shown in Tab. 1) and fast in data exploration.

Tab.1 Comparison of query SQL and SBQL

JAVA+JDBC+SQL	PySBQL
<pre> Connection conn; ResultSet R; Statement s; ... s=conn.createQuery(); ... R=s.executeQuery(   "SELECT salary FROM   empl WHERE sname =   'SMITH'"); while (R.next()) {   System.out.println   (R.getString(1)); } </pre>	<pre> print (men where sname == 'SMITH').salary </pre>

The language SBQL enables creation of the own system of data exchange based on data servers and the system p2p following the example of gnutella, a file sharing network. The approach for repository formation is applied not only for description of education courses themselves but also any information connected with them, the example of which can be Rural-eGov project.

## 5. IMPLEMENTING "RURAL-EGOV" RESULTS WITHIN CENAR PROJECT

The Rural-eGov project aims to focus on and analyse the needs regarding public services support of SMEs in five rural areas of EU member states with different degrees of e-government services deployment and adoption. The specific aims of the Rural-eGov project among other things are:

- to develop a set of proposed training scenarios (based on blended learning strategies for vocational training). These will promote the combination of ICT-based learning (such as digital learning repositories that support virtual communities) with traditional forms of learning (such as seminars and learning groups). Their aim will be to train SMEs from rural areas in understanding and reaping the benefits from e-government services.
- to develop innovative and relevant e-learning content that will support the proposed training scenarios, which will be described and stored (in the form of learning objects) in the Observatory's repository of digital training objects.

The earlier described project CENAR is applied in description of public services within the Rural-eGov project. The model of content description in the form of repository will enable access to government services classified earlier and thus will speed up attainment of information of great interest for specific subject.

## 6. CONCLUSION

The above text is only introduction to the problems presented by the CENAR project whose main aim is rendering the educational contents described by means of metadata accessible. This project is based on the edutella project (project is a multi-staged effort to scope, specify, architect and implement an RDF-based metadata infrastructure for JXTA) and indirectly on JXTA of the firm SUN Microsystems, Inc. Application of different approach to structure of information exchange system and first of all the database ODB and the language SQL as a main project may be widely applied.

One of the expecting results will be an e-learning repository metadata build on co-operation between two projects CENAR and Rural-eGov. It is planned that this repository will be used by university students (Lublin, Gdańsk, others) which is an added value for both projects.

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