Hellenic Libraries Union Catalogue (HLUC)

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Abstract:
Purpose *- This is a descriptive paper highlighting the Hellenic Library Union Catalogue (HLUC) which is an information system that aims to integrate and highlight all the collections from the Greek libraries in one single catalogue.*
Design/methodology/approach *– The HLUC information system was designed and developed by NTUA-HEAL-Link and the National Library of Greece. The approach used was to organize an open access collection of high-quality bibliographic data and the aim has been to promote, amongst other things, rare, special and other types of bibliographic material. The project is currently in a pilot phase. So far, more than 50 libraries from Greece and Cyprus are participating and the number of participants is increasing.*
Originality/value *- The project responds to a real contemporary need of the entirety of the libraries, and will offer a service which will promote the history and the treasures of the Greek libraries, independently of their type, being public, or academic. Added value will be the integration of Inter-Library Loan Service with the HLUC.*

Index Terms — Union Catalogue, Unified search, Greek Libraries, Cooperation, Bibliographic data

I. Introduction

One of the many projects developed by the National Library of Greece in the context of upgrading its digital services is the Hellenic Library Union Catalogue (HLUC). It is a federated catalogue which will provide access to the entire bibliographic material of the country's libraries, while offering a host of advanced capabilities and sophisticated services.

II. Union Catalogues in Greece – A Historical Review

The creation of a single Hellenic Library Union Catalogue with emphasis on adopting common standards and cataloguing procedures as well as savings in time and manpower, by avoiding multi-cataloguing has been a vision for Greek Librarians for long time, as it has been for many other librarians' communities [1,2,3,4] With this objective in early 2000, the initial attempt to create a Hellenic Academic Libraries Union Catalog[1] began, by the Hellenic Academic Libraries Link[2]. At the same time, Zephyros, a portal for accessing and locating all available books, journals and other materials in Greek Academic libraries, was created. The environment was designed based on the Z39.50 protocol. Zephyros was created by the Information Technology office at the Central Library of the University of Crete[3].
The operation of the HALUC and Zephyros continues to this day successfully, even though libraries have not proceeded with the adoption of common standards for cataloguing and thematic classification of their material.
The next effort to achieve convergence began in early 2010 when it was proposed to the Greek Academic libraries, the creation of an Integrated Library Catalogue (ILSaS - Integrated Library System as a Service[4]) where 26 Academic Libraries' catalogues were consolidated [5]. Similar efforts have been made to modernize and converge both Public and Municipal Libraries by changing their library systems or joining the e-ABEKT system.
By the end of 2016, the NLG in response to its coordinating and guiding role, by law and by its position, proceeded with the creation of the HLUC.

III. Hellenic Libraries Union Catalogue (HLUC)

HLUC was developed and implemented by the HEAL-Link Annex at the National Technical University of Athens, with the collaboration of the employees of the National Library of Greece and with the contribution of the private nonprofit organization Friends and Patrons of the Stavros Niarchos Foundation Cultural Center, which undertook the management of the donation of the Stavros Niarchos Foundation to the NLG as a part of the relocation to its new building. The project was included as a part of Action 2 "Development of Digital Services" which was aiming at reorganizing, modernize and develop the NLG services, so as to re-identify its institutional role and its appeal to the public.
HLUC offers a number of sophisticated capabilities and services, while allowing its further development. Specifically, at a technical level it will:

[1]Hellenic Academic Libraries Union Catalog: http://www.unioncatalog.gr

[2]Hellenic Academic Libraries Link: http://www.seab.gr
[3]Zephyros: http://tiny.cc/t8ns8y
[4]Integrated Library System as a Service: http://tiny.cc/y7ns8y

- Monitor the life cycle of a record from its creation in a local library system up to its incorporation into HLUC
- Advanced capabilities in terms of debugging and reporting for the member libraries
- Mass corrections to local collections of participating libraries
- Inclusion of journals and electronic materials
- Use of MARC21 as the basic standard for the production of the HLUC
- Innovative algorithm for deduplication / identical record matching and consistent generation of the Master Record - Full, backward, detection of the different entries
- Simplification of HLUC's data updating procedures - Provision for real-time differential renewal where technically feasible
- New search interface for the end user (use of facet search, Web2.0 technologies, etc.)
- Ability to copy records (copy cataloguing)
- Implementation and linking with the existing Iris interlibrary loan network

While at institutional level it will:

- Create a National Libraries Network through the creation of the HLUC
- Create a point of access to the bibliographic material of the country with multiple interconnection options (National Cataloguing Center)
- Create a National Archive of Authority Control Terms
- Create a National Interlibrary Loan Network for books and other printed and / or digital material supported by the HLUC infrastructure

The ultimate goal of HLUC is the transition to a modern environment of accessibility and visibility of the country's bibliographic wealth, under the auspices of the National Library of Greece.

IV. Design and Implementation

The design and implementation of the project were carried out by the HEAL-Link Annex at the National Technical University of Athens in collaboration with the National Library of Greece. The choice was made due to the necessary know - how already available in the Annex, following its contribution to the creation of the HALUC. The result of this cooperation was the transfer of know-how and the development of a close collaboration between the employees of the National Library of Greece and the HEAL-Link NTUA Annex. The implementation of the project was carried out in two stages.

The first stage of the implementation of the project consisted of the technical application design and the implementation of the integrated IT system. The second stage of the project included the population of the HLUC with bibliographical data from the member libraries that participated in the pilot phase. The steps were the following:

- data integration (initial data extraction – transfer to NLG – upload of records to HLUC)
- profile creation for the member libraries
- examination of their (member libraries) data, and
- examine and detect any system failures

The aim of this stage was the handling of any problems and/or failures and the transition into the production mode of the Union Catalogue.

V. Methodology for the Implementation of the Union Catalogue

New infrastructure was created to monitor the life cycle of a bibliographic record. The transcribing of a bibliographic record, from the beginning of its life cycle when created by a librarian at a local library system up to its incorporation in the HLUC plays a central role in the new operating environment. In this way, changes in the record statuses are monitored, while at the same time there is a direct link between the transcriptions of the records, in their primary form, and the entries finally entered into the HLUC.

A. Bibliographic Recording Storage Model

The bibliographic record storage model within the Union Catalogue Management System - UCMS, as shown in Figure 1 below, stores a set of bibliographic data originating from a local library that form the UCMS record for that particular library.

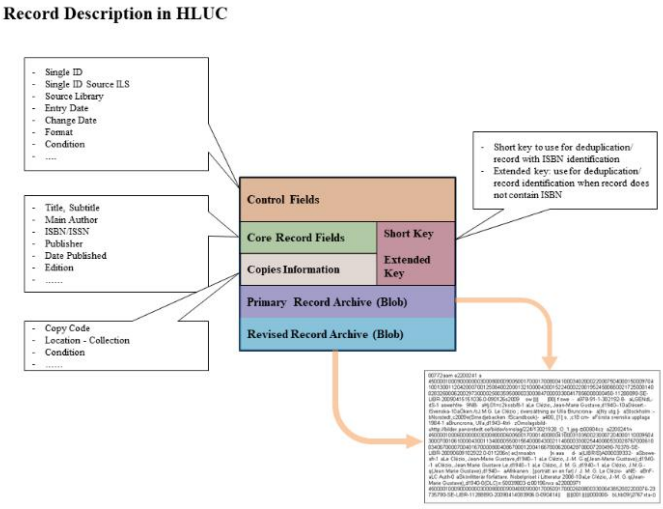

Figure 1 UCMS Bibliographic Record storage model

The life cycle stages of a bibliographic record in UCMS, are illustrated in Figure 2 below. Specifically, the bibliographic record can take the following phases:

Initial phase

- **New**: This is a record that comes from a local library system and is not present in UCMS, resulting in a new entry
- **Update**: This is a record already existing in UCMS, which will be updated

Interim phase (control mode)

- **Self-check**: This is the phase in which every entry initiates an integrity check and runs a deduplication process within the records of a library collection. In addition, in this phase, all necessary fields / collection information in UCMS is being completed.
- **Global-check**: This is the phase in which every entry initiates an integrity check and runs a deduplication process with the records of all library collections. In addition, in this phase, all necessary fields / collection information in UCMS is being completed.

Final phase

- **Erroneous**: this is the situation where a record does not pass the integrity testing procedures due to errors in the raw data of the record (lack of fields, incorrect fields etc.), and it remains in this state until it is corrected or removed in the local catalogue (Deprecated)
- **Deprecated**: This is the state where an entry refers to when it is "removed" by the local library system (withdrawal, lost item, merger, etc.)
- **Duplicate**: This is the state in which a record, within a library collection, is found to be a duplicate. This entry along with the other duplicate records cannot be joined in HLUC and it is necessary to take action to remove the error (correction, merging, etc.)
- **In union**: it is the state where a record has passed successfully the integrity check and participates in HLUC

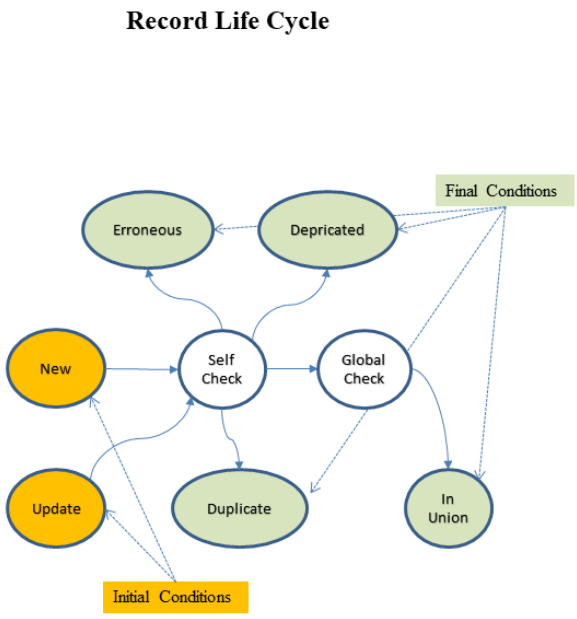

Figure 2. UCMS Bibliographic Record Life Cycle

B. Workflows

Workflow 1 *- Eligibility checking - Certification for participation in HLUC*

The conditions and requirements for library participation in HLUC are:

- Data Status (format, character set, library system, etc.)
- Collections – Subject Heading for books (book collection evaluation, scarcity , subject areas covered)
- Policies (cataloguing, loaning, authorities, etc.)
- Technical features (connectivity methods for data updates, ease of data extraction, etc.)
- Copyright (contributing metadata, items, etc.)
- Compliance with the terms and conditions for participation in the HLUC (technical requirements, availability, terms, etc.)

In Figure 3 the library eligibility certification procedure is shown.

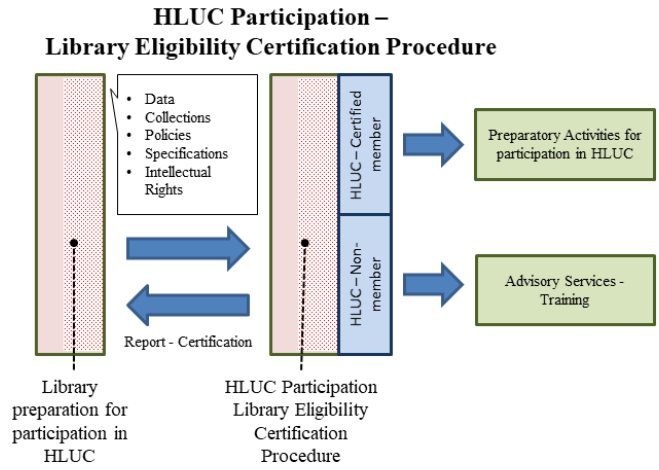

Figure 3 HLUC Participation -- Library Eligibility Certification Procedure

Workflow 2 *- Preliminary activities*

Once the library has been certified, it can start with the preliminary activities, which are finalized by preparing the bibliographic data of the library's collections. The phases of the preliminary activities are as follows: initial extraction - uploading records to UCMS, data analysis, conversions and integrity checks and the process of de-duplicating / locating duplicate library records.

The phases of the preparatory actions are illustrated in Figure 4.

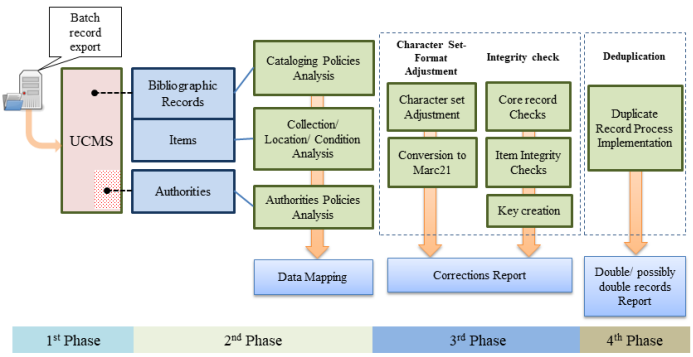

Figure 4 Preliminary Activities Phases

Workflow 3 *- Records identification process*

Immediately after the completion of the preliminary activities for those records that change to the «In union» state, the matching-records algorithm will be run, which will result in the final records of HLUC (master records and single-entry records).

The way the records will be merged depends on the use for which these records (master and/or single records) are intended, as shown in Figure 5. Specifically, there is a different way that the records will be merged in order to be presented through the Online Public Access Catalogue, or for the Interlibrary Loan System and they will be structured differently for display in the Cataloguing Center. The differences are mainly about the way and the degree of the field merging.

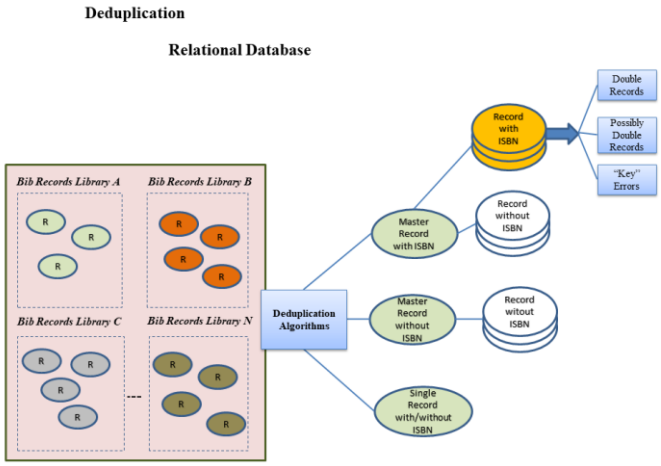

Figure 5 Record Identification Process

VI. Technologies – Integrated Development Environment and Architecture

A key option for the presentation of the HLUC was the development using open source technologies. This preference has served both the need to maintain costs at low level and, above all, the desired aim for increased parameterization / modification of these applications so as to meet all the specific requirements.

A. Integrated Library Information System

As a management information system for hosting the bibliographic records of HLUC, the Koha platform was selected [5]. Koha is an open source software already used by many Greek libraries. Given that Koha is offered as a comprehensive software with a three-tier architecture (Web Server, Php / SGI Perl Scripts and MySql Database Level, based on open source technologies), it is relatively easy for modification and parameterization.

B. HLUC Interface for end users

VuFind [7,8] has been selected as the preferred solution to be used for the federated search for the HLUC bibliographic data. Samples of the user interface are presented in Figure 6 and Figure 7.

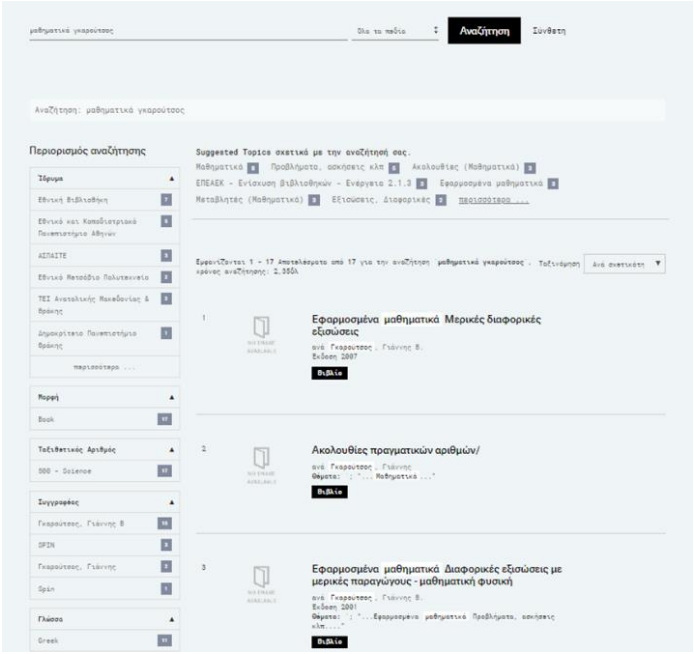

Figure 6 Search Results though the HLUC Interface

The main objective is to allow users to search and browse all library resources by replacing the traditional OPAC. VuFind is a fully scalable system and can be modified by adding modules, so that it can better respond to the HLUC's requirements. It is based on Apache Solr (http://lucene.apache.org/solr/), which is an open source enterprise search platform that offers great performance and scalability. It also enables VuFind to respond to search queries in milliseconds. Finally, it has the capability of data sharing and can extent the directory load over multiple servers or in a clustered server environment, thus serving many architectural infrastructures. This feature is very useful, as the HLUC bibliographic records are expected to exceed 5 million, while the number of users that will be accessing it, will range to several thousand per day.

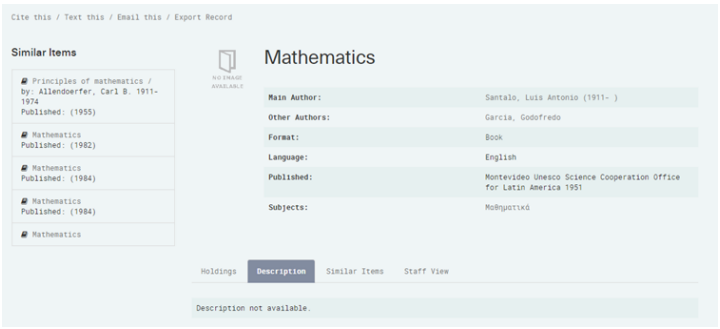

Figure 7 Item in the HLUC Interface

C. HLUC Architecture

In order to develop the tools and implement the systems, a computational infrastructure was required, which hosted the development and will continue to host the system when it will be in full operation. The installation of the systems was

implemented on the existing GRNET infrastructure[5] physical and virtual machines. The operating system of these servers is one of the freely available Linux distributions. The offered servers have no restrictions on the operating infrastructure they will host and are designed to meet 100% of all Linux distributions.

Fig. 8 below schematically illustrates the physical architecture of the system as it has been designed for the successful implementation of this project. Note that the distinctiveness of the servers and networks of the figure below is intended to better understand its structure alone, and it is not the final infrastructure.

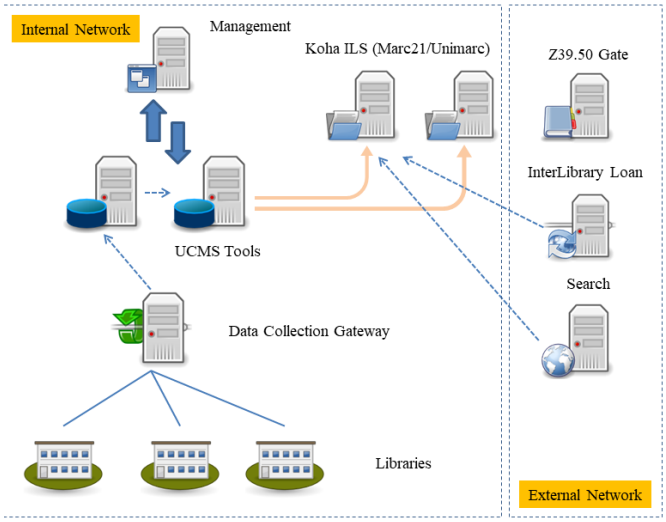

Figure 8 HLUC Architecture

In Fig. 9 the HLUC Management Information System architecture is presented.

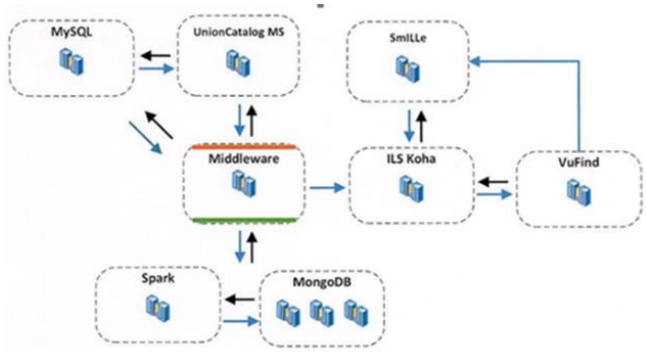

Figure 9 HLUC Management Information System Architecture

D. Interlibrary Loan System

For the development of a National Interlibrary Loan Network, the open source smILLe software will be used, which was developed for the needs of the interlibrary loan (for books and articles) of the Hellenic Academic Libraries (Interlibrary Loan System "IRIS")[6] -). Among its significant advantages is its unified access to all resources (libraries, e-commerce suppliers, electronic databases, etc.) through an interface for the librarian in charge of interlibrary loan.

Today, smILLe is used by 46 libraries and has served around 30,000 interlibrary loan requests (about 15-20 per day). Academic users (lecturers, researchers, students, etc.) with personal accounts amount to approximately 3,500, while librarians can serve them directly.

VII. BENEFICIARIES

All types of libraries in Greece (Academic, Public, Municipal, Special, Research, Private, etc.) are entitled to participate in HLUC, in particular the libraries whose collections / catalogues can be used by HLUC to promote and preserve them. HLUC aims to become a reservoir of high-quality bibliographic resources and, on the other hand, to promote, among other things, rare, expert, etc. bibliographic material. Two calls for participation have already been sent during the pilot phase of HLUC, in which 52 member libraries participated by sending their data.

VIII. FUTURE OBJECTIVES OF THE HLUC

As mentioned above, HLUC has a lot of potential, while at the same time it could be further expanded with the aim of meeting the needs and requirements of the new era.

Following are some of the future objectives of the HLUC, which demonstrate the dynamic and the continuity of this national infrastructure.

- Activate Interconnected Data Interface
- Dissemination of HLUC data using the RDF triplets technology for the development of new services
- Interconnection with International Organizations
- Expansion and interconnection of the NLG Greek Libraries Network
- Transformation of the IRIS Interlibrary Loan Network and its conversion into a National Interlibrary Loan Network (for books and printed journals)
- Participation in libraries' committees for the creation of common policies and the use of common standards in cataloguing and subject indexing
- Provision for counseling services and training, whenever possible, to address any problems and weaknesses in the library catalogues in Greece and Cyprus

HLUC is and will be a catalogue with a lot of potential for growth and prospect. A key requirement for achieving its objectives is the continuous investment in resources (human, infrastructure and technical support). The truth is that libraries, regardless of genre, face many common problems, for which solutions must be found mainly through cooperative processes and the application of good practices. All member libraries can play an active role in improving HLUC.

[5] GRNET: https://grnet.gr/company/

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AUTHORS

Marilia Apostolaki was born in Athens. She received her bachelor degree in Librarianship from ATEI of Athens in 2005. She is presently attending an MSc in Information Management in Libraries, Archives, and Museums at the University of West Attica, Department of Archival, Library and Information Studies. She has worked for the Greek Parliament Library and the Library of the Archaeological Society in Athens. Currently, she is working as a Librarian at the National Library of Greece and is in charge of the Periodicals Department, handling newspapers and serials (journals and magazines).

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George Veranis received his Diploma in Applied Informatics and his MSc in Information Systems from University of Macedonia in Thessaloniki in 2005 and 2008 respectively.

He works as Senior Software Developer for Hellenic Academic Libraries Link Services since 2008. He has been involved in numerous projects developing, deploying and enhancing several applications, systems and websites to meet and satisfy objectives. Also is very experienced with interoperability between different applications, because he has developed a middleware based on that and also has participate in other open source projects. Moreover, has developed open source smILLe which is used by National Network of Interlibrary Loan in Greece.

His research interests include knowledge management, could computing, information retrieval, software engineering, semantic web technologies, data mining, bibliometrics and research evaluation methods, library management systems, webservices and middleware systems.

He has 12 published articles in international scientific journals and conference proceedings.