

# Vytautas Magnus University Research Management System: CRIS solution shared with other universities in Lithuania

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## 1. Objectives

The objectives [1] pursued through the Vytautas Magnus University Research Management System (VDU CRIS) are:

- **Enhancing Global Visibility:** Amplifying the visibility of research outputs, activities, and researchers on a global scale.
- **Ensuring Preservation:** Accumulating and safeguarding the long-term preservation of research outputs and performance results from VDU.
- **Increasing Accessibility:** Expanding the availability and access to research outputs via open access channels.
- **Optimizing Administration:** Streamlining the management and administration of research activities.

## 2. VDU CRIS structure

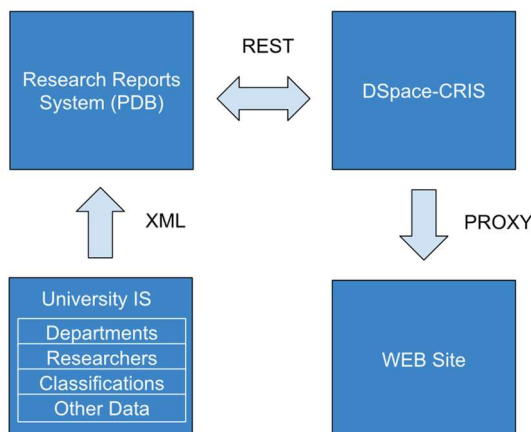


Fig. 1. The structure of the VDU CRIS

The VDU CRIS is composed of the following key components [2]:

- **DSpace-CRIS:** This platform is an enhancement of DSpace 7, equipped with a CRIS extension. It serves as a repository for metadata and documents related to publications, researcher profiles, research projects, and other items identifiable as research outputs or information pertinent to research activities.
- **Research Reporting System (PDB):** A web-based information system developed using PHP programming language, Smarty PHP templating system, and PostgreSQL RDBMS. It facilitates the

evaluation of research outputs for both individual researchers and departments, aiding in certification processes, compilation of publication lists for competitions, and generation of various reports on research activities.

- **University Information System (IS):** This system acts as a central repository of information regarding university researchers, departments, classification systems, authentication mechanisms, and other data critical to the operational integrity of the research management system.
- **Website:** The research management system is integrated within a dedicated website. This integration enhances the precision in attributing the university's research outputs in external web-based evaluation systems, as the URLs of all research entities commence with the university's main website URL.

## 2.1. DSpace-CRIS

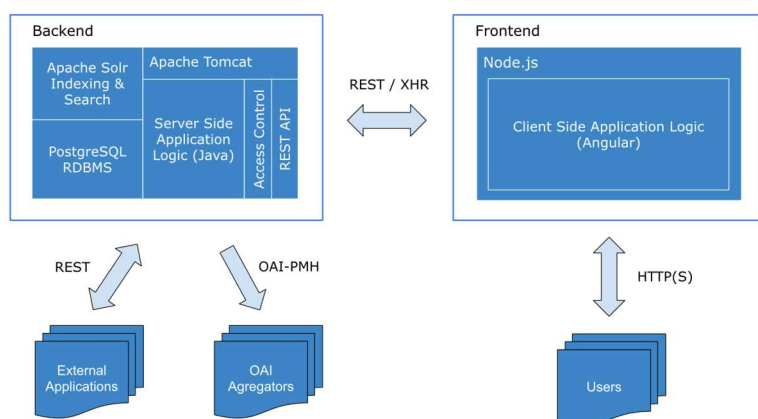


Fig. 2. DSpace-CRIS

The system is structured around two primary server software components: the Backend and the Frontend. These components are designed to operate either on a single server or across multiple servers.

**Backend Component:** The DSpace-CRIS Backend is developed as a JAVA EE (Enterprise Edition) application, utilizing JAVA programming language for its functional solutions. It operates within the Apache Tomcat Java EE container, a web server that facilitates access to all Backend functionalities via the REST API. For data storage, it employs PostgreSQL RDBMS, leveraging hibernate technology to map object-oriented data forms to SQL data tables and queries within PostgreSQL RDBMS. Additionally, the system incorporates Apache Solr for indexing and search capabilities.

**Frontend Component:** The Frontend Server, powered by Node.js, handles HTTP requests from users interacting with the research management system via web browsers. It employs the Angular framework to develop client-side logic, ensuring seamless communication with the Backend server through the REST API. This integration allows for the effective presentation of the system's functionalities to the users.

**Interoperability and Architecture:** The system's architecture is entirely open, enabling third-party or university information systems to access all CRIS functionalities and data through the CRIS REST API. While the architecture is open, access rights are stringently controlled to ensure security and privacy.

**Public Access and Configurability:** The system offers public access to metadata via the OAI-PMH API, which external OAI-PMH aggregators can utilize. DSpace-CRIS is highly configurable, offering features such as:

- **Data Structure Management:** Including Communities, Collections, Entities (Person, Publication, OrgUnit, Project, etc.).
- **Advanced Indexing and Search Capabilities.**
- **Customizable Browse Lists.**

- Matrix Presentation Layouts.
- Robust Authentication and Authorization Mechanisms.
- Configurable Submission Processes.
- Dedicated Working Areas for Registered Users.
- Metadata Importation from External Live Systems.
- Comprehensive REST API and OAI-PMH Integration.

2.2. Research reporting system

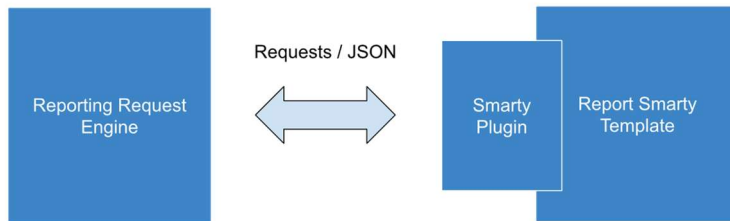


Fig. 3. Research reporting system

Research publications are meticulously prepared in advance for their future incorporation into reports, enriched with additional attributes essential for comprehensive accounting, such as WOS IF, WOS AIF, Scopus SNIP, etc. Custom classifications vital for reporting can also be established, including but not limited to sections of the report categorized by scientific fields, publication types, WOS and SCOPUS indicators, referencing databases, and recognized publishers. These preparations and structural configurations are completed beforehand, simplifying the creation of reporting templates without necessitating a deep understanding of the database's internal structures or database query technologies.

Upon receiving a query with specific filtering attributes, the reporting request engine promptly identifies the relevant research publications and compiles all pertinent data into a JSON-formatted list for the report.

The report generation leverages Smarty templates, powered by the PHP Smarty template engine, designed to distinctly separate the presentation layer (HTML/CSS) from the server-side logic (PHP). This template engine facilitates the creation of dynamic templates utilizing Smarty variables, modifiers, functions, and comments.

The user interface, operating within a web browser, is constructed using HTML, SCSS, and the jQuery software framework, ensuring seamless interaction with the server application developed in PHP. PostgreSQL RDBMS underpins data storage, with the system's development grounded on the KUSoftas CMS, which serves as the programming framework. REST API functionalities are extended via the PHP Slim micro-framework through KUSoftas CMS, enabling the development of additional request processing functions. Together, they guarantee consistent report outputs across various formats: HTML, PDF, Word, CSV.

The reporting request engine is equipped with robust filtering, grouping, and sorting features to refine responses based on criteria such as Year, Date, Department, Author, Publication Type, Research Field, Research Area, Country, Language, and more.

3. VDU CRIS solution advantages

Table 1. VDU CRIS advantages.

Option	Description
Open system architecture	Access to all system functions via REST API creates favorable conditions for integration with other University information systems
Standards and recommendations	Compatibility with essential standards and recommendations such as CERIF, COAR, OpenAIRE, etc. ensures efficient data exchange and import / export with other similar systems

Live metadata imports	Live metadata imports during submit: WOS, SCOPUS, PubMed, CrossRef, etc. makes it possible to quickly and efficiently prepare and submit research entities in the cataloguing process by importing records metadata from external live sources
Integration with ORCID	Integration of researcher's profile with ORCID allows CRIS researchers to log-in to ORCID via CRIS and automatically synchronize their CRIS profile content to their ORCID profile content.
CRIS content integration into University website	CRIS content as integral part of the University website creates conditions for the effective dissemination and evaluation of information in external evaluation systems on the basis of the Web by providing URL links to CRIS research entities as URL links to the University website – unambiguously identifying that this is scientific output of the University
Highly configurable system	Creates opportunities for a very effective adaptation of the system to meet the needs of the University, in many cases avoiding complex programming work and enables to achieve results in a relatively short time
Open source, advanced architecture and modern technologies	It is a promising solution for the future

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#### 4. VDU CRIS solution in the universities of Lithuania

- Vytautas Magnus University, <https://www.vdu.lt/cris>
- Lithuanian University of Health Sciences, <https://lsmu.lt/cris>
- Klaipeda University, <https://www.ku.lt/cris>
- Mykolas Romeris University, <https://cris.mruni.eu/cris>

#### References

- [1] Kučiukas, Vilius and Bloveščiūnienė, Lina. (2018) “Model of accumulation, preservation and dissemination of research output and activities.” Website <https://portalcris.vdu.lt/eng/about>.
- [2] Kučiukas, Vilius and Bloveščiūnienė, Lina. (2023) “Vytautas Magnus University (VDU) Research Management System (CRIS) Solution.” Website <https://portalcris.vdu.lt/eng/vdu-cris-solution>.