1st Conference on Research Data Infrastructure

Humanities and Social Sciences

https://doi.org/10.52825/CoRDI.v1i.353

Published: 07 Sept. 2023

WissKI

A Virtual Research Environment based on Drupal

Mark Fichtner[1][https://orcid.org/0000-0001-5597-4222], Robert Nasarek[2][https://orcid.org/0000-0003-1163-8504], and Tom Wiesing[3][https://orcid.org/0009-0002-7392-0556]

[1] Germanisches Nationalmuseum, Germany

[2] Germanisches Nationalmuseum, Germany

[3] Friedrich-Alexander Universität Erlangen-Nürnberg, Germany

Abstract. WissKI is a free and open source virtual research environment based on the free and open source content management system Drupal. It features everything that the content management system provides while using a triplestore for authorative data storage. Thus changes can be made in the triplestore and they are directly reflected by the system. Furthermore WissKI provides all features that are necessary for a full Linked Open Data Semantic Web platform.

Keywords: WissKI, Linked Open Data, Semantic Web, Virtual Research Environments

Introduction

Increasing digitisation and dealing with the Semantic Web are a central challenge of the future for the traditional humanities. In this context, the digital medium not only supports research, but also poses challenges in terms of the change in methods, the speed of development and the openness of research data. In recent years, virtual research environments have increasingly established themselves as research platforms in research projects. A constant point of criticism from the user's point of view is that dealing with virtual research environments usually requires a certain affinity to the digital medium and a greater period of familiarisation than was necessary for the traditional collection of data in the analogue domain. The central approach of virtual research environments, however, is to maintain a balance between complexity or a large number of application possibilities on the one hand and a low entry threshold with simple usability of the data on the other. The following is an example of the implementation of such an approach from the WissKI research project funded by the DFG.

WissKI Project

As part of the three-year and subsequently two-year DFG-funded research project "Scientific Communication Infrastructure" (WissKI, [1]), the virtual research infrastructure of the same name "WissKI" was created on the basis of the open-source content management system Drupal. In cooperation between the Germanisches Nationalmuseum Nürnberg (GNM), the Zoologisches Forschungsmuseum Alexander Koenig in Bonn (ZFMK) and the Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), a software infrastructure was developed from the requirements of cooperative research in the field of cultural heritage and its documentation in digital media. The focus of the system is not only the simple provision and open availability of source materials - structured texts, graphics, images, video, audio - and metadata in digital

form, but also collaboration on the basis of semantic web principles. By leaving the typical features of common content management systems untouched, the system has detailed user control with rights management and is able to manage web content such as websites, forums and wikis and present them online.

The software is published free of charge as open source on the Drupal module website [1] and can therefore be used, reused and extended accordingly.

Integration in Drupal

The current version of the WissKI software is based on the currently most modern version of the content management system Drupal - Drupal 10 [2]. The functionality of Drupal can be extended and modified by third-party modules. Accordingly, the WissKI system is a set of modules divided into logical units, each of which brings encapsulated functionality to the system. The modules are based on all core functionalities of Drupal, so that all common features of Drupal, such as user control with detailed rights management or the creation of web pages, are retained.

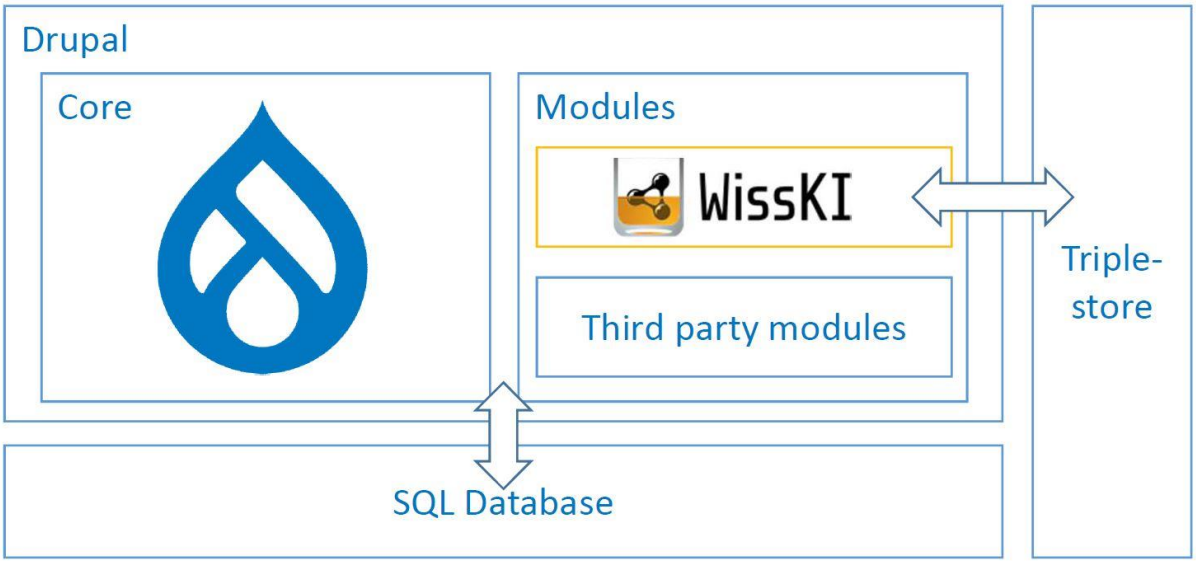

Figure 1. WissKI integration in Drupal

Semantic modelling with Drupal and WissKI

The focus of the WissKI project was to combine the implementation of the common data storage of the Semantic Web in the form of triples with the functionality of Drupal. An approach

such as Semantic Mediawiki [3] would be obvious: All individuals correspond to their own websites and all relations correspond to data fields. If one tries to implement this directly with Drupal, individuals in Drupal correspond to entities, concepts to bundles and relations to fields.

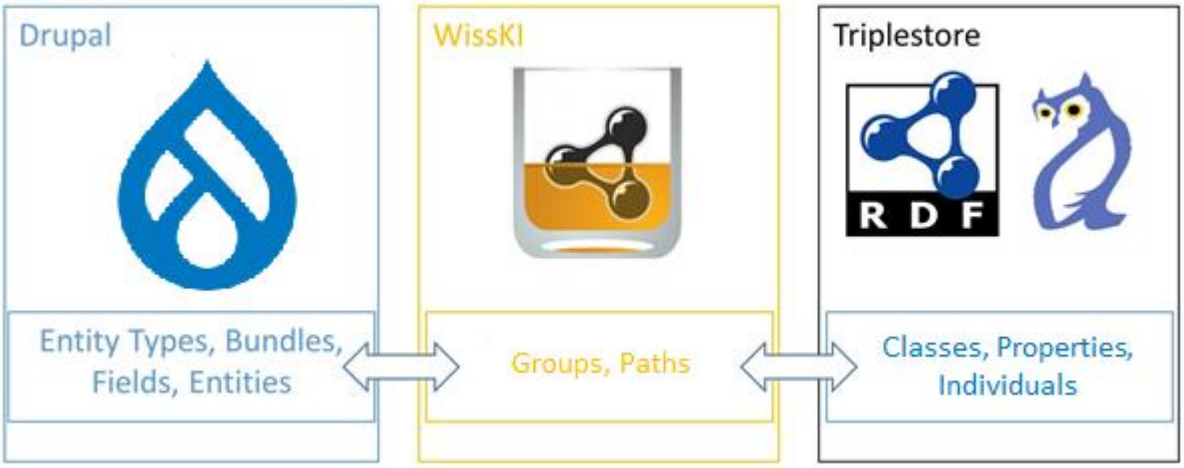

Figure 2. Translation of Drupal contents to the Triplestore via WissKI

Due to the strong requirements of cultural heritage ontologies like the CIDOC Conceptual Reference Model (CIDOC CRM, ISO 21127, [4]) for a complex data graph, WissKI implements an even more complex approach. The integral component of the system is the so-called "Pathbuilder". It supports the system administrator in creating "paths" through the ontology. A path is a concatenation of n concepts and n-1 relations between the concepts. When storing data using a path, an individual is first created for each concept. Then the individuals created are connected to each other by the relations according to the specifications of the path. At the end of such a path in WissKI there is always a relation to a primitive data type in which the actual input is stored. To store several inputs via the same subject, paths can be combined into so-called groups. The group defines the common portion of all paths belonging to it. The trivial case (groups and paths of length 1) corresponds directly to the implementation of OWL described above. However, it additionally allows the implementation of more complex modelling as prescribed by the CIDOC CRM. For the implementation in Drupal, the Pathbuilder forms an intermediate layer between the Triplestore with the data stored there in triples on the one hand and Drupal with the data storage based on entity types, bundles, entities and fields on the other. It creates a mapping from groups and subgroups in Pathbuilder to bundles and referenced bundles in Drupal as well as from paths to data fields. This mechanism hides the full complexity of the Semantic Web approach as well as the CIDOC CRM from the actual user, who only has to fill in forms.

The system gives the possibility to load any ontology based on OWL. When creating paths based on the ontology, the system can support the administrator by calculating the possible concepts and relations for each step (based on domain and range).

Conclusion

The WissKI system offers the administrator many options for support and the user the possibility to store his or her data on the basis of common semantic web technology. However, the complexity of this process is not reduced, but shifted from the user to the administrator. The administrator needs a sound knowledge of Drupal, the Semantic Web and the standards on which it is based, as well as the CIDOC CRM capture standard. At the same time, he is responsible for implementing the intended semantics of the users in the database in the form of masks and fields. With this approach, the WissKI system tries to keep the entry hurdle for the user low and at the same time offer the administrator all the possibilities of the Semantic Web.

References:

1. “ABOUT WISSKI | wiss-ki.eu”. https://wiss-ki.eu/ (26.04.2023)
2. “WissKI | Drupal.org”. https://www.drupal.org/project/wisski (26.04.2023)
3. “Drupal – Open Source CMS | Drupal.org”. https://www.drupal.org/ (26.04.2023)
4. “semantic-mediawiki.org”. https://www.semantic-mediawiki.org/wiki/Semantic_MediaWiki (26.04.2023)
5. “Home | CIDOC CRM”. https://cidoc-crm.org/ (26.04.2023)