Integrating data on early medieval graves: Mapping the THANADOS database to the ARIADNE infrastructure with the ARIADNE Mortuary Data Application Profile

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Keywords: *Ontologies — early medieval graves — data integration — digital infrastructure — THANADOS.*

CHNT Reference: Aspöck, E., Eichert, S., Richards, N. and Theodoridou, M. (2022). 'Integrating data on early medieval graves from different digital re-sources. The ARIADNEplus Mortuary Data Application Profile', in CHNT Editorial board. Proceedings of the 27th International Conference on Cultural Heritage and New Technologies, November 2022. Heidelberg: Propylaeum.
DOI: xxxxxxx.

ARIADNE ontology and Mortuary Data Application Profile

The archaeological discipline comprises many different sub-disciplines and specialisms, resulting in a range of different data types that represent the knowledge of the field. To cater for the specific requirements of the latter, the ARIADNEplus infrastructure project developed Application Profiles (APs) based on the core CIDOC CRM ontology and the family of compatible models. APs are sets of appropriate classes and properties, policies and guidelines for supporting mappings of archaeological data to the ARIADNE project AO-Cat ontology, which itself is an AP of the CIDOC CRM ontology. APs should provide examples of mappings that ideally represent the knowledge of the individual subdomains. APs were developed by archaeologists in collaboration with ontology experts.

This paper will present the integration of the THANADOS archaeological and anthropological data to the ARIADNE infrastructure with the help of the Mortuary Data AP. The Mortuary Data AP will be presented in detail in another contribution.

The THANADOS database

THANADOS (https://thanados.net/) - short for "The Anthropological and Archaeological Database of Sepultures" - aims to present all hitherto published archaeological and anthropological data on early medieval burial grounds in nowadays Austria in an up-to-date, open source and open access online application. This first phase was concluded by the end of 2021. As a next step the temporal and geographical scope of sites presented in THANADOS will be expanded. In addition to information

about the sites in catalogue form, THANADOS also provides state of the art data visualisations, options to query the data and download functions. In addition, all data sets are provided with their original citations and citation suggestions.

The underlying data are structured using classes and properties of the core CIDOC CRM and technically stored in a PostgreSQL/PostGIS database.

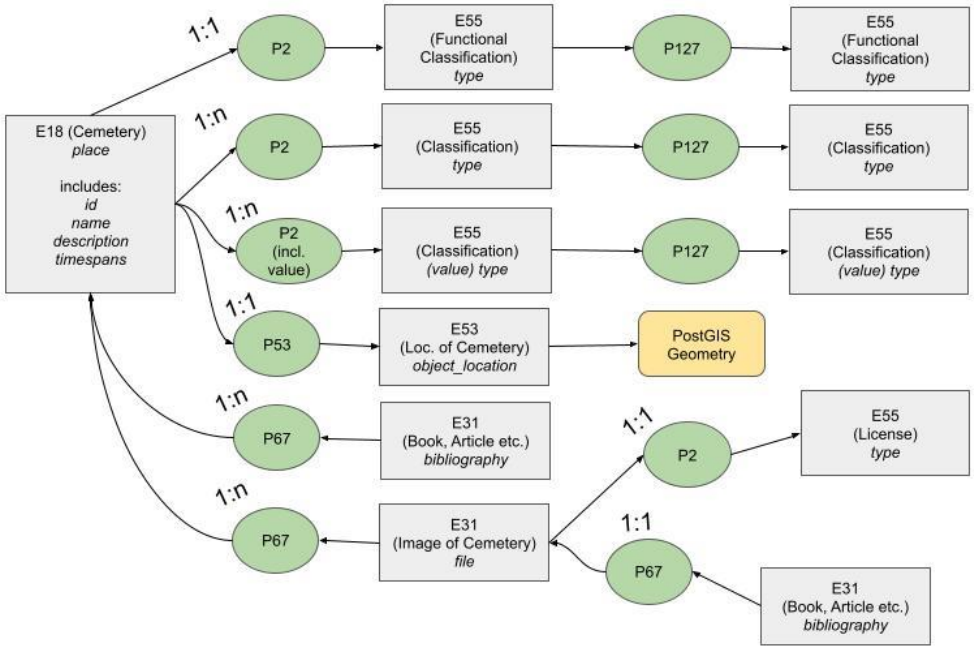

Fig. 1 THANADOS CRM mapping of a cemetery.

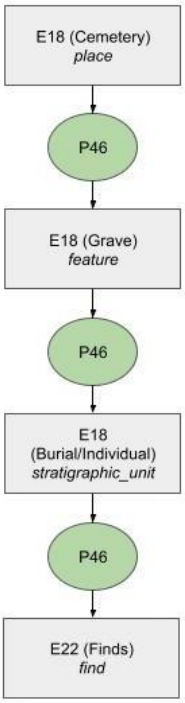

Fig. 2. THANADOS CRM mapping of the hierarchy. Each level can have the same network structure as above.

THANADOS uses its own vocabulary (https://thanados.net/vocabulary) to classify/categorise its data. Where available the vocabulary entries are linked to corresponding entries of controlled vocabularies, e.g. Getty Arts and Architecture Thesaurus (AAT), Geonames, Wikidata, WHO ICD, periodO etc.

An API provides various output formats for the respective entities. In order to harvest data for ARIADNE Plus an XML representation of each cemetery with its graves, human remains and finds was developed. To keep the data aligned, the API can also be used to list all cemeteries/sites that have been updated since a certain date, to update the respective entities.

The mapping of THANADOS xml to AO-Cat and the Mortuary Application Profile was done using the 3M Mapping Memory Manager and consists of four main mapping tables corresponding to the four main entities of THANADOS: place (cemetery), feature (grave), stratigraphic unit (burial) and artefact (find). At a high level, the mapping of THANADOS to AO-Cat allows the THANADOS resources to become visible on the ARIADNEplus portal and be integrated with the millions of other portal resources. For this purpose, place (cemetery), feature (grave) and stratigraphic unit (burial) are mapped to AO_Collection while artefact (find) is mapped to AO_IndividualData_Resource. Both AO_Collection and AO_Individual_Data_Resource are subclasses of E73_Information_Object and describe the digital resources of the ARIADNE Research Infrastructure. These digital data resources refer to the actual resources modelled as E27_Site, A8_Stratigraphic_Unit and E22_Man-Made_Object. The mappings of the THANADOS entities to AO_Cat, Mortuary AP and the corresponding ARIADNE_subjects are shown in table 1 and in figure 3 as implemented in 3M.

Table 1. Mapping mortuary data to the ARIADNE infrastructure.

THANADOS	AO_Cat	Mortuary AP	ARIADNE subject
place	AO_Collection	E27_Site	Site/monument
feature	AO_Collection	A8_Stratigraphic_Unit	Burial
stratigraphic_unit	AO_Collection	A8_Stratigraphic_Unit	Burial
artefact	AO_Individual_Data_Resource	E22_Man-Made_Object	Artefact
Human remains	AO_Individual_Data_Resource	E20_Biological_Object	Burial

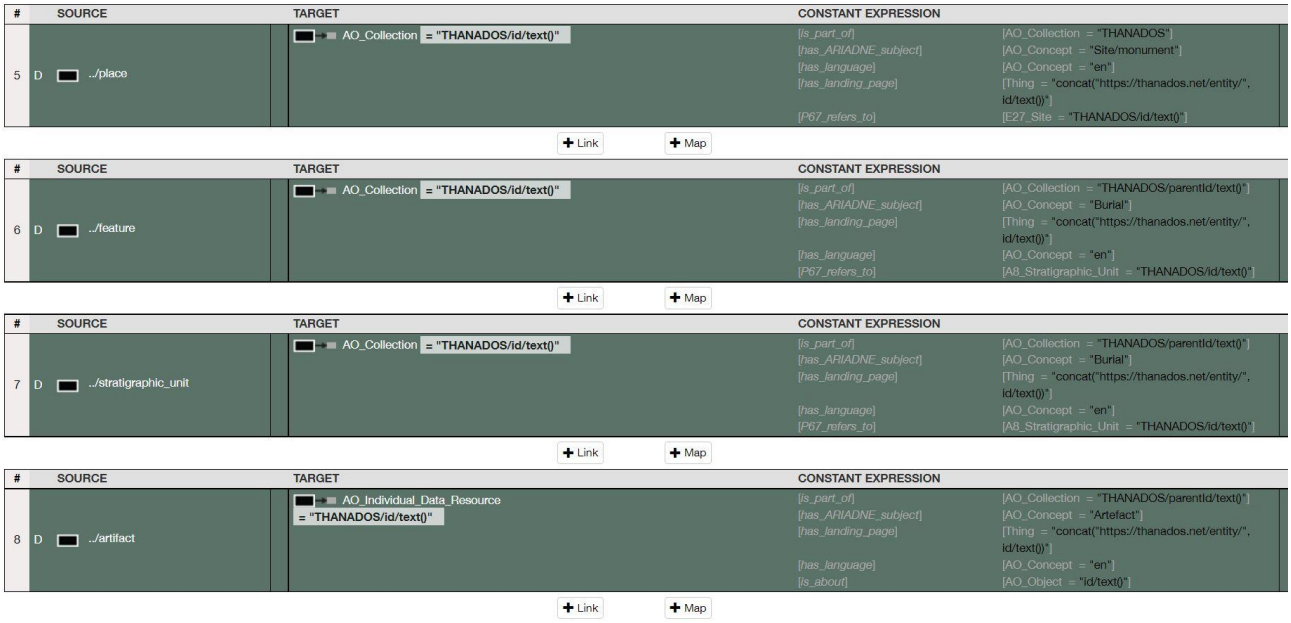

Fig. 3. 3M Mapping Memory Manager interface showing the mapping of the four main tables corresponding to the four main entities of THANADOS.

Publishing THANADOS data to the ARIADNEplus portal requires mappings of the THANADOS vocabularies to AAT and mappings of the THANADOS periods to PeriodO.

Discussion

Mapping datasets to ontologies is a way to increase their interoperability and their potential for being re-used. However, how to map data may often be ambiguous and down to the opinion of individual researchers. Different 'domain-experts' will have divergent understandings of how to represent the knowledge of their field or of the meaning of classes and properties if scope notes are difficult to comprehend. The answer of ARIADNEplus to this problem was the creation of APs to provide exemplary mappings that other researchers can use as an orientation and to increase interoperability.

The creation of the mortuary data AP has shown that mapping to an ontology can reveal inconsistency in the data organisation and hence contributes to a more stringent structuring of information in future data collections. The hierarchical structure of CIDOC CRM and the mechanism of inheritance allowed the alignment of the THANADOS, AO-Cat and Mortuary AP schemata without any complications. THANADOS follows a more general approach mapping place (cemetery), feature (grave) and stratigraphic unit (burial) to E18 Physical Thing. According to the Mortuary AP, cemetery

is mapped to E27 Site while grave and burial are mapped to A8 Stratigraphic Unit. Both E27 and A8 are subclasses of E18 so there is no violation of rules during the mapping.

The CIDOC CRM ontology contributes to research on early medieval graves and increases the potential for re-use of early medieval cemetery data, as it enables querying across datasets – information on graves and cemeteries that were not contained in the same source can be queried. It provides an example of how archaeological data can be aggregated across multiple providers.

Funding

ARIADNEplus is a Horizon 2020 project funded by the European Commission under Grant Agreement n. 823914.

Between 2019 and 2021 the development of THANADOS was financed by the go!digital- next generation call of the Austrian Academy of Sciences (GDND 2018 039). The project was hosted by the Natural History Museum Vienna and the Austrian Archaeological Institute of the Austrian Academy of Sciences.

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