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Interoperable and Federated Vocabulary Services

Tuesday, October 14, 2025 4:00 PM (1h 30m)

Vocabulary services are a critical component of data sharing infrastructures. If these can be shared across infrastructures, then a more global ecosystem for data sharing and reuse can be supported. They are a foundational enabler for the very concept of FAIR (Findable, Accessible, Interoperable, Reusable), for without common references to semantic concepts, no data can be interpreted safely. A vocabulary service—ranging from basic terminology catalogues to more sophisticated Semantic Artefact Catalogues (SACs) or ontology repositories—enables users to share, describe, discover, browse and download controlled vocabularies or other types of semantic artefact (such as terminologies, ontologies, thesauri). Those artefacts may be available in various representation languages (e.g. OWL, SKOS, RDF-S) and encoding formats (e.g., TTL, XML, JSON-LD, Notation3).

Interoperability between vocabulary services is essential to enable the discovery, access, and reuse of vocabularies across diverse domains. However, most vocabulary services are developed in isolation, and even when they adhere to relevant standards (such as SKOS or OWL), there are no agreed interconnections between them. A growing number of vocabulary services have emerged across different domains and communities, often developed independently with domain-specific priorities, different technology stacks and design principles, leading to fragmentation and interoperability challenges.

Federation of vocabulary services is achieved through API-level and UI-level integration, supporting seamless data sharing and a unified user experience. However, there are many challenges in federating vocabulary services and the semantic resources they deliver. A high-priority task is surfacing the operational services currently available and understanding how these differ, and why. Dedicated programs of work are required to progress the vision of vocabulary services federation. Solutions that work toward achieving this vision are likely to be multifaceted, addressing challenges such as:

-Finding and choosing terms and vocabularies across a wide range of vocabulary services, with different scopes, interfaces (user interfaces and application programming interfaces) and underlying technologies;
-Standardisation (with governance and maintenance) of APIs and data exchange formats for federation;
-Transparency in who is using which vocabularies (the inbound link problem) and how;
-Identification and replication of subsets; Standardisation of metadata profiles, including provenance and change management;
-FAIR crosswalks; and
-Good PIDs, efficiencies and trust in where and how they resolve.

This session will explore the required scope and evaluation criteria for a general solution and examine how several initiatives meet these requirements. One such initiative is FAIR-IMPACT, a European project within the EOSC program, which has identified and studied three complementary technical approaches to SAC interoperability. Each approach offers distinct benefits and trade-offs.

1. MOD-API: A Standardised API for Interoperable SACs
   This approach defines a common API specification, the MOD-API, based on the MOD ontology, which standardises metadata descriptions for semantic artefacts and catalogues. Widely adopted through an open call by FAIR-IMPACT, it supports uniform querying across catalogues and enhances FAIRness. Eleven SACs, including those built on SKOSMOS, OLS, OntoPortal, ShowVoc, and Prez, are currently adopting MOD-API.
2. OntoPortal Federation: Leveraging a Shared Technology Stack
   SACs based on the OntoPortal stack can easily federate by virtue of shared backend infrastructure. This enables both API-level compatibility and UI-level integration for browsing and searching across federated SACS that use OntoPortal. Currently operational across AgroPortal, EcoPortal, EarthPortal,

and BiodivPortal, this marks a significant milestone in SAC interoperability and vocabulary services federation.

3. API Gateway: A Centralised Aggregation and Proxy Model
   This model introduces an external API gateway, such as the one currently developed by TS4NFDI, that connects to various SACs via tailored connectors. It fetches and transforms data from multiple sources into a unified model without requiring changes to the original SACs. Though convenient and inclusive, it depends on a central proxy and lacks incentives for SACs to adopt shared standards. It builds on earlier experiments, such as FAIRCat, and currently supports platforms using SKOSMOS, OLS, and OntoPortal.

Session structure:

This session is a structured panel discussion on advancing federated vocabulary services. It seeks to progress discourse regarding the scope of evaluation criteria toward broader adoption of general solutions.

Firstly, the problem space will be introduced for a federated ecosystem of vocabulary services, including Semantic Artifact Catalogues (SACS), which are essential for enabling FAIR data. Then, panel members will share a current practice or initiative, followed by their perspective on: 'moving forward: how do we continue toward an ecosystem of federated vocabulary services?'(10 minutes each). This may include reflections on strategy for articulating vision, identifying key roadblocks, minimal viable product, priorities, and pathways forward (the next steps). The community audience will also be encouraged to contribute their reflections on challenges and next steps through a shared document. Panellists include:

-Clement Jonquet - Approaches to vocabulary services or semantic artefact catalogues interoperability studied in the FAIR-IMPACT project.
-Christelle Pierkot (or Clement Jonquet) - OntoPortal Federation illustrated with EarthPortal.
-Alexandra Kokkinaki - Adopting the MOD-API in the NVS.
-Naouel Karam (TBC) - Implementing the API Gateway as a unique endpoint to vocabulary services federation.
-Nicholas Car - A review of long-term, operational, vocabulary production and (re)use
-John Graybeal - OntoChoice: A collaborative project documenting evaluation strategies for choosing terms and ontologies, ontology selection and recommendation
-Rob Atkinson - Requirements for a general solution to implementing FAIR principles for vocabularies in a scalable global data ecosystem.

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