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Knowledge sharing and discovery across heterogeneous research infrastructures

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Research infrastructures play an increasingly essential role in scientific research. They provide rich data sources for scientists, such as services and software packages, via catalog and virtual research environments. However, such research infrastructures are typically domain-specific and often not connected. Accordingly, researchers and practitioners face fundamental challenges introduced by fragmented knowledge from heterogeneous, autonomous sources with complicated and uncertain relations in particular research domains. Additionally, the exponential growth rate of knowledge in a specific domain surpasses human experts' ability to formalize and capture tacit and explicit knowledge efficiently. Thus, a knowledge management system is required to discover knowledge effectively, automate the knowledge acquisition based on artificial intelligence approaches, integrate the captured knowledge, and deliver consistent knowledge to agents, research communities, and end-users. In this study, we present a knowledge management system, called ENVRI-KMS, for ENVIRONMENTAL RESEARCH INFRASTRUCTURES, which are crucial pillars for environmental scientists in their quest for understanding and interpreting the complex Earth System.

The ENVRI-KMS is a Knowledge-as-a-Service for ENVRI-FAIR research communities to document the development and operation processes of RIs and support them with their engineering and design decisions. In general, the ENVRI-KMS should (1) ingest technical results from ENVRIplus, FAIR assessment, the key sub-domains, and other tasks using a formal language for knowledge representation and proven semantic technologies; (2) provide services and tools to enable RI developers and data managers to browse, search, retrieve and compare RI technical statuses and technical solutions to development problems via available content; (3) provide content management tools for specialists in the ENVRI community to ingest new knowledge and control the quality of content; (4) also provide interfaces to other existing semantic resources, e.g., the service catalog of a future ENVRI-HUB to enhance knowledge discovery and cross-RI search, between knowledge services and the online presence of ENVRI resources.

In the next phase, the development effort will mainly focus on the following aspects: (1) Continuous content ingestion and curation. The ENVRI-KMS team will improve the knowledge ingestion tool and continuously ingest the description (metadata) of high-quality results from the ENVRI community (e.g., sub-domain or RI developers), including development results (e.g., best practices, software technologies, recommendations, updated FAIRness assessment possibly generated by new tools) in the ENVRI-KMS, and make those descriptions FAIR for the community.

(2) Continuous improvement of the ENVRI-KMS based on the feedback is received from the community. Extra features, e.g., for ENVRI-KMS discovery and recommendation, will be further explored. (3) The development and operation of the ENVRI-KMS will also follow the software engineering DevOps practices. The continuous testing, integration, and deployment pipeline will be established. (4) We will also extend the content maintenance to community specialists. In this way, we hope the community will play a key role in the ENVRI-KMS.

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