

Abstract: Live Demonstration of the PITHIA e-Science Centre

Tamas Kiss, David Chan You Fee, Dimitris Kagialis, Gabriele Pierantoni

Centre for Parallel Computing
University of Westminster
London, UK
t.kiss@westminster.ac.uk

ABSTRACT

PITHIA-NRF (Plasmasphere Ionosphere Thermosphere Integrated Research Environment and Access services: a Network of Research Facilities) is a four-year project funded by the European Commission's H2020 programme to integrate data, models and physical observing facilities for further advancing European research capacity in this area. A central point of PITHIA-NRF is the PITHIA e-Science Centre (PeSC), a science gateway that provides access to distributed data sources and prediction models to support scientific discovery. As the project reached its half-way point in March 2023, the first official prototype of the e-Science Centre was released. This live demonstration will provide an overview of the current status and capabilities of the PeSC, highlighting the underlying ontology and metadata structure, the registration process for models and datasets, the ontology-based search functionalities and the interaction methods for executing models and processing data.

One of the main objectives of the PeSC is to enable scientists to register their Data Collections, that can be both raw or higher-level datasets and prediction models, using a standard metadata format and a domain ontology. For these purposes, PITHIA builds on the results of the ESPAS FP7 project [1] by adopting and modifying its ontology and metadata specification. The project utilises the ISO 19156 standard on Observations and Measurements (O&M) to describe Data Collections in an XML format that is widely used within the research community. Following the standard, Data Collections are referring to other XML documents, such as Computations that a model used to derive the results, Acquisitions describing how the data was collected, Instruments that were used during the data collection process, or Projects that were responsible for the data/model. Within the XML documents, specific keywords of the Space Physics ontology can be used to describe the various elements. For example, Observed Property can be Field, Particle, Wave, or Mixed, at the top level. When preparing the XML metadata file, only these values are accepted for validation. Once described in XML format, Data Collections can be published in the PeSC and searched using the ontology-based search engine.

Besides large and typically changing/growing Data Collections, PeSC also supports the registration of Catalogues.

These are smaller sets of data, originating from a Data Collection and related to specific events, e.g. volcano eruptions. Catalogue Data Subsets can be assigned DOIs to be referenced in publications and provide a permanent set of data for reproducibility.

Additionally, to publication and search, the PeSC also provides several mechanisms for interacting with Data Collections, e.g. executing a model or downloading subsets of the data. In the current version two of the four planned interaction methods are implemented: accessing the Data Collection by a direct link and interacting with it via an API and an automatically generated GUI. Data Collections can either be hosted by the local provider or can be deployed on EGI cloud computing resources.

The development of the PeSC is still work in progress. Authentication and authorisation are currently being implemented using EGI Checkin [2] and the PERUN Attribute Management System [3]. Further interaction mechanisms enabling local execution and dynamic deployment in the cloud will also be added in the near future.

The main screen of the PeSC is illustrated on Figure 1. The source code is open and available in GitHub.

Keywords—science gateways, e-science centre, ontology, standard metadata, cloud computing.

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- [2] EGI Check-in - <https://www.egi.eu/service/check-in/>
- [3] Perun - <https://perun.egi.eu/>
- [4] PeSC source code - <https://github.com/pithia-eu/pithia-esc-gui-poc>

PITHIA-NRF e-Science Centre

Search & Browse Metadata



Space Physics Ontology



Metadata Registration & Management

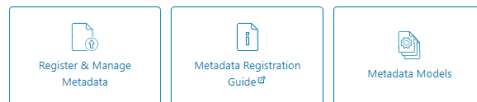


Figure 1 – Main menu of the PITHIA e-Science Centre