Technical platform architecture for digital twins

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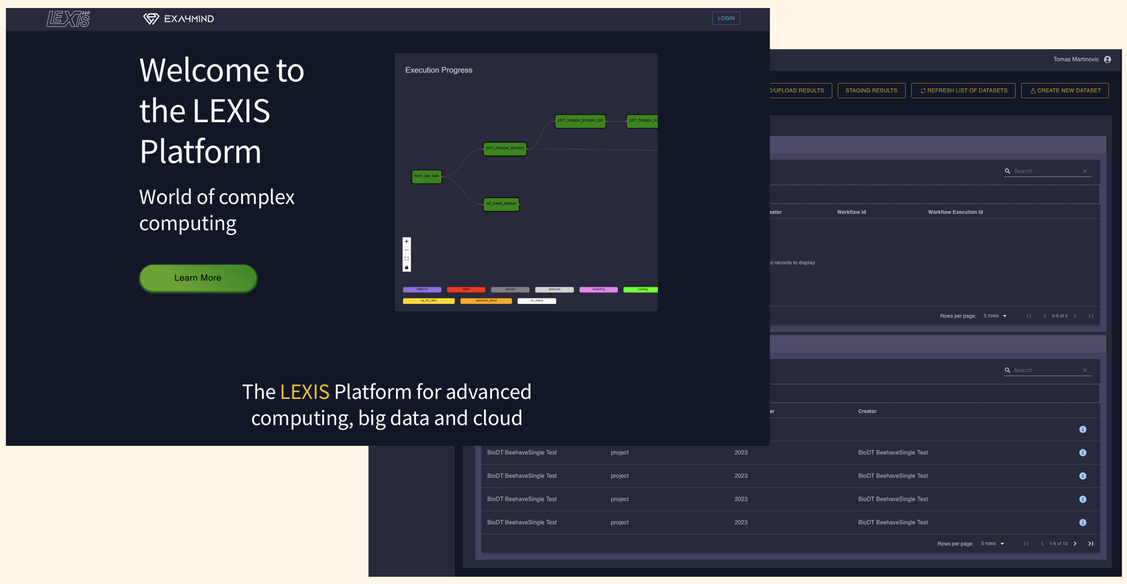
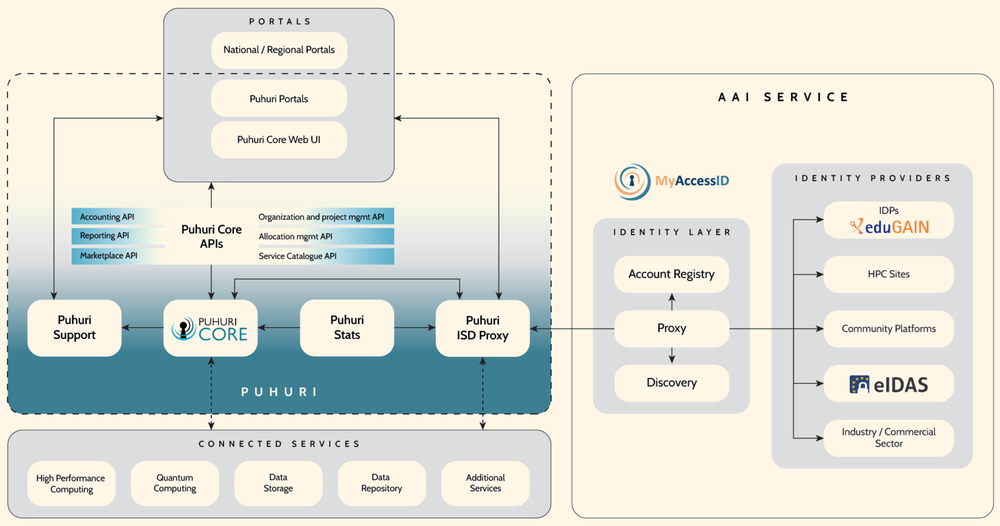


Technical description

The solution to the mentioned requirements is based upon several technologies. The main components are:

- Puhuri
  - Authentication and authorization infrastructure supporting a broad range of identity providers
  - Resource management
- LEXIS platform
  - High-level workflow execution
  - Vault for external credential
  - Data staging based on iRODS
  - HPC-as-a-Service based on HEAppE middleware
  - API for execution and data management in LEXIS Platform

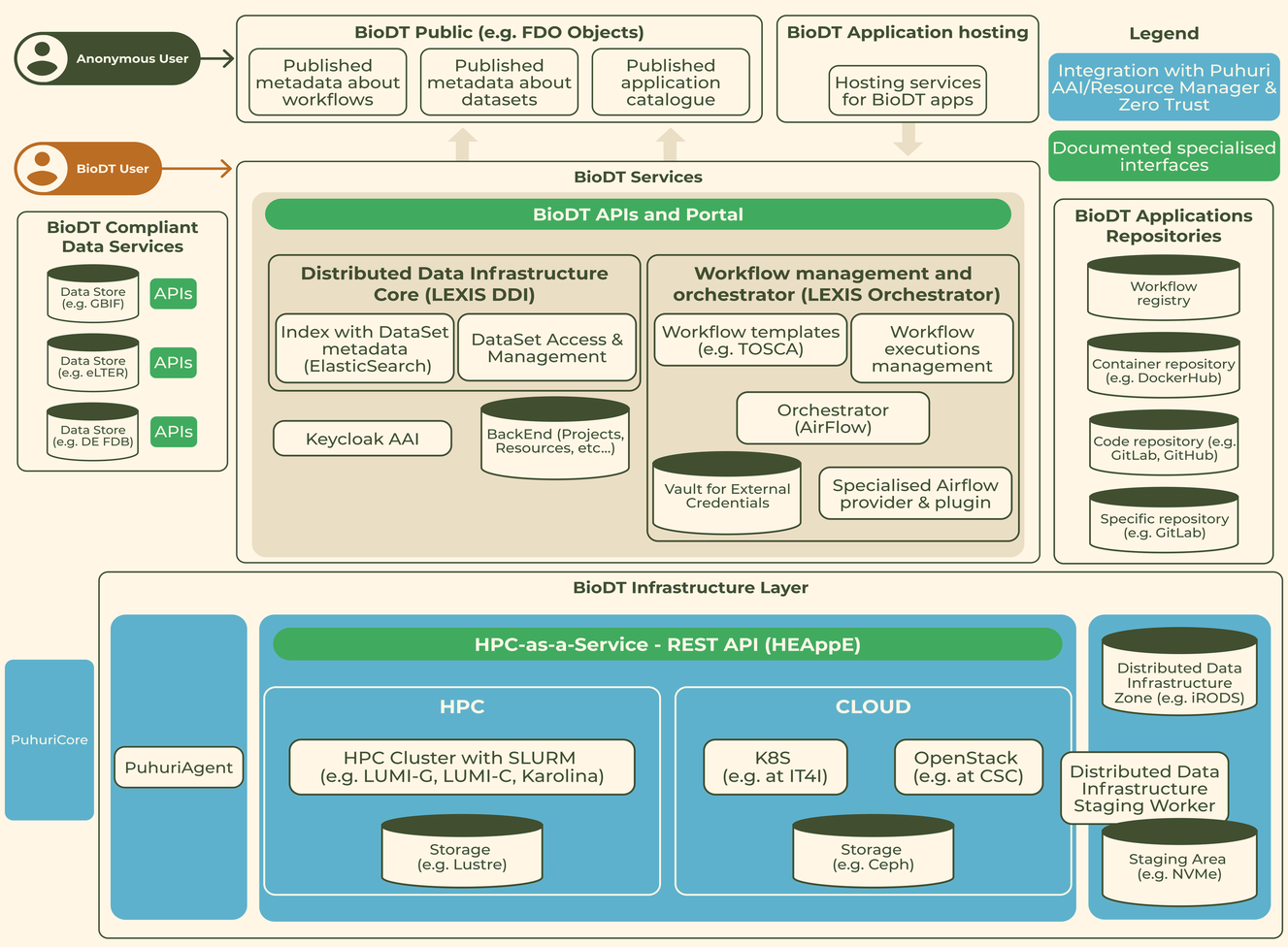
These technologies will enable DT developers to create workflows using HPC resources or Cloud containers orchestrated through LEXIS through simple scripts with parameters as inputs which are then exposed to users. The creation of custom interactive interfaces is supported.



Vision

The main consideration when creating the technical platform was enabling the developed digital twins (DT) deployable at different sites, making their integration simple, provisioning well-defined APIs, and supporting digital twin development. To make this possible we focused on:

- A common distributed environment for DT execution for deployment at multiple sites (currently: LUMI, IT4Innovations)
- A common authentication and authorization infrastructure
- Simplifying scalability through smart resource management
- A solution for data retrieval from external data providers
- Possibility to run different tasks (including simulation, data pre/post-processing, visualization) on top of High-Performance Computing (HPC) and Cloud resources
- Increase productivity of digital twin development compared to classical HPC
- Options for steering DT execution through APIs
- Provide APIs for data management
- Support the description of DTs as FAIR Digital Objects (FDOs) and their integration with other BioDT FDO types
- Support for custom user workflow management
- Ability to coordinate between different DTs if needed
- Support traceability and logging for DTs (and other workflows)



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