

Cloud and HPC Based Model&Simulation platform to Investigate Diseases Mechanisms

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Infrastructure framework optimized for ML/AI image analysis and 2D/3D simulations for the EU Disc4All project

1 INTRODUCTION

LBP (Low Back Pain) is the largest cause of morbidity worldwide, and it is related to various multi-factorial pathologies such as Intervertebral Disc Degeneration, very complex to investigate in their entirety.

The HORIZON MSCA Disc4All project is proposing to provide an interdisciplinary solution to integrate biological, physical, medical, computational experimental models and prediction algorithms contributions via a centralized diagnosis platform, so to complement each other and to exploit multi-scale and/or data-driven models and simulations tools, based on image analysis, biophysics and biology.

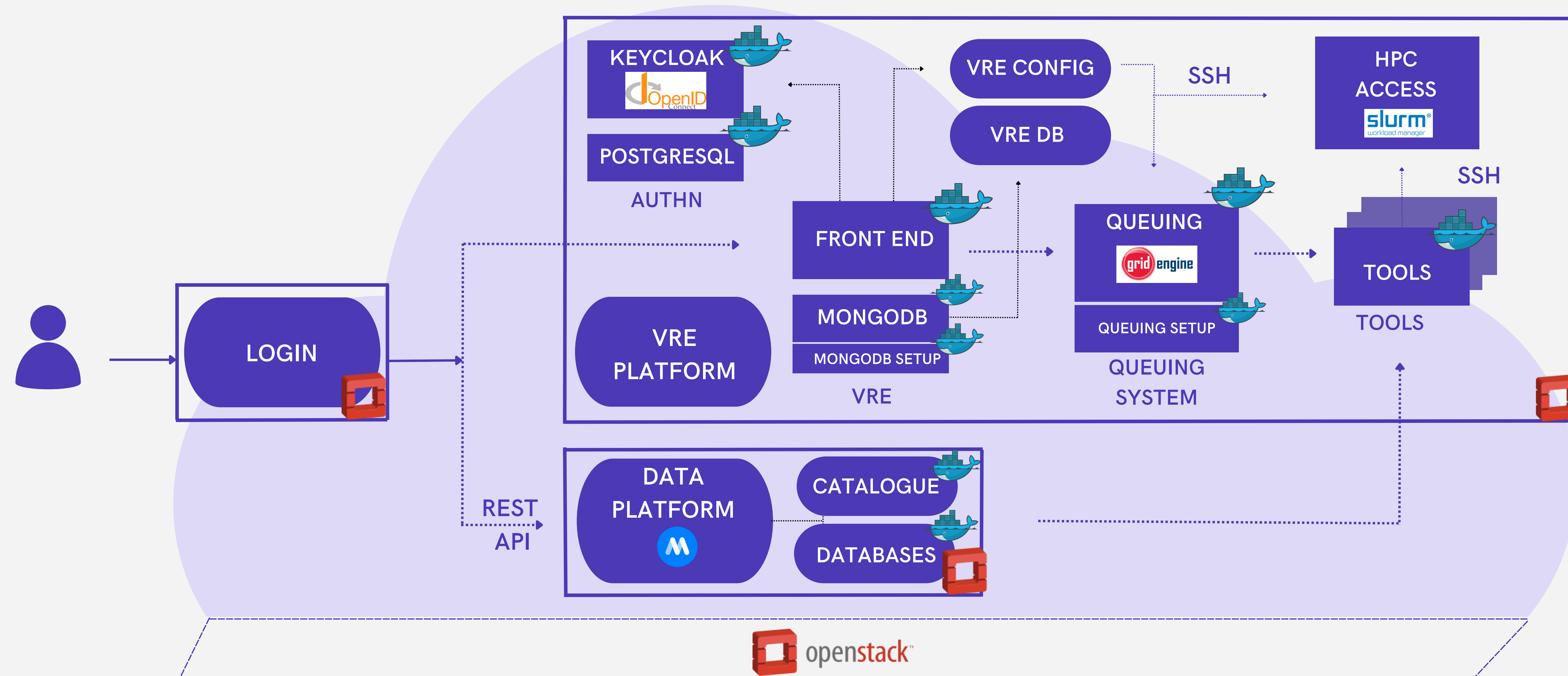
2 OBJECTIVE

The Disc4All platform aims to create a unique environment for data sharing and tools analysis related to the Intervertebral Disc Degeneration, focusing especially in Models & Simulations (M&S) tools, and their integration into automated workflows. In particular, 2D and 3D simulations tools are deployed: the simulations would require high computational costs, and would be necessary to use HPC available facilities through a BioBB-based approach (BioExcel Building Blocks) and/or specific implemented launchers in the platform, taking into account the HPC accessing credentials of the user.

3 METHODOLOGY

The OpenVRE (Virtual Research Environment) existing scalable back-end platform is used as the foundation, which then would be plugged in with specific resources as Docker containers.

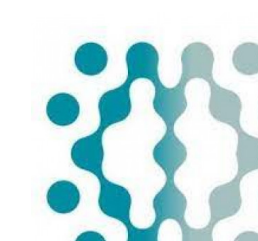
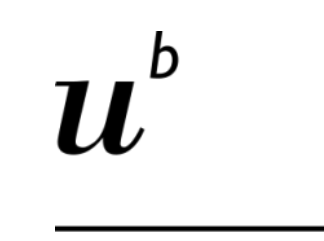
The overall computational infrastructure would provide data management and a central data infrastructure; user authentication and management of data access credentials; a virtual research environment providing private workspace and an execution platform for analysis tools and for data visualization.



4 RESULTS & CONCLUSIONS

The platform front-end is available at disc4all.eu, where the data catalogue and analysis platform are queryable.

Various analysis tools are or under maintenance and or/are still in development, but the final beta testing, which will include at minimum 500 simulations per run, will take place towards the end of the project.



ACKNOWLEDGMENTS

This project is part of the Disc4All Training network to advance integrated computational simulations in translational medicine, applies to intervertebral disc degeneration and funded by Horizon 2020 (H2020-MSCA-ITN-ETN-2020 GA: 955735).

RELATED LITERATURE

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2. Open Virtual Research Environment (openVRE) [<https://github.com/inab/openVRE>]
3. van der Velde KJ, et Al. MOLGENIS research: advanced bioinformatics data software for non-bioinformaticians. Bioinformatics. 2019 Mar 15;35(6):1076-1078.