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The de.NBI Cloud Federation

In recent years, modern life sciences research underwent a rapid development driven mainly by the technical improvements in analytical areas leading to miniaturization, parallelization, and high throughput processing of biological samples. This has driven the growth and number of experimental datasets immensely, requiring scalable platforms for large scale data analysis beyond the capabilities of individual labs and training to effectively use such platforms. The German Network for Bioinformatics Infrastructure (de.NBI) was established in 2015 as a national bioinformatics consortium aiming to provide high quality bioinformatics services, comprehensive training, and with the de.NBI Cloud, powerful cloud-based computing capacities to address these requirements. de.NBI further provides its portfolio as the designated German node of the European Life Science Infrastructure ELIXIR [3].

The de.NBI Cloud is one of the flagship services of the de.NBI network. It consists of eight federated cloud locations that implement a common governance and use the project application and management workflow provided by the de.NBI Cloud portal. Registration, project resource application and authentication are facilitated by the integration of the LifeScience AAI as an EduGAIN-compatible single sign-on provider, backed by institutional ID providers of universities and research institutes.

The de.NBI Cloud portfolio includes several project types designed to suit different use cases and users with varying levels of knowledge in cloud computing. Two project types, OpenStack and Kubernetes, offer maximum flexibility in terms of the configuration of cloud-specific components and allow the installation of any large-scale analysis, stream processing or orchestration framework available in the cloud ecosystem. Both project types are ideal for science gateway developers to offer bioinformatics services to the national and international life sciences communities, like the Competence Center Cloud Technologies for Data Management and Processing (de.KCD), the National Research Data Initiative (NFDI), and EOSC-Life on the European level.

The project type SimpleVM enables users to employ cloud resources with little to no background knowledge in cloud computing or systems administration. SimpleVM performs as an abstraction layer on top of OpenStack to manage virtual machines (VMs) or clusters thereof. It is designed to support the combination of resources from independent OpenStack installations, thus operating as a federated multi-cloud platform which is accessible from a single web-based control panel.

For users who aim for the ability to define data processing workflows from tools available in BioConda and the Galaxy ToolShed with a graphical user interface, the de.NBI Cloud infrastructure also hosts the Galaxy service available at usegalaxy.eu. Galaxy simplifies the discovery and adaptation of existing workflows, that were shared by other users, from multiple scientific domains and enables their execution at scale in the cloud.

In conclusion, the de.NBI Cloud provides the ability to unlock the full potential of research data and enables easier collaboration across different ecosystems and research areas, which in turn enables scientists to innovate and scale-up their data-driven research, not only in the life and computational biosciences, but across different science domains.

Topic

Needs and solutions in scientific computing: National and scientific perspectives

Primary author: Mr RUDKO, Viktor (Institute of Bio-and Geosciences, IBG-5, Computational Metagenomics, Forschungszentrum Jülich, Bielefeld, Germany)

Co-authors: BELMANN, Peter (Institute of Bio-and Geosciences, IBG-5, Computational Metagenomics, Forschungszentrum Jülich, Bielefeld, Germany); WEINHOLZ, David (Institute of Bio-and Geosciences, IBG-5, Computational Metagenomics, Forschungszentrum Jülich, Bielefeld, Germany); MOK, Qiqi (Institute of Bio-and Geosciences, IBG-5, Computational Metagenomics, Forschungszentrum Jülich, Bielefeld, Germany); Prof. GOESMANN, Alexander (Justus-Liebig-University Giessen, Giessen, Germany); Prof. EILS, Roland (BIH-Zentrum Digitale Gesundheit, Charité -Universitätsmedizin Berlin, Berlin, Germany); Dr BORK, Peer (European Molecular Biology Laboratory, Heidelberg, Germany); Prof. KOHLBACHER, Oliver (Eberhard Karls University Tübingen, Tübingen, Germany); Prof. KUMMER, Ursula (BioQuant & Heidelberg University, Heidelberg, Germany); Prof. BACKOFEN, Rolf

(Albert-Ludwigs University Freiburg, Freiburg, Germany); Dr BUCHHALTER, Ivo (Deutsches Krebsforschungszentrum DKFZ Heidelberg, Heidelberg, Germany); Prof. STOYE, Jens (Bielefeld University, Bielefeld, Germany); Dr HOFFMANN, Nils (Institute of Bio-and Geosciences, IBG-5, Computational Metagenomics, Forschungszentrum Jülich, Bielefeld, Germany); SCZYRBA, Alexander (Institute of Bio-and Geosciences, IBG-5, Computational Metagenomics, Forschungszentrum Jülich, Bielefeld, Germany)

Presenter: Mr RUDKO, Viktor (Institute of Bio-and Geosciences, IBG-5, Computational Metagenomics, Forschungszentrum Jülich, Bielefeld, Germany)

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