DEEP framework for deep learning
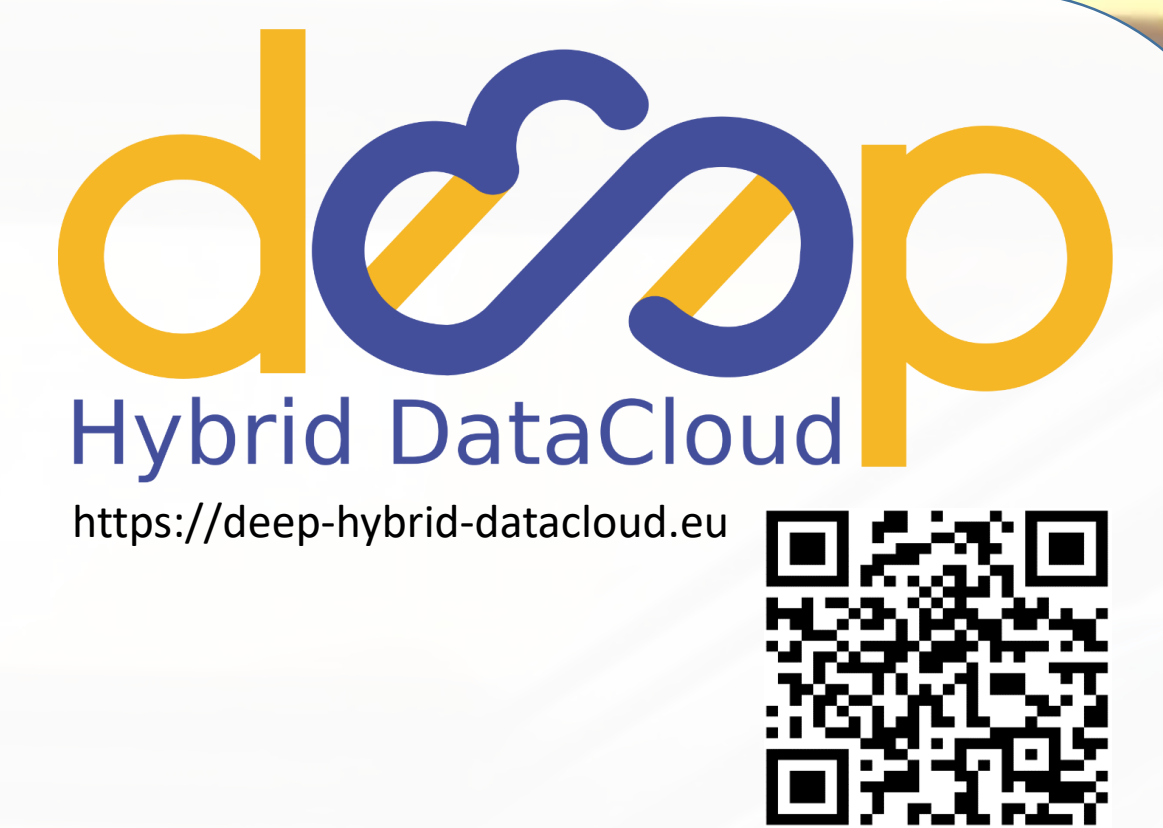
A.S. Alic [a)], M. Antonacci [b)], M. Caballer [a)], I. Campos [c)], A. Costantini [b)], M. David [d)], S. Dlugolinsky [e)], G. Donvito [b)], C. Duma [b)], J. Gomes [d)], M. Hardt [f)], I. Heredia [c)], L. Hluchy [e)], K. Ito [g)], V. Kozlov [f)], L. Lloret [c)], A. López García [c)], J. Marco [c)], L. Matyska [h)], G. Moltó [a)], G. Nguyen [e)], P. Orviz [c)], M. Plociennik [i)], Z. Šustr [h)], V. Tran [e)], P. Wolniewicz [i)], W. zu Castell [g)]

a) UPV   b) INFN   c) CSIC   d) LIP   e) IISAS   f) KIT   g) HMGU   h) CESNET   i) PSNC

Hybrid DataCloud
https://deep-hybrid-datacloud.eu

The DEEP-Hybrid-DataCloud project developed a distributed architecture to leverage intensive computing techniques such as needed for deep learning. The DEEP framework applies a hybrid-cloud approach and provides a set of tools and cloud services to cover the whole machine learning cycle: from models creation, training, validation, and testing to model serving and sharing. The project recently published its second software release and platform.
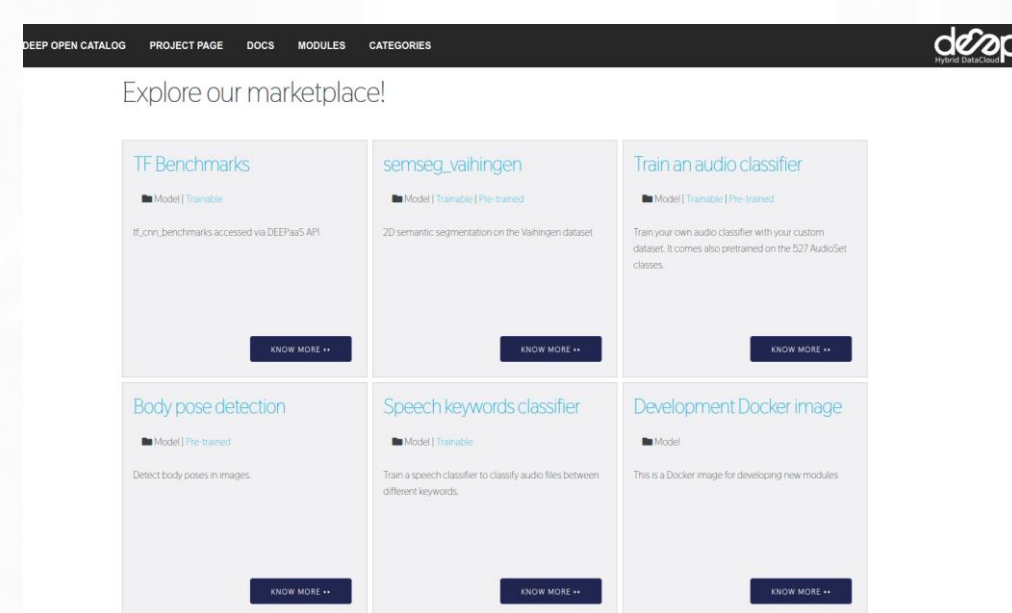
Key features

DEEPaaS API
Rest API providing **web access** to machine learning models. An arbitrary model can be integrated. See Ref. [1]
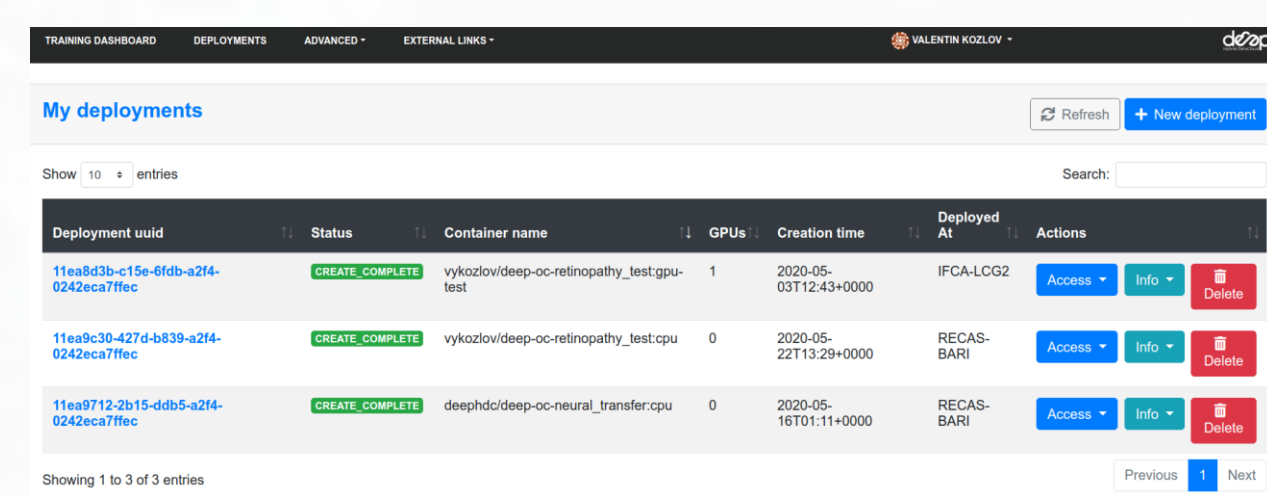
DEEP Marketplace
Ready-to-use modules to run on a laptop, server, or e-Infrastructure. Pre-trained modules can be executed online via serverless approach. See Ref. [2-3]

Dashboard
Allows users to access computing resources to deploy their modules and track deployments. See Ref. [4]
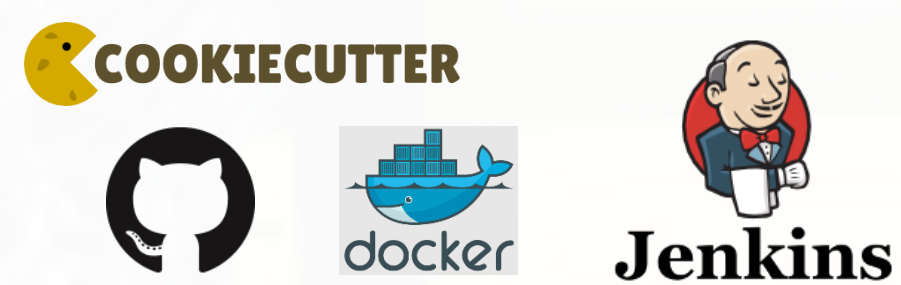
Pilot testbed
Heterogeneous sets of resources available for users.

Cloud & HPC accessed via orchestrator

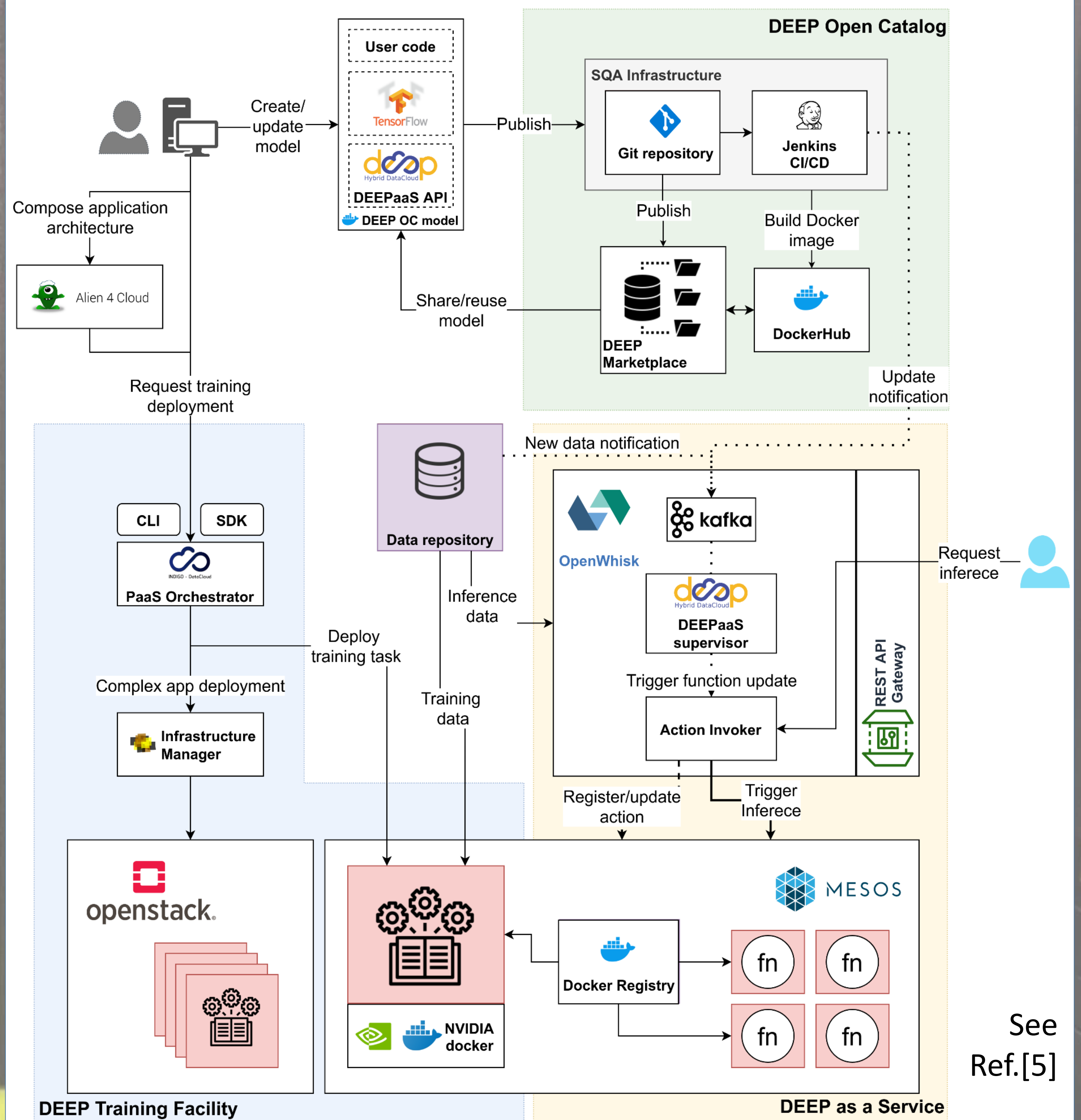**Alien4Cloud** for a graphical composition of complex infrastructures
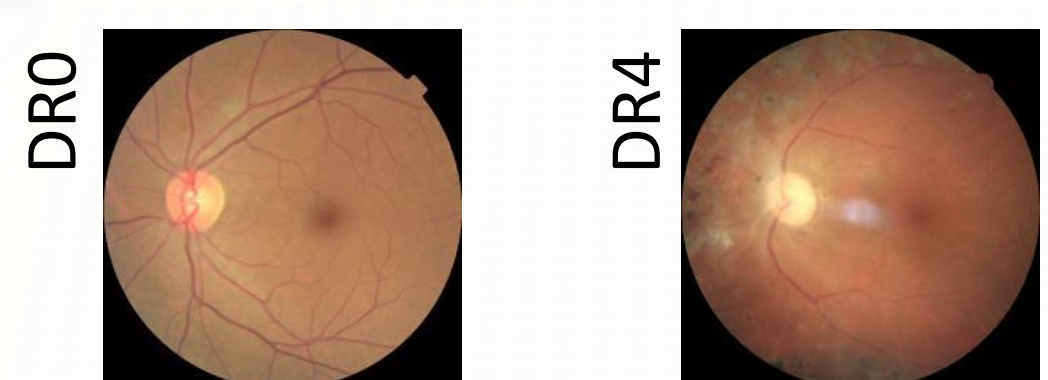
DevOps approach

Storage solutions

Detailed architecture
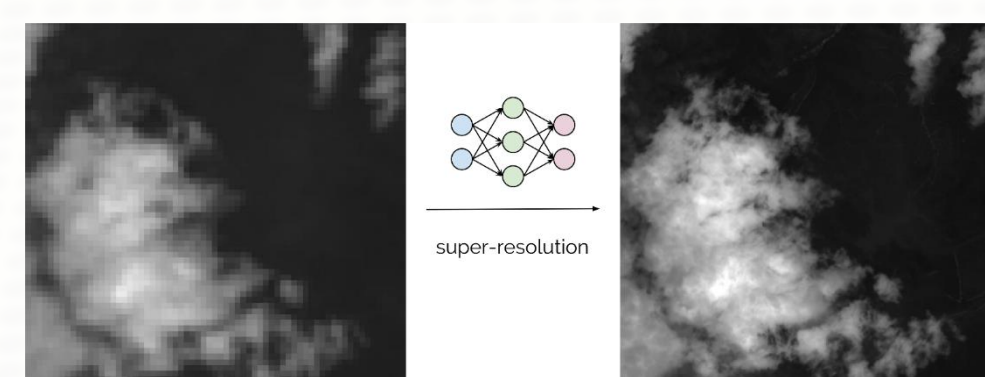

See Ref.[5]

Domains of use-cases

Biology
- Classification of Plants / Seeds / Phytoplankton / … via generic model for image classification (e.g. ResNet50, Xception).
- Diabetic Retinopathy: Automated classification based on color fundus retinal photography images.

Color fundus images for a healthy (DR0) and the most pathological level (DR4)

Earth observation
- Monitoring through satellite imagery: An image super-resolution service (Sentinel2, Landsat8, …) to upscale low resolution bands to high resolution (DSen2).

Network security
- Massive online Data Streams: Proactive network monitoring and security protection (LSTM, GRU). See Ref. [6]
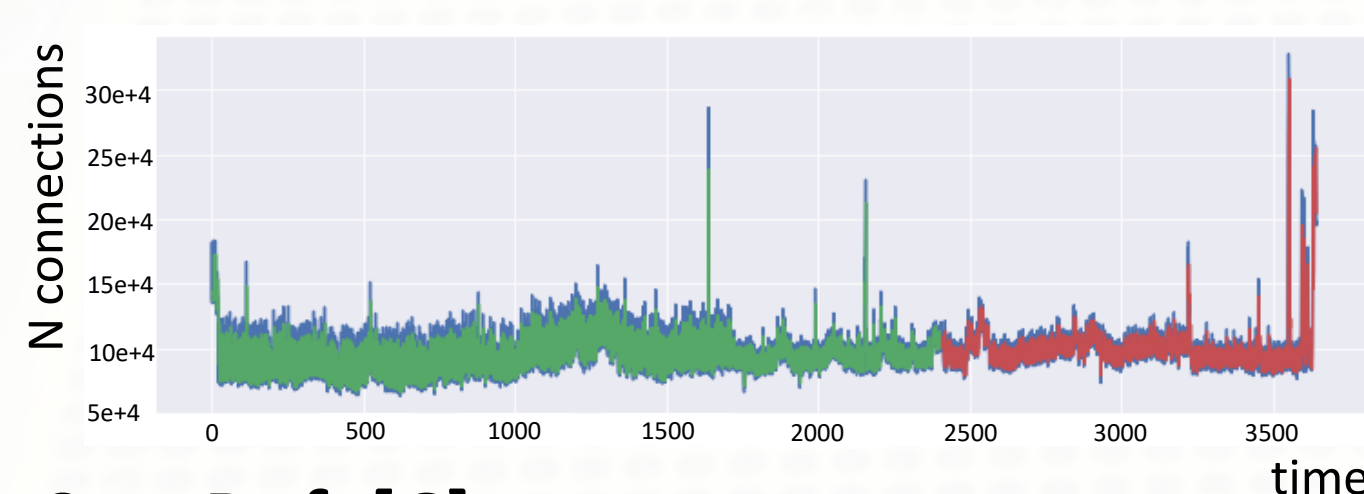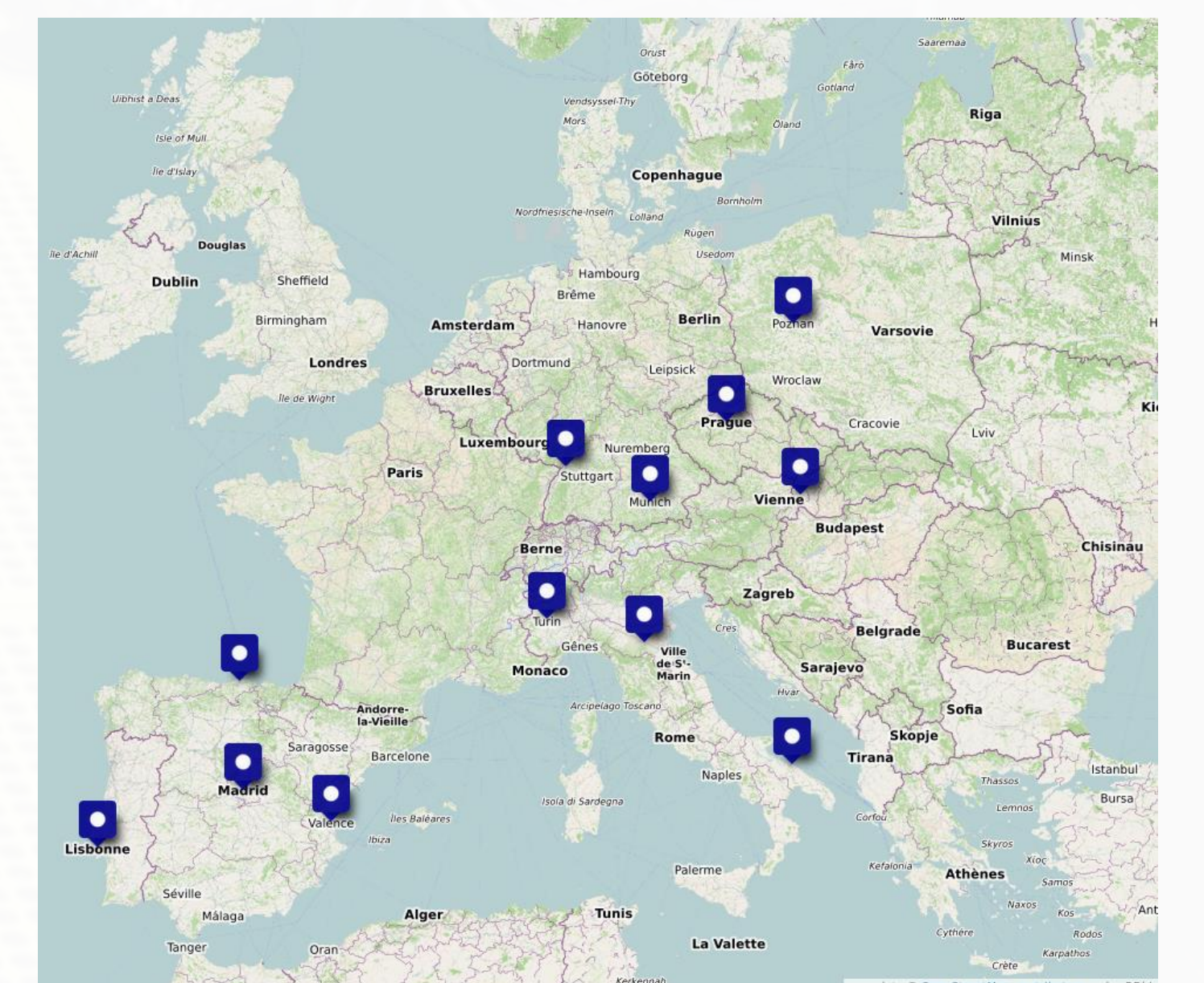
Physics
- Post-processing of massive amounts of data: Analysis of Lattice QCD configurations in the course of the corresponding simulations.

DEEP Consortium

Runtime: 30 months, Nov 2017 - Apr 2020
Partners: 9 academic + 1 industrial from 7 countries

Atos   cesnet   CSIC   INFN   HelmholtzZentrum münchen   Deutsches Forschungszentrum für Gesundheit und Umwelt   KIT Karlsruher Institut für Technologie   LIP   PSNC   Ústav Informatiky slovenská akadémia vied   UNIVERSITAT POLITÈCNICA DE VALÈNCIA

References

[1] Á. López García, (2019). Journal of Open Source Software, 4(42), 1517

[2] Marketplace, https://marketplace.deep-hybrid-datacloud.eu

[3] DEEP as a Service, https://deepaas.deep-hybrid-datacloud.eu

[4] Train Dashboard, https://train.deep-hybrid-datacloud.eu

[5] Á. López García et al., in IEEE Access, vol. 8, p. 18681, 2020.

[6] G. Nguyen et al, in IEEE Access, vol. 8, p. 19696, 2020.

European Commission