DEEP-HybridDataCloud

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

Goal: prepare **a new generation of e-Infrastructures** that harness latest generation technologies, supporting **deep learning** and other **intensive computing** techniques to exploit **very large data** sources

Objective: promote the use of intensive computing services by different research communities and areas, and their support by the corresponding e-Infrastructure providers and open source projects

Keywords: *Clouds and Distributed Computing, Containerized HPC, Deep Learning, Accelerators, HPC Workflows*

Technologies to consider

Explore the applicability of **containers**

docker, nvidia-docker, UDOCKER, LXC / LXD ...

Either in **Bare-metal-like** (batch systems)
or in **Cloud middleware**

openstack (Magnum, nova-lxd), Open Nebula (ONEDock), kubernetes, Apache MESOS (Marathon, Chronos)

Key challenges

- Scalability for containerised HPC Applications
- Native support for GPU and Infiniband
- Enable containers for unprivileged users

Solution strategies

- Testbeds with GPU and Infinband
- Expand computing capability to address multiple resource providers
- Use containers to fully utilise bare-metal resources in the Cloud
- Offer a DevOps approach for the development of applications
- Analysis and implementation of pilot applications

Roadmap

- Final report after testing at large scale
- Final release of High Level Hybrid Cloud solutions deployed
  Application-as-a-service implementation
  Second prototype of the Pilot testbed and integration with EOSC infrastructures, supporting all use-cases
  Functionalities and scalability of High Level Hybrid Cloud solutions demonstrated
  DEEP-as-a-Service solution

2020

- Final implementation for supporting accelerators and HPC
- Use-cases are integrated in testbeds, DevOps approach operational

2019

- First prototype of the Pilot testbed and integration with EOSC, supporting some use-cases
  First implementation of the software platform
  High Level Hybrid Cloud solutions prototype completed
  Batch executions in the DEEP-as-a-Service solution
- Technology assessment and initial selection of use-cases
  Initial design and implementation plan for software platform
  High Level Hybrid Cloud solutions general architecture defined
  DEEP-as-a-Service architecture and API description

2018

- Assessment of available technologies carried out

Start

Use-cases

Biology

- Deep learning for retinopathy detection
  automated classification and stage and progression of retinopathy based on large set of color fundus retinal photography images [1]
- Plant Classification with Deep Learning
  automatically identify plant species from images using deep learning [2]

Earth observation

- Deep learning application for monitoring through satellite imagery
  demonstrate the potential of combining satellite imagery and machine learning techniques in a cloud infrastructure [3]

Network Security

- Massive Online DataStreams (MODS)
  address security issues, intrusion detection, and anomaly detection by processing the information collected at the data centre level and using machine learning / deep learning techniques [4]

Physics

- Post-processing of massive amounts of data
  use cloud-based computing facilities and services to facilitate the analysis of Lattice QCD configurations in the course of the corresponding simulation [5]

References

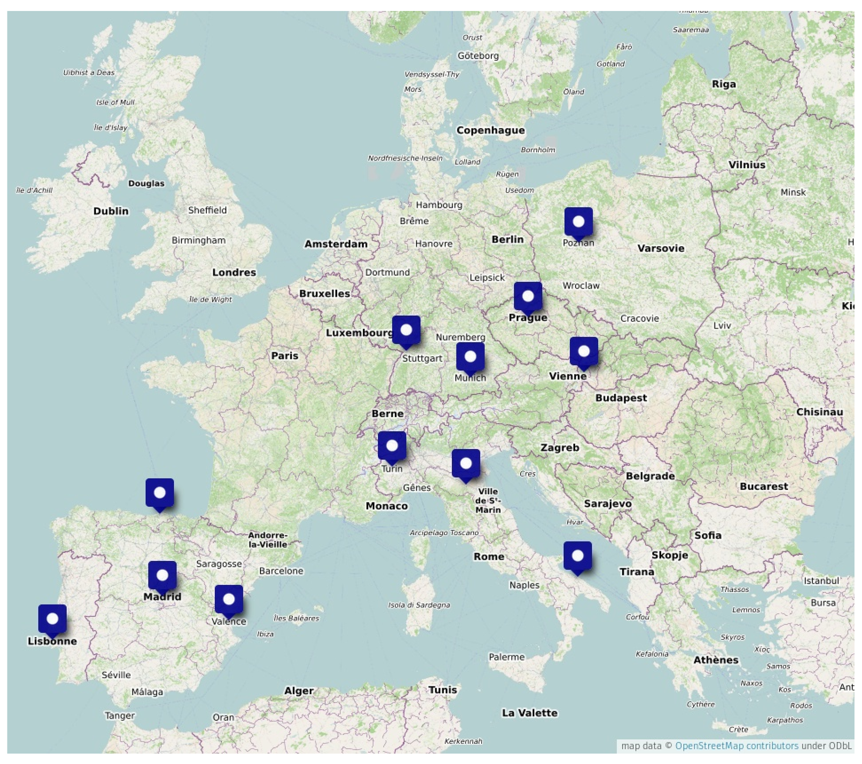
[1] Eulenberg, P. et al, Nature communications 8:463 (2017).
[2] Heredia, I., Proc. of the Computing Frontiers Conference (2017), p.259
[3] Jean, N. et al, Science (2016), Vol. 353, Issue 6301, p.790
[4] Nguyen, G., Data & Knowledge Engineering (2018), in press
[5] Campos, I., EPJ Web of Conferences (2018) 175, 09005

Key figures

Runtime: 30 months, November 2017 - April 2020

Partners: 9 academic and 1 industrial partner from 7 countries

Atos, cesnet, CSIC, INFN, HelmholtzZentrum münchen (Deutsches Forschungszentrum für Gesundheit und Umwelt), KIT, LIP, PSNC, Ústav Informatiky Slovenská Akadémia Vied, Universitat Politècnica de València



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