Data Schools

Computational Infrastructures: Cloud oriented Services

Alessandro Costantini
INFN, Italy

Training Goals

Cloud Services for the public

- Google Cloud platform
- AWS

Cloud Services for the scientific communities

- INFN Cloud
- EGI federated cloud

Computational Infrastructures, Costantini et al. 2020

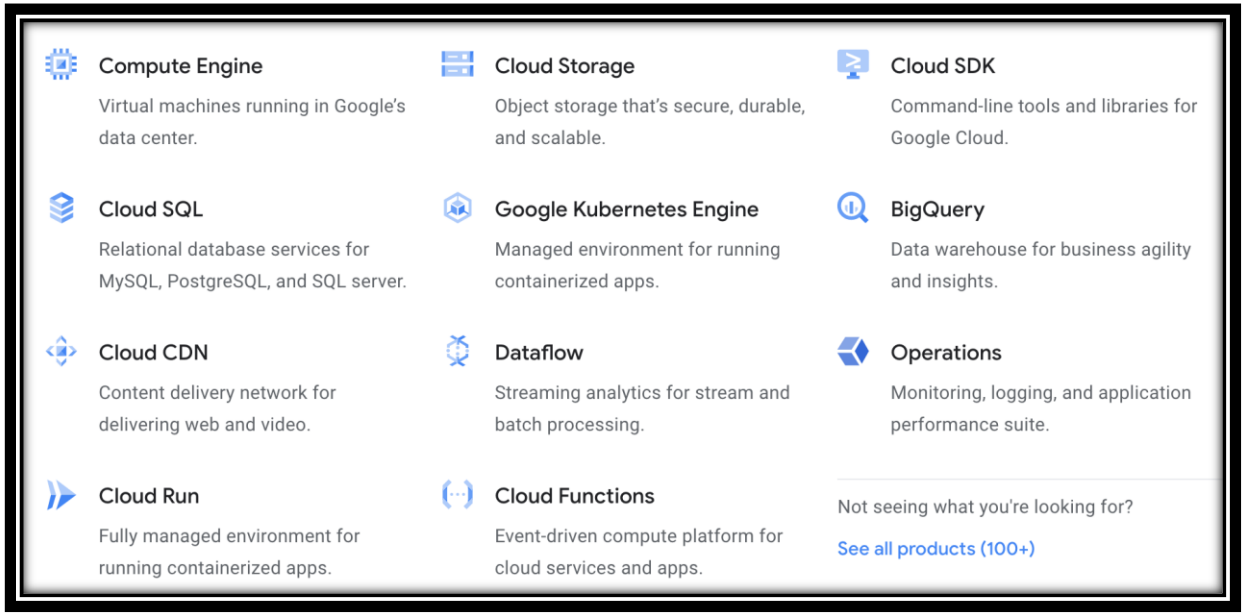
Google Cloud Platform

- **Google Cloud Platform** (**GCP**), offered by Google, is a suite of cloud computing services
- Registration requires a **credit card or bank account** details.
- Google Cloud Platform provides the following environments
  - infrastructure as a service
  - platform as a service
  - serverless computing.

Computational Infrastructures, Costantini et al. 2020

Google Cloud Platform

- Alongside a set of management tools, it provides a series of modular cloud services including
  - Compute
  - Storage & Databases
  - Networking
  - Big Data
  - Cloud AI
  - Management Tools
  - Identity & Security
  - IoT
  - API Platform



Source: https://cloud.google.com/products

AWS

Amazon Web Services (**AWS**) provides on-demand cloud computing platforms and APIs

- to individuals, companies, and governments,
- provide a set of primitive abstract technical infrastructure and distributed computing building blocks and tools

AWS comprises more than 175 products and services

AWS offers its services as **pay-as-you-go basis**

Source: https://en.wikipedia.org/wiki/Amazon_Web_Services#cite_note-techradar-11

Services for research commnuities

- INFN Cloud
  - INFN is offering to its users a comprehensive and integrated set of Cloud services through its dedicated **INFN Cloud infrastructure**
- EGI Federated Cloud
  - a multi-national cloud system that integrates community, private and/or public clouds into a scalable computing platform for research in Europe

Computational Infrastructures, Costantini et al. 2020

National Institute for Nuclear Physics

Mission

High energy physics experiments in collaboration with worldwide research centers and institutions. For the past 10 years, this mainly meant supporting the experiments @ CERN (LHC), although the scope is now widening very quickly to other communities.

State-of-the-art distributed IT technologies

Istituto Nazionale di Fisica Nucleare

- Cloud computing and related services
- Exascale distributed storage services
- Cloud-assisted and edge-enabled intelligent systems (ML and DL techniques for industrial digital twins, IoT, medicine and more…)

Currently, INFN operates:

- 9 medium size centers (Tier-2s in the LHC Computing Grid
- 1 large Tier-1 center, at CNAF (Bologna), owning an ISO-27001 certification
- centers are connected with 10-100 Gbit/s network

Visit https://www.cnaf.infn.it/

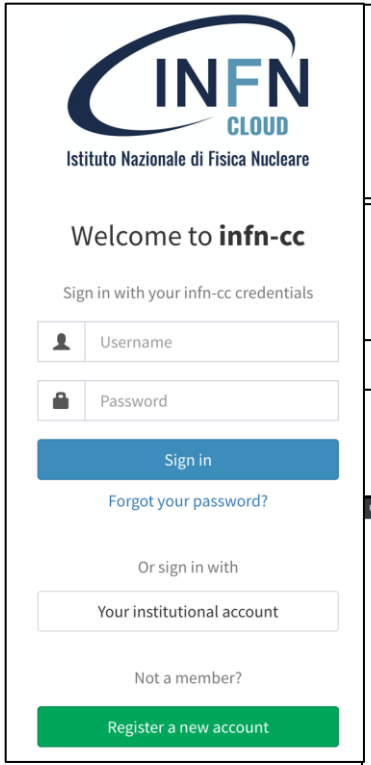
Computational Infrastructures, Costantini et al. 2020

Cloud Services: the INFN Cloud example

- INFN is offering to its users a comprehensive and integrated set of Cloud services through its dedicated **INFN Cloud infrastructure**.
- The **INFN Cloud portfolio**
  - easy to use web interface but also exploitable via command line interfaces
  - defined upon clear user requirements.
  - based on **composable, scalable, open source solutions** and can be easily extended either by the INFN Cloud support team or directly by end users.
- **Authentication and authorization** for accessing all INFN Cloud services
  - enforced through the INDIGO-IAM federated solution
  - fully compliant with European Open Science Cloud (EOSC) and industry standards.
- **Access to the INFN Cloud services** is currently reserved to INFN personnel
  - research agreements with other institutions are foreseen in the future.

Computational Infrastructures, Costantini et al. 2020

The Dashboard

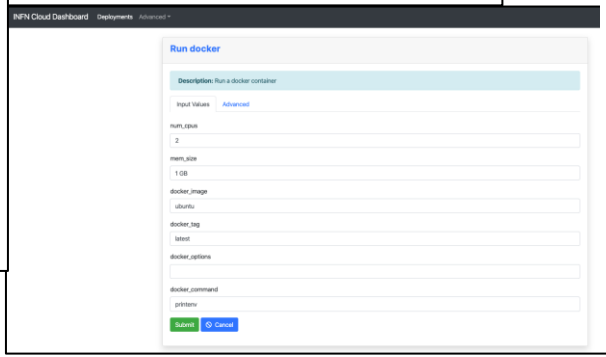


Authentication *can* be enabled for::

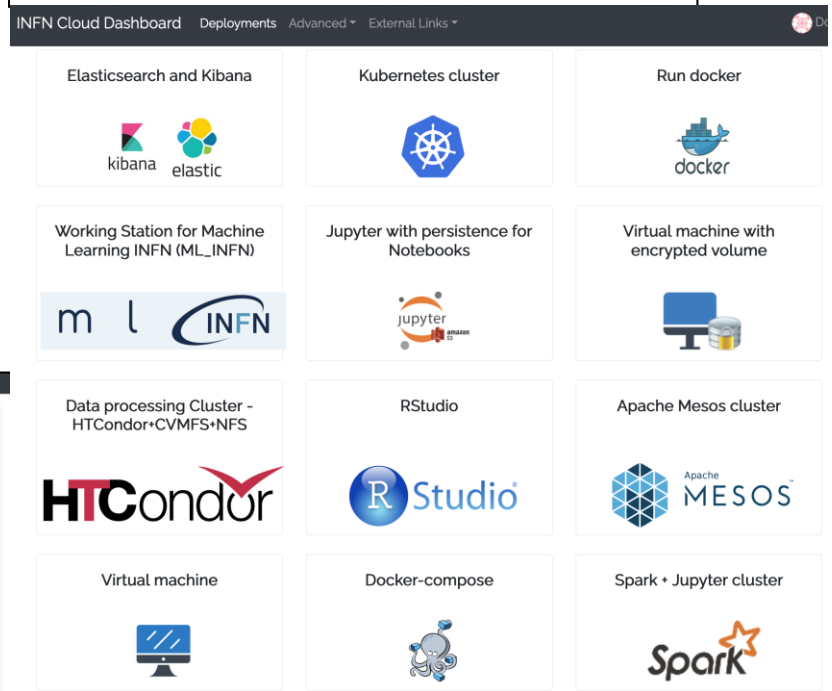
- Local username/password
- Google accounts
- EduGAIN (e.g. University, research centers, etc.)
- Other OIDC providers

Transparent, multi-site federation for users of Cloud resources belonging to INFN and/or to other Cloud providers (private or public)

Composed, high-level services easily customizable and configurable directly by users



Access to the Cloud services through a common dashboard, with different views depending on the users / user groups.



Computational Infrastructures, Costantini et al. 2020

EGI: Advanced computing for research

Mission

To deliver **open solutions for advanced computing and data analytics** in research and innovation, **by coordinating and provisioning an international federated infrastructure** from both the public and private sector in Europe. As an open initiative **with a global outlook**, the EGI Federation also connects service providers beyond Europe following the collaboration needs of the served communities.

The **EGI Federation** is an international e-infrastructure that provides advanced computing and data analytics for research and innovation.

EGI fully realises the **Open to the World** vision

Cloud providers

Resource centres (delivering HTC)

Computational Infrastructures, Costantini et al. 2020

EGI Service Catalogue

Compute

Cloud Compute
Run virtual machines on demand with complete control over computing resources

Cloud Container Compute
Run Docker containers in a lightweight virtualised environment

High-Throughput Compute
Execute thousands of computational tasks to analyse large datasets

Workload Manager
Manage computing workloads in an efficient way

Applications

Applications on Demand
Use online applications for your data & compute intensive research

Notebooks
Create interactive documents with live code, visualisations and text

Security

Check-in
Login with your own credentials

ISO 20000 Certified IT Service Management System www.tuv-sud.com/ms-cert

ISO 9001 Certified Quality Management System www.tuv-sud.com/ms-cert

https://www.egi.eu/services/

Training

FitSM Training
Learn how to manage IT services with a pragmatic and lightweight standard

ISO 27001 Training
Learn how to manage and secure information assets

Training Infrastructure
Dedicated computing and storage for training and education

Storage and Data

Online Storage
Store, share and access your files and their metadata on a global scale

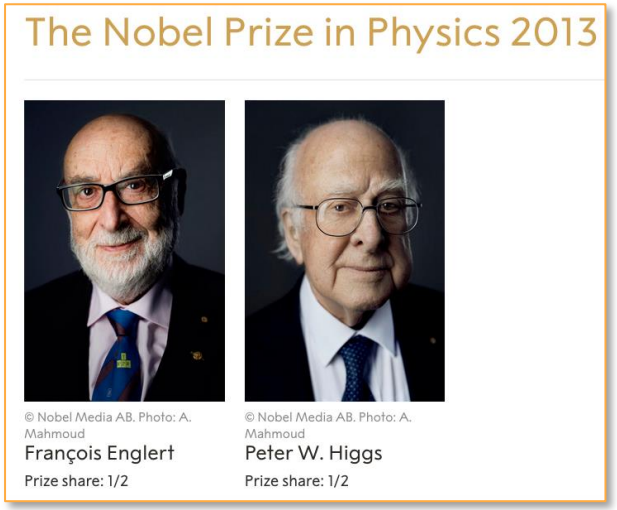
Archive Storage
Back-up your data for the long term and future use in a secure environment

Data Transfer
Transfer large sets of data from one place to another

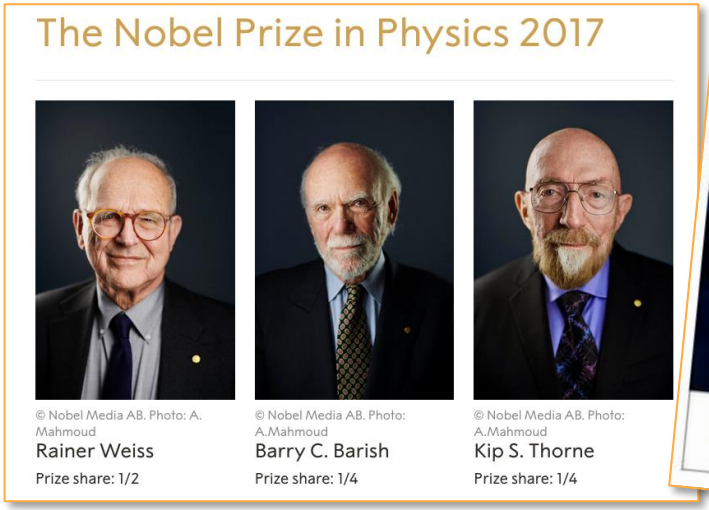
Computational Infrastructures, Costantini et al. 2020

Distributed scientific computing enables scientific discoveries…

1700 open access publications / year



LHC Collaboration



LIGO-VIRGO Collaboration

https://www.egi.eu/use-cases/

Computational Infrastructures, Costantini et al. 2020

Information and Material

- https://en.wikipedia.org/wiki/Amazon_Web_Services#cite_note-techradar-11
- https://cloud.google.com/solutions
- www.cloud.infn.it
- https://www.egi.eu/services/
- Alessandro Costantini – alessandro.costantini@cnaf.infn.it

Data Schools

Contact

Alessandro Costantini – alessandro.costantini@cnaf.infn.it

Contributors

Alessandro Costantini - INFN
Robert Quick - IU
Cristina Doina Duma - INFN
Gergely Sypos - EGI
Giuseppe La Rocca - EGI