

Business models for computing and data infrastructures

today & tomorrow

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20 years ago...

EU Data Grid

- little virtualization,
- expensive HPC
- low performance PC clusters



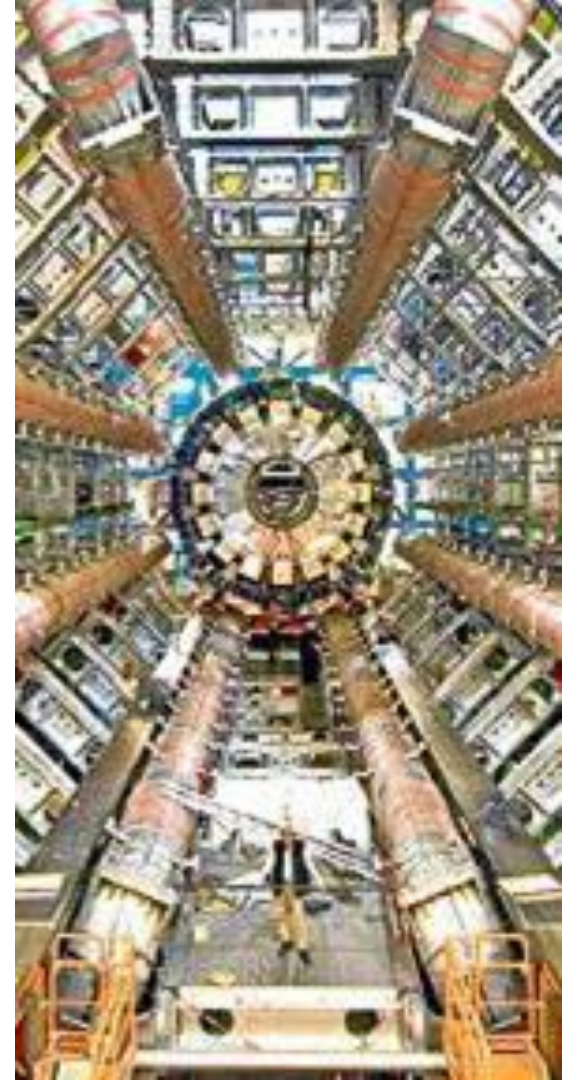
EGEE 1, 2 & 3

WLCG



Grid computing

- Flexible, secure, coordinated resource sharing among individuals and institutions
- Enable communities to share distributed resources in order to achieve a common goal
 - where the resources of one institution are not enough
 - where results need to be achieved faster and/or cheaper
- Supporting virtual community which share geographically distributed computing and data resources in **heterogeneous** administrative domains.



Grid & business models

- Grid was a perfect model for large and well organized scientific organizations whose members are normally very much computer savvy;
- Not a good model for the isolated scientist (long tail);
- **Not generic enough for wide commercial adoption;**
- Non trivial security issues
- Some project (like BEinGRID) tried to experiment with business models with mixed success

The lack of a clear business model
contributed to a limited adoption of grid computing
outside the scientific field

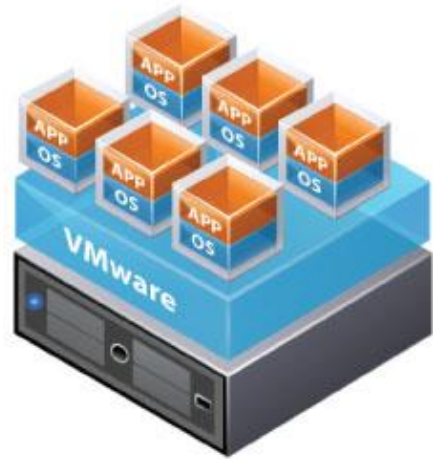
Things have changed
in these last 20 years...

Virtualization

- Virtualization is a technique that enables to pack all necessary software and data in a the so called virtual machine
- Virtual machines run on top of the real computer
- Virtual machines make it easier to set-up execution environments and offer additional benefits for security and privacy
- Other benefits, such as migration and easy deployment, enabled the adoption of this technology



Traditional Architecture



Virtual Architecture

The Cloud

Cloud computing is a **service**

- Cloud Computing represents a major change in IT service architecture, delivery and consumption
- More flexible IT, which can adapt to businesses and where costs can be predicted

On-demand services / Ubiquitous network access
/
Very fast deployment/ Rapid elasticity /
Pay per use



Cloud services



Free services?



Data as commodity

Data is predominant.

It is changing the way in which we do **research, science** and **business**.



Competing or collaborating

INSIDE GOOGLE CLOUD

Subatomic particles and big data: Google joins CERN openlab



Image of ALICE detector © CERN

Kevin D. Kissell
Google Cloud Office of the CTO

November 15, 2019

Today we are excited to announce that Google has signed an agreement to join [CERN openlab](#). Together, we will be working to explore possibilities for joint research and development projects in cloud computing, machine learning, and quantum computing.

“The data challenges for the 2021-2023 and 2026-2029 runs of the LHC will need to be addressed by **more than just cloud scale-out of computing** using off-the-shelf services.”



Open data & business models

A business model could be designed where who produce open data get some rewards when these data are used for commercial purposes while they should remain free for education and research.

Regulation

The EU should play the role of regulator, by controlling who is providing open data and who is benefitting and applying all the necessary controls and limits. The EU should finance the definition of reference model architectures which the commercial suppliers will have to implement. Same for UIs, data standards etc...



Good practice



THE RESEARCH DATA ALLIANCE

www.rd-alliance.org

*building the social and technical bridges
that enable open sharing of data*

RDA

**25 FLAGSHIP
OUTPUTS**

**75
ADOPTION
CASES**

**93 GROUPS WORKING ON GLOBAL
DATA INTEROPERABILITY
CHALLENGES**

**7.269 INDIVIDUAL
MEMBERS FROM 137
COUNTRIES**

**45 ORGANISATIONAL MEMBERS &
8 AFFILIATE MEMBERS**

RDA is an international member based organization started in 2013, with financial support mostly from the EU Commission, the US NSF and Australia, promoting activities that reduce barriers to data sharing and exchange, to foster acceleration of data driven innovation worldwide.

With more than 7,200 members globally representing 137 countries, RDA includes researchers, scientists and data science professionals working in multiple disciplines, domains and thematic fields and from different types of organisations across the globe.

Data as Commons

The base for a Commons of data and computing in Europe?

The EOSC portal is possibly an important step in this direction.



The current EOSC model to create a Commons where EU scientific and commercial providers will offer virtual distributed service will encounter **major challenges** from the global IT providers.

EOSC & business models

Phase 1: € 300 M from the European Commission

Phase 2: mix of fees from national funders + revenues from users

Freemium model

Free access for registered researchers in higher education (to achieve a critical mass indispensable to produce a **network effect**) + pay per use of commercial IaaS, PaaS and SaaS services accredited by EOSC / subscription to access the services for commercial purposes / fees paid by conformant commercial service providers to offer their services in the EOSC marketplace.