

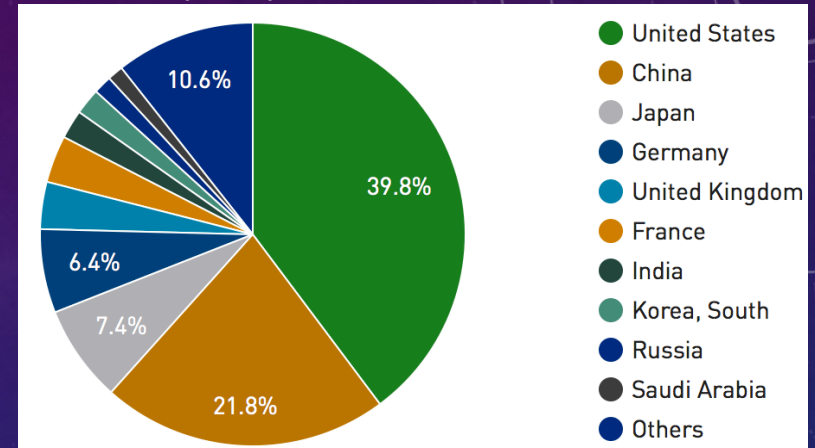
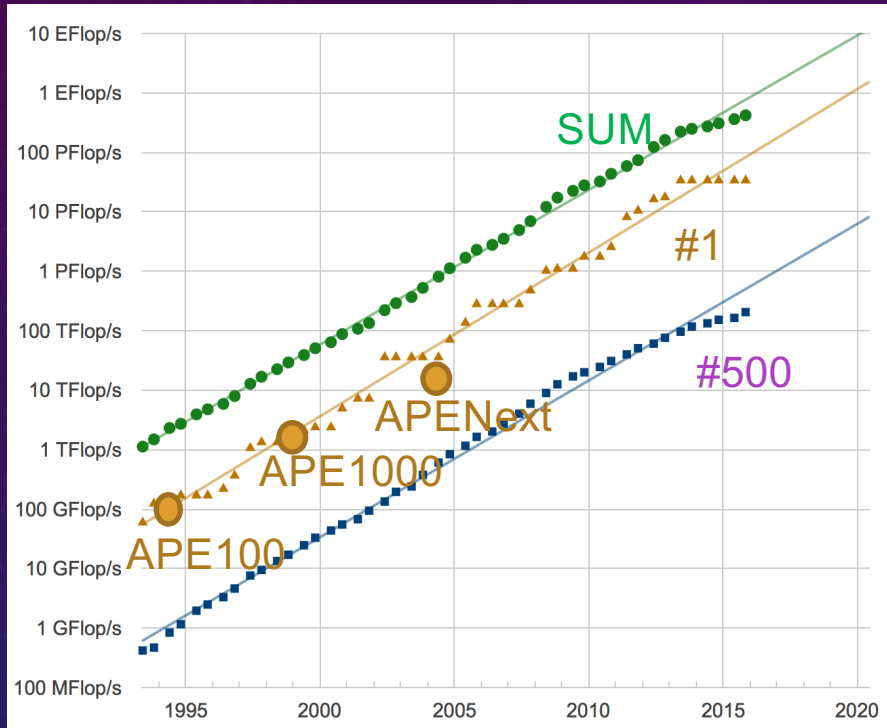
THE INFN VISION FOR THE FUTURE OF HPC AND HTC FROM REGIONAL AREAS TO EUROPE

Donatella Lucchesi
University and INFN of Padova

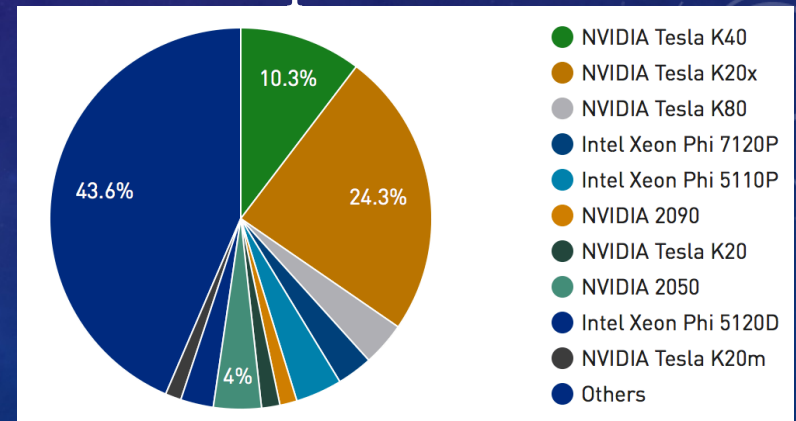
MHPC Workshop on High Performance Computing
24-26 February 2016
SISSA, International School for Advanced Studies

High Performance Computing as of today

Country System Share



Processor performance share



ENI 19 place
CINECA 37 "

High Performance Computing as of today in Europe

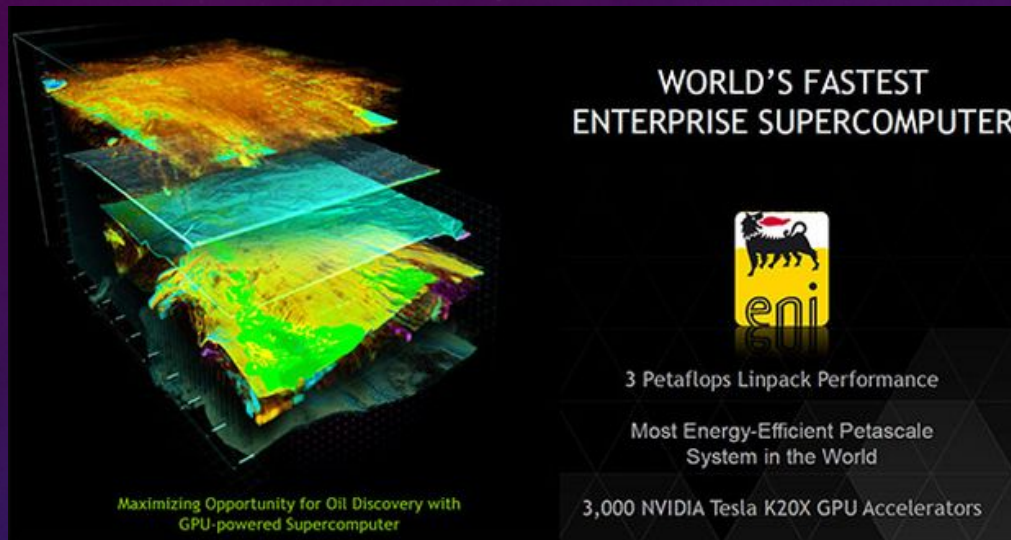
Computing centers organized as Research Infrastructure

System Name	Hosting Centre	Architecture	Final capability
CURIE	GENCI@CEA	Bull x86	2 Petaflop/s
FERMI	CINECA	IBM BlueGene/Q	2 Petaflop/s
SuperMUC	GCS@LRZ	IBM iDataPlex	3.2 Petaflop/s
JUQUEEN	GCS@FZJ	IBM BlueGene/Q	5.87 Petaflop/s
MareNostrum	BSC	IBM iDataPlex	1 Petaflop/s
Hornet	GCS@HLRS	Cray XC40	3.79 Petaflop/s

Resources made available to users via peer-review calls.
Probably not the most quick and efficient method



High Performance Computing as of today in Italy



IBM based on NVIDIA
Tesla GPU accelerators
connected by high-speed
InfiniBand.
Managed by Cineca

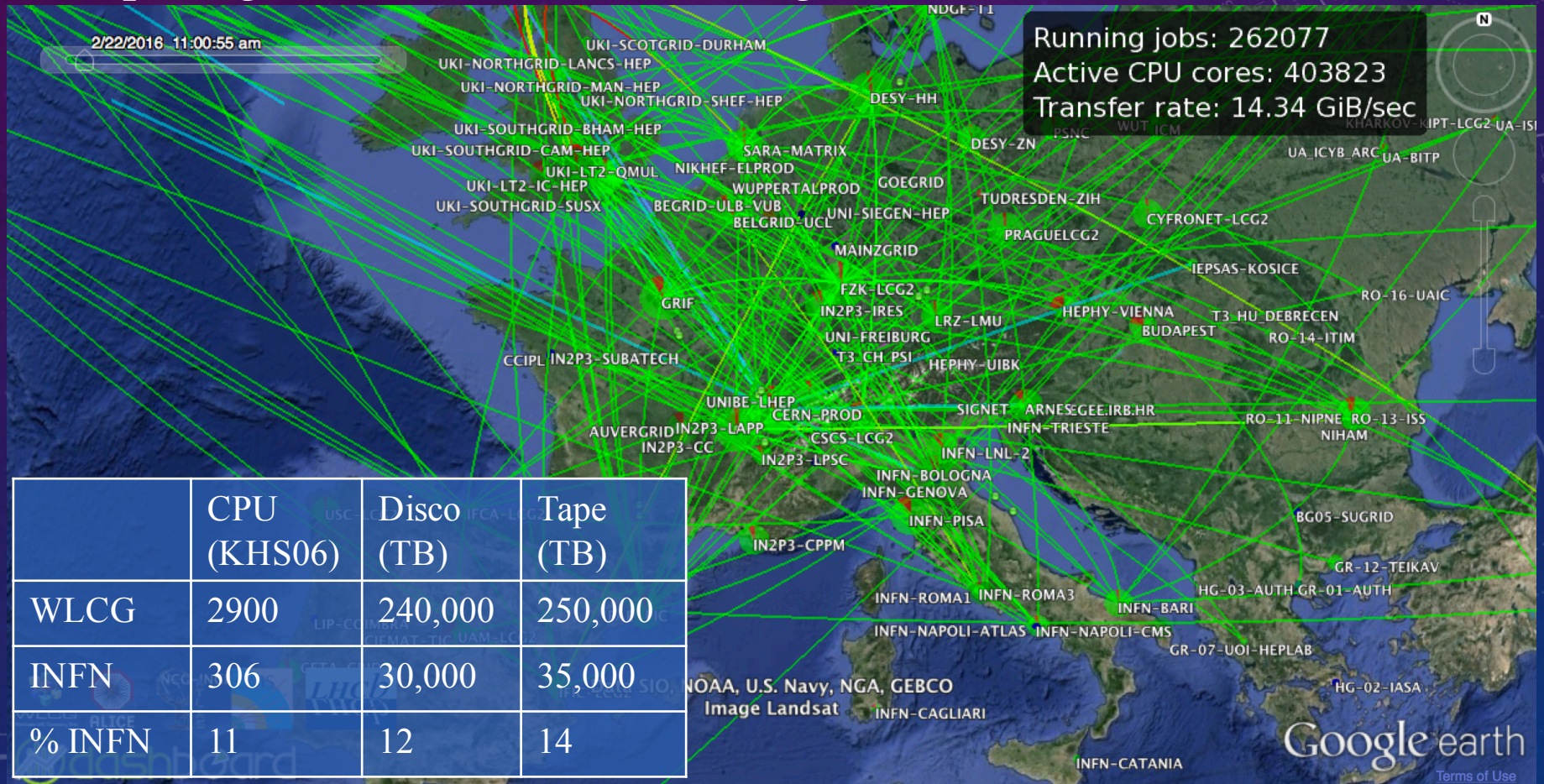


Cineca
FERMI system 2 PetaFlops
MARCONI system will reach 16PetaFlops

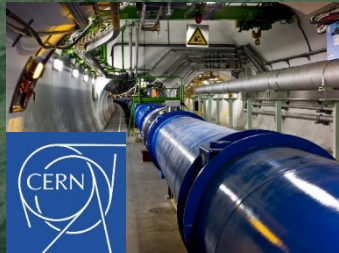
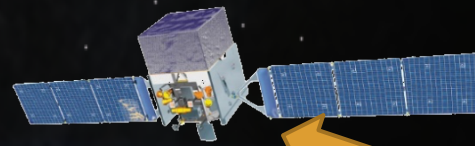
INFN: Few activities focused on inter-communication APENET+SUMA

High Throughput Computing as of today

Worldwide LHC Computing Grid (WLCG), created the GRID:
computing centers connected via high bandwidth network

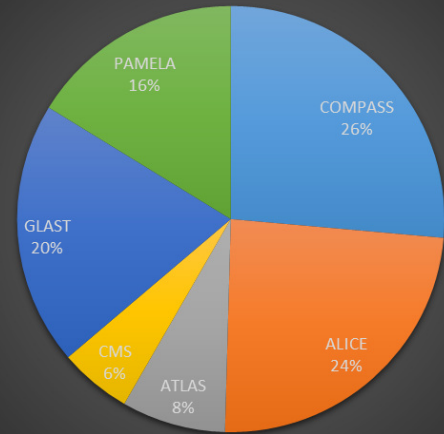


FARM INFN @ TS



CERN

CPU Total Power: 10 TFLOPS

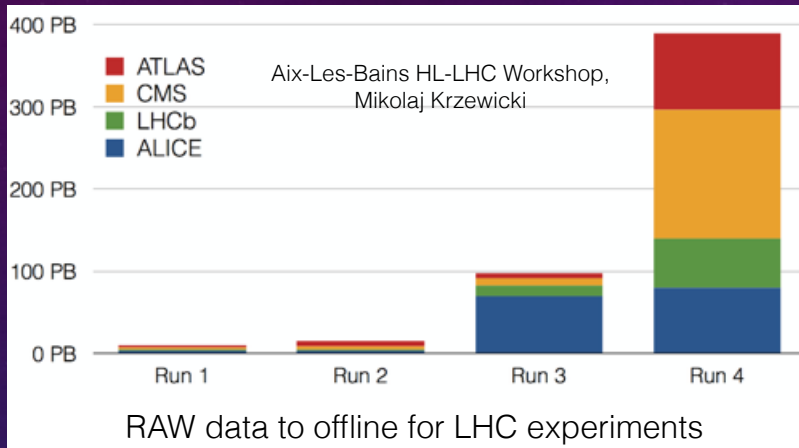


CPU	10000 kHS06 - 10 TFlops	84 WN's 790 cores 2.7 TB RAM
DISK	300 TBn + 400 TBn	GPFS + EOS FS
TAPE	80/160TBn (HSM) 40/80TBn (Backup)	Quantum Scalar i2000 (LTO4/LTO3)
NET	Storage 8 Gb/s Fibre Channel	Ethernet 1 – 10 Gb/s

Trieste

The Future Needs

LHC experiments:



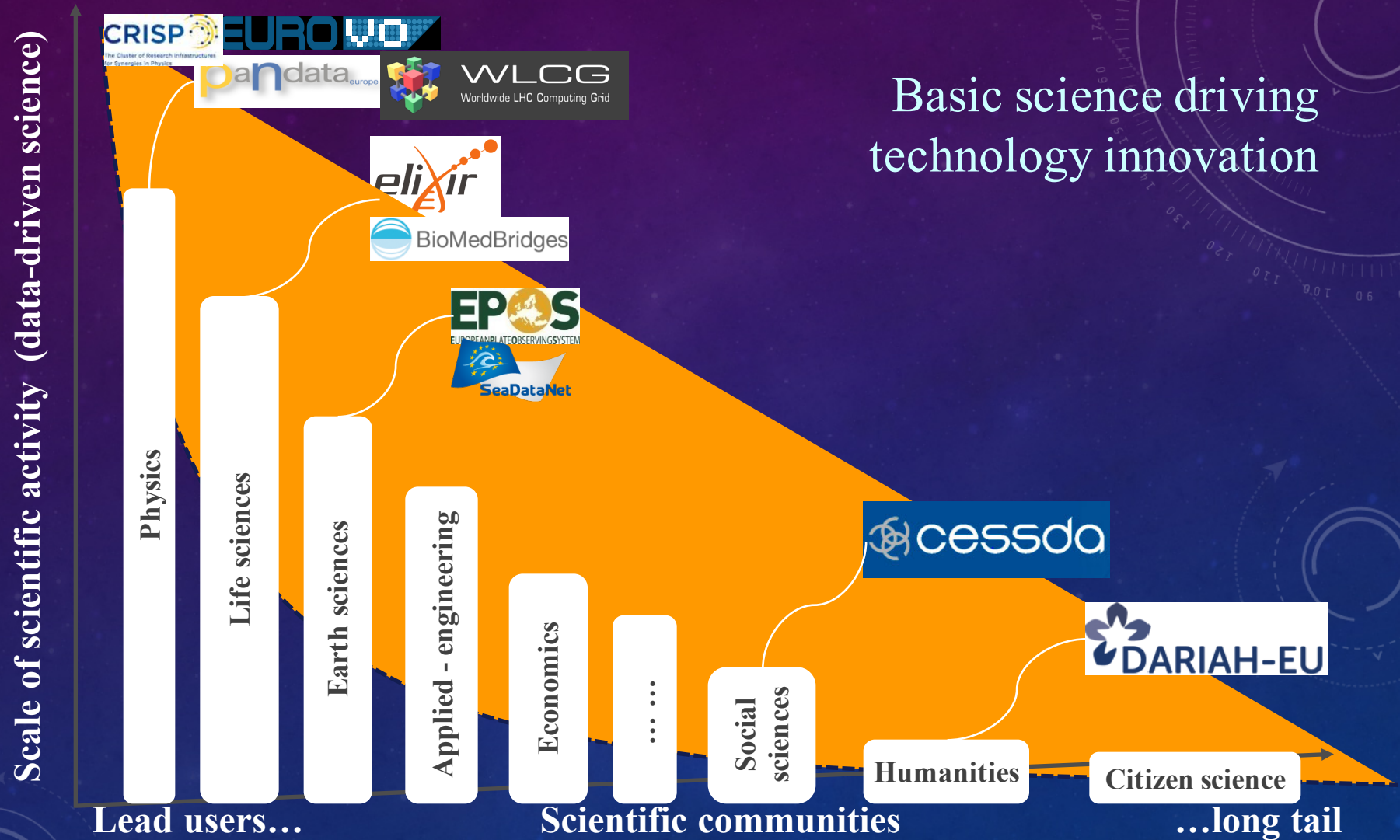
huge increase respect to first data taking

- ❑ Astroparticle and space experiments enter the game: CTA, SKA
- ❑ Theoretical physics needs more computational power for the next step.
- ❑ Other sciences: Life science, material science, climate change, earth science, etc. need computing cycles and data management

Analysis of the European Panorama

- ❑ Digital infrastructures are fragmented by scientific, economic domains (physics, health, space, climate, ect,) and by country.
- ❑ Lack of interoperability of infrastructures and tools prevents share of data to industry, governments and scientist even of the same area.
- ❑ Increasing demand of world-class HPC infrastructure to process data (and big data?).
- ❑ Request for open data and re-use of data to make the most of advanced data analytics techniques

Why Physicists can help



Toward an integrated e-Infrastructure

□ European Open Science Cloud (EOSC)

- place EU in a leading role in scientific & data infrastructure
- give European Scientists services for storage, management, analysis and re-use of research data
- Pilot call opening soon infradev-04-2016 (~10 MEuro)
- INFN among proponents of a proposal

Carlos Moedas – Commissioner for Research, Science and Innovation

Submitted by alim on 18 Sep 2015



European Commission - Speech - [Check Against Delivery]

Open Innovation, Open Science, Open to the World

“... launch of a pilot action that should demonstrate how wide availability of scientific data and data-analysis services for European researchers can be ensured through a cloud infrastructure”

Toward an integrated e-Infrastructure cont'd

□ European Data Infrastructure

- underpin EOSC
- world-class supercomputing, high-speed connectivity, leading-edge data storage also for industry (including SMEs) and the public sector
- Pilot project: *Important Project of Common European Interest on High Performance Computing and Big Data Enabled Applications*
- Italy participates with the
“*The Italian Data Infrastructure*”
lead by INFN

The Italian Ministry of Economic Development, the Ministry of Education, University and Research, the Ministry of Public Function, the regional Ministry of Emilia-Romagna, the regional Ministry of Piemonte, the regional Ministry of Trentino, the regional Ministry of Lazio and the regional Ministry of Marche

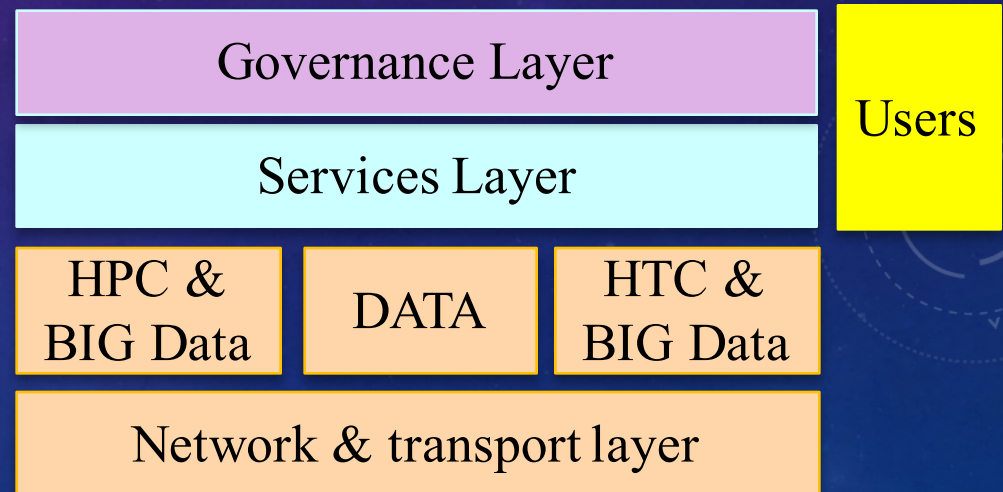


The Italian Data Infrastructure



Possible implementation scheme to:

- make accessible and usable to users the centers
- manage the resources



INFN is coordinating the activities

The Italian Data Infrastructure: business model

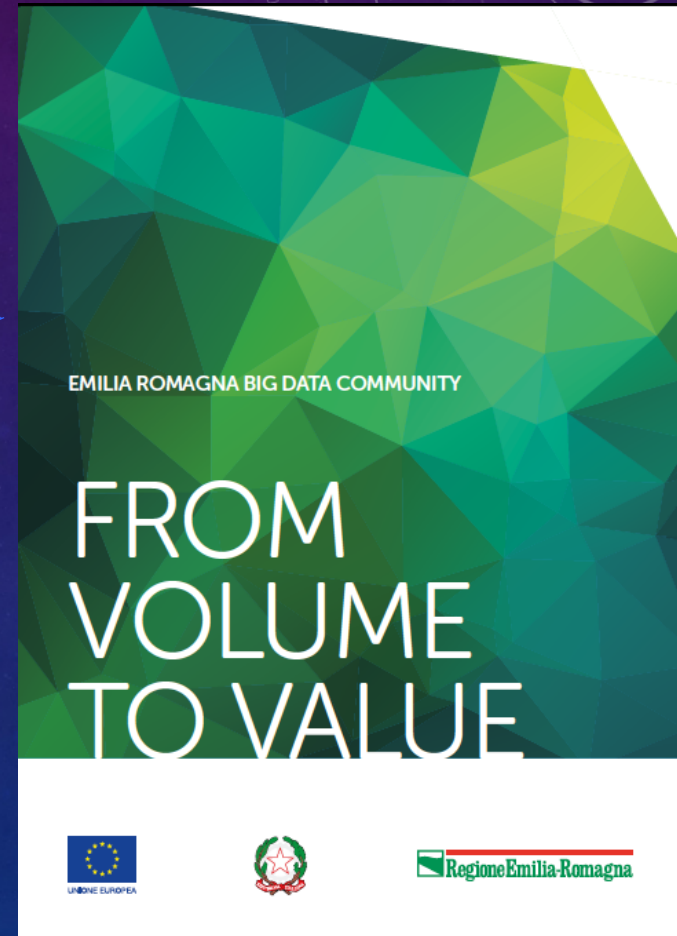
- ❑ Funds directly from the research agency, INFN, CNR, GARR, CINECA
- ❑ National funds, MIUR, MISE and Structural funds
- ❑ Regional funds , Emilia Romagna, Marche, Piemonte, Puglia, Trentino, ..
- ❑ European funds, H2020, ESFI, special projects

First pilot on Emilia Romagna Region

Process supported by Regional (EU) funds:

- Survey of:
 - research computing capacities
 - competences in HPC, Big Data and software development
 - research communities
- Design and implementation test bed:
 - Definition of applications domain: Research, PA, Health, education,
 - involvement of the partners (i.e. private companies, SMEs)

INFN among the major players



Final Considerations

- ❑ INFN owns the largest HTC (data) resource infrastructure in Italy. It has allowed Nobel price discoveries!
- ❑ Research future needs require a change in the paradigm of doing computing: hybrid computing connected by high speed network to manage big data
- ❑ INFN is one of the proponents of a pilot for the European Data Infrastructure and will participate in the Open Science Cloud project. In Italy, INFN coordinates Italian Data Infrastructure
- ❑ Projects are modular, infrastructure can be built
 - Regional, National and European level
 - for research at any scale including the long-tail science
 - for industry, SME, PA