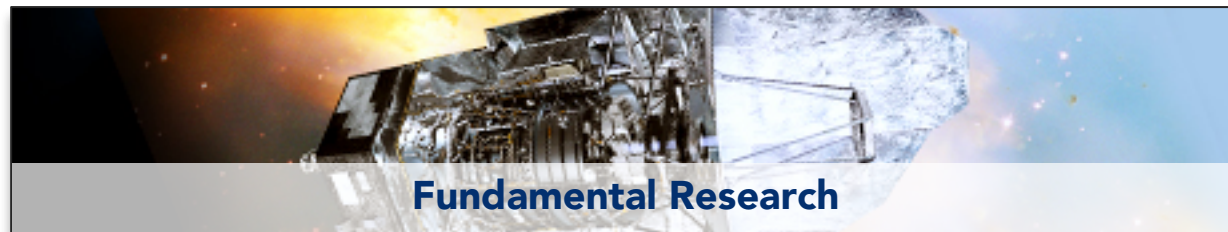
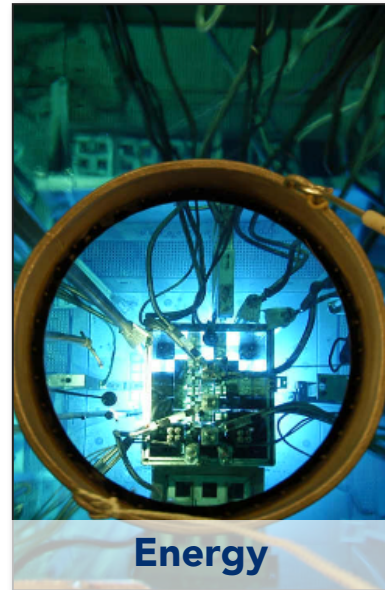
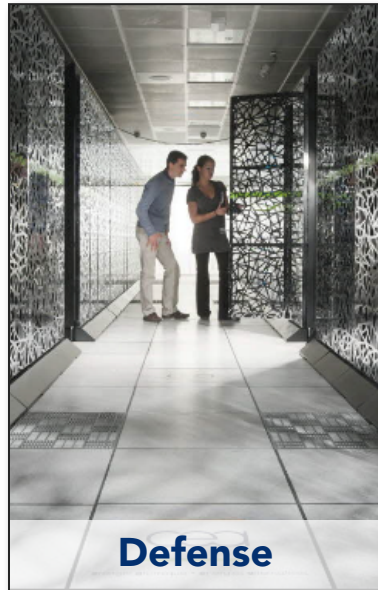


CEA – The French Alternative Energies and Atomic Energy Commission



  **Institute for Research into the Fundamental Laws of the Universe**



21000
employees



5.8
billion euros



> 5000
publications



> 450
European projects



DAP
Astrophysics

DPHP
Particle Physics

DPHN
Nuclear Physics

GANIL
Heavy Ion National Accelerator

DEDIP
Detectors Electronics Computing

DACM
Accelerators Cryogenic Magnets

DIS
System Engineering



1050 { 671 permanent
268 fixed-term
111 PhD students



1000/an



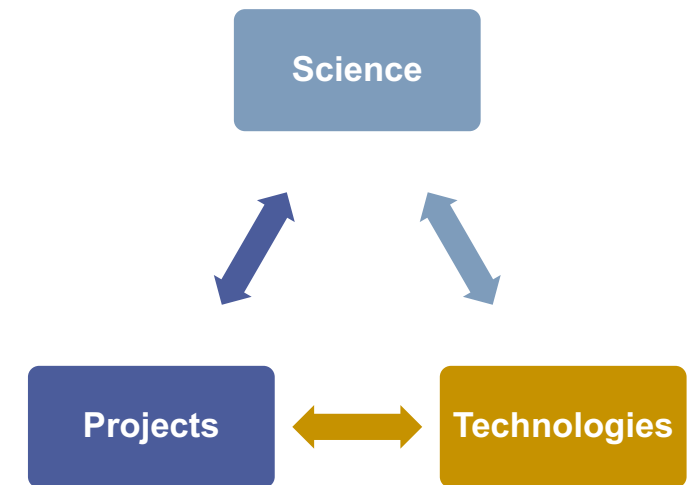
26 ERC
(10 ongoing)

Missions of IRFU

- ❑ **Carry out technological and fundamental research** within the framework of CEA's missions, in order to explore the fundamental laws of the universe, from the smallest scales (elementary constituents, nuclear matter) to the largest (energy content and structure of the universe)
- ❑ **Apply our technological innovations** to major national or international projects: MRI or fusion magnets, accelerators and neutron sources, medical imaging, etc.

Thanks to its size and the strong integration of its departments, IRFU has the :

- ❑ **Ability to cover the entire research chain**
 - Theory, experiment proposal, simulation, design, construction, operation, data analysis, phenomenology and communication
- ❑ **Ability to manage large, innovative and complex projects**
 - Accelerators, magnets, detectors



Platforms



COMPUTING

3 HPC clusters
13000 cores,
2500 Mh HS06/y

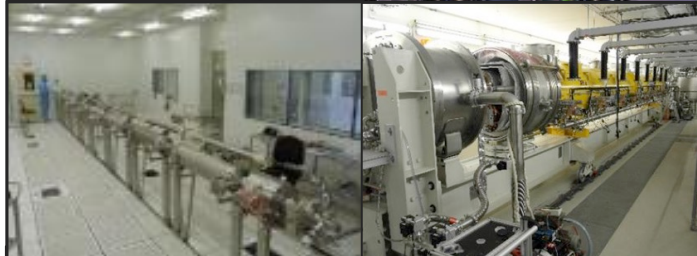
LHC Grid (tier 2)
9000 cores,
500 Mh HS06/y

SPACE

Clean rooms iso5-8

Instrumentation

Integration and test halls



MAGNETS ACCELERATORS

Synergium 25000 m²

Clean rooms iso4-5

Integration halls and test cryostats

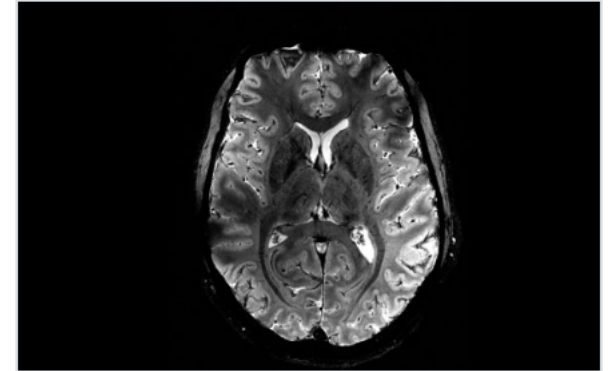
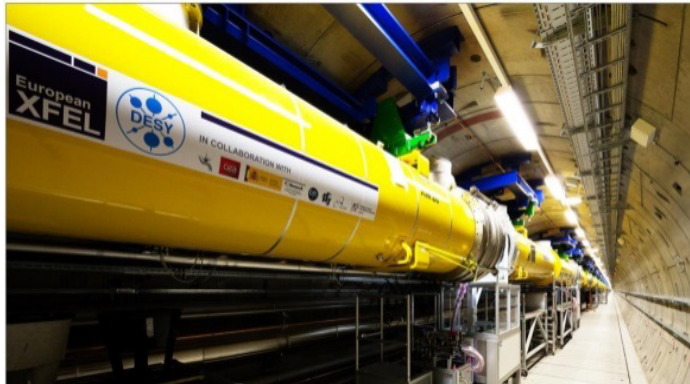
DETECTORS

Clean rooms
incl. Ciclad iso7 130m²
and iso5 50m²

Integration and test halls

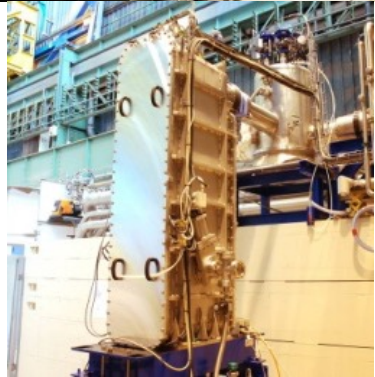
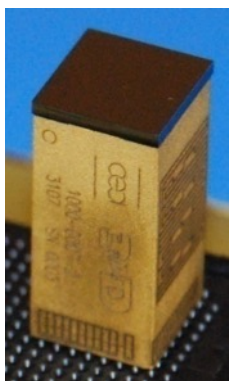


Application of our technologies to large national and international projects



© CEA

2 Avril 2024 -> Le CEA dévoile pour la première fois au monde, une série d'images de cerveau obtenue avec le scanner IRM Iseult, doté d'un champ magnétique inégalé de 11,7 teslas.



Fusion :

Light sources:

Neutrons sources:

Health :

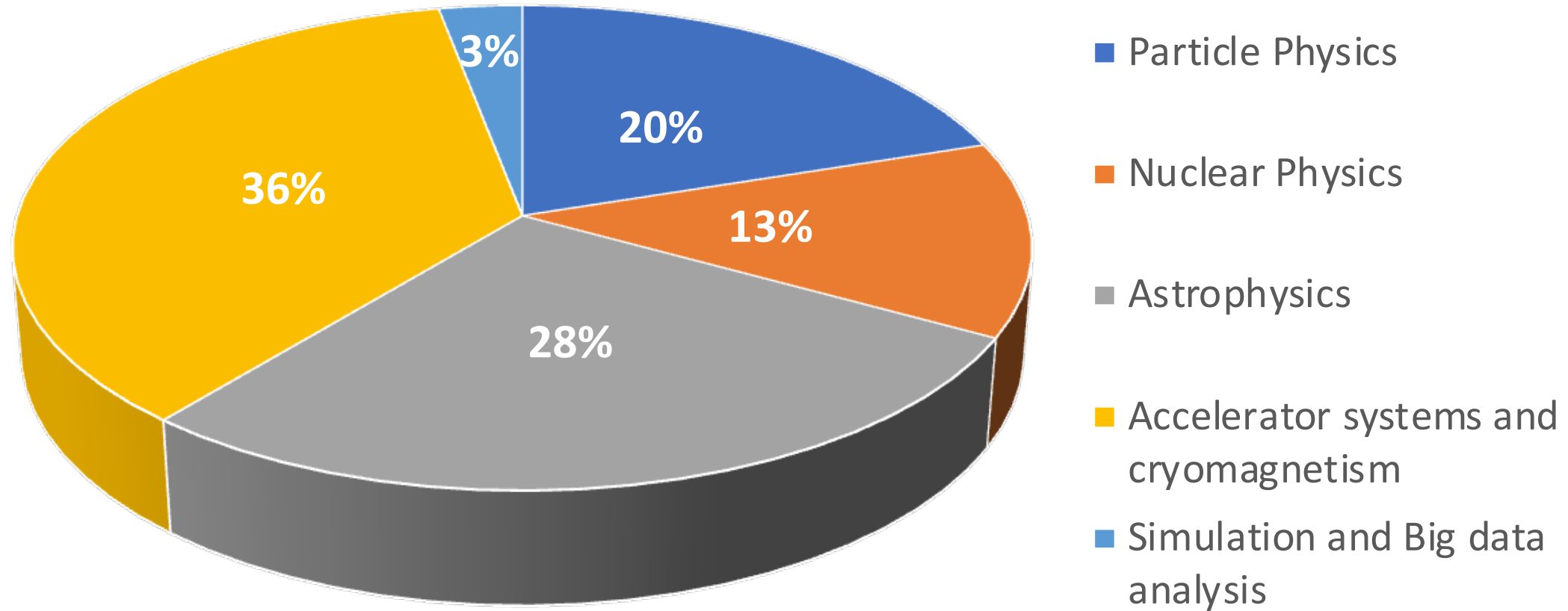
IFMIF-EVEDA/DONES, JT60-SA

SOLEIL, E-XFEL

ESS, SARAF, ICONE

MRI (Iseult 11.7T magnet), TOF-PET

Human Resources per scientific field



2017-2022
(w/o GANIL)

International collaborations



National partners, teaching

Academia



Université
Paris Cité



UNIVERSITÉ
DE LORRAINE

Defense



Industry



Integration into the University landscape

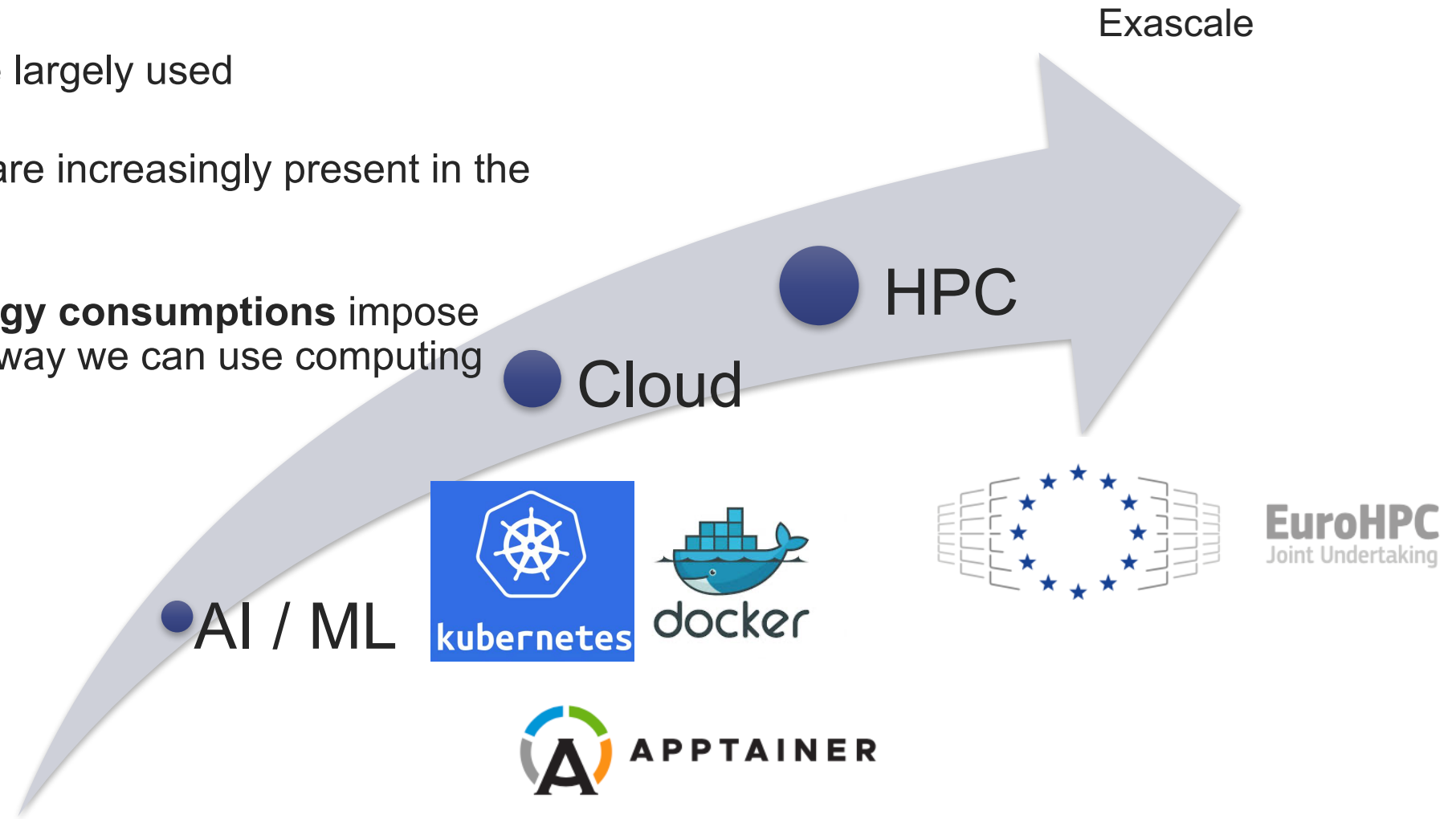
- DAP is part of the AIM mixed research unit with CEA-CNRS-University Paris-Cité affiliation,
- IRFU is “*co-tutelle*” of APC mixed research unit in Paris (with CNRS-University Paris-Cité-Paris Observatory),
- All IRFU departments except GANIL are considered units of the Paris-Saclay University cluster.

Teaching duties

- Participation at all levels of teaching in Engineering Schools and Universities,
- Average of 3000 hours/year.

Software & Computing challenges

- ❑ **EuroHPC for the Exascale** is driving the creation of a large number of super-computers across EU
- ❑ **Cloud infrastructures** are largely used
- ❑ **AI and ML technologies** are increasingly present in the toolbox of researchers
- ❑ **Carbon Emissions / Energy consumptions** impose several constraints on the way we can use computing resources

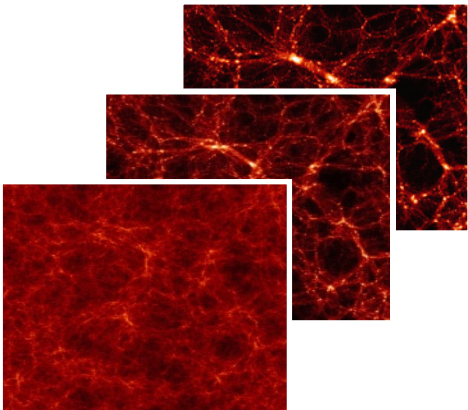


Software and Computing @ IRFU

- ❑ **Computing Infrastructure : 3 HPC clusters, LHC GRID (T2*)**

Promote continuous innovation and enforce the communication among physicists, software developers and infrastructure administrators

- ❑ **Simulations for Astrophysics:** an important effort is driven by numerical analysis and simulations using AMR technics. This represents an important use case for the usage of large HPC centers (e.g. the French national research infrastructure [Gencsi](#))



- ❑ **Data analysis:** researchers from IRFU are involved in many domains (*cosmology, nuclear physics, particle physics, astrophysics*)

- ❑ **NumPEX:** IRFU is a partner in a large national project to design and develop the software components that will equip the future *exascale* machines

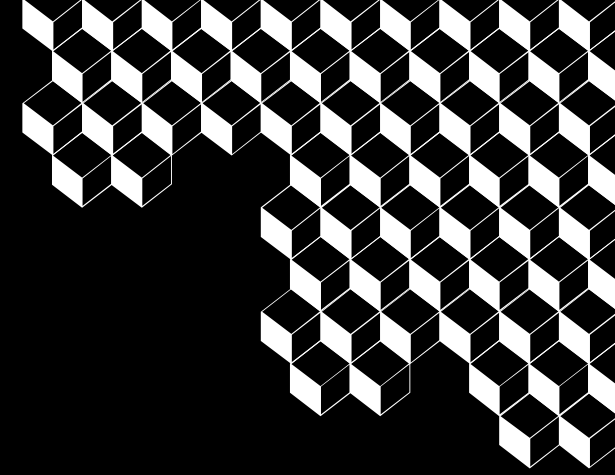


Sharing experience and knowledge

- ❑ **Software and Computing challenges** : we need to foster collaboration between scientists and data scientists/engineers
- ❑ **HEPIX conference** and similar events are an essential opportunity to share experience and knowledge, and should be seen as way to strengthen our community
 - ❑ **Capitalizing on the successful practices** allow us to adapt more quickly to the changes and innovations which are extremely fast in this domain
 - ❑ **Connecting people** from different domains: system administration, service deployment, and development of analysis and simulation code need cooperation among experts
- ❑ **OpenScience**: is an important paradigm of our domain, with an impact both on results reproducibility and general software tools reusability among different areas



PARIS, France – KubeCon + CloudNativeCon Europe – March 21, 2024 – **The Cloud Native Computing Foundation**® (CNCF®), which builds sustainable ecosystems for cloud native software, today announced that **CERN**, the European Organization for Nuclear Research and one of the world's largest and most respected centers for scientific research, has been awarded the **CNCF Top End User Award**. Two times a year, CNCF recognizes the significant contributions made by CNCF End User members across the cloud native ecosystem.



Thank you for your attention !