IDAF — Strategy

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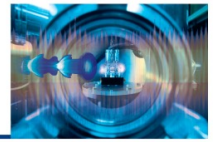
9. Annual MT Meeting
KIT 10.10.2023

HELMHOLTZ

Start with Review of PoF IV Proposal

Goal of the IDAF

The Evolution of the LK II Tier-2 Facility



- **Recommendation**: Tier-2 LK II Facility should support additional user communities
- Observation throughout all Programs in Matter
  - Growing data deluge ➡ Important to **access** and **analyse** large amounts of data

Necessity for a facility to store and analyse data with access for all scientists within Matter.

MT IDAF

↳ From LK II Tier-2 ➡ Interdisciplinary Data and Analysis Facility

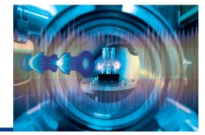
- Association with MT
  - MT is interdisciplinary ➡ IDAF is moved from MU to MT
  - Current setup planned at DESY (very broad matter community, experience with Tier-2)

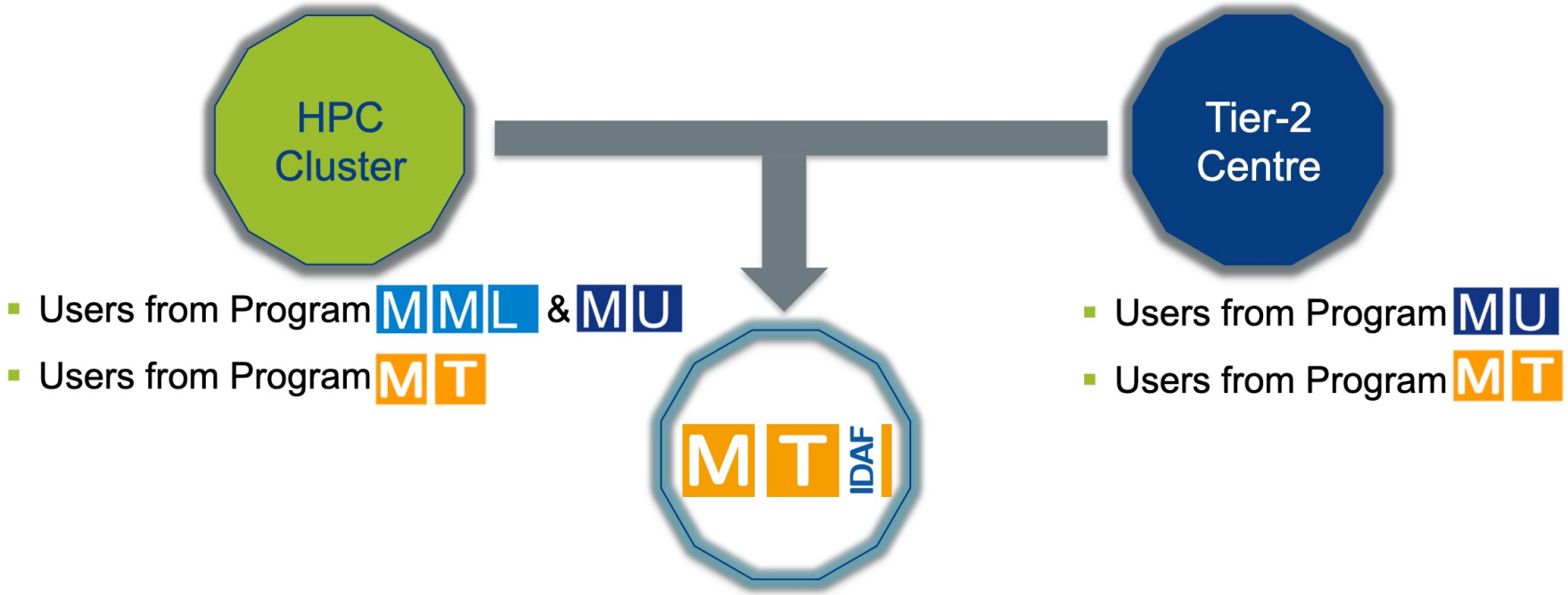
Start with Review of PoF IV Proposal

Plans for the IDAF

Building the IDAF:

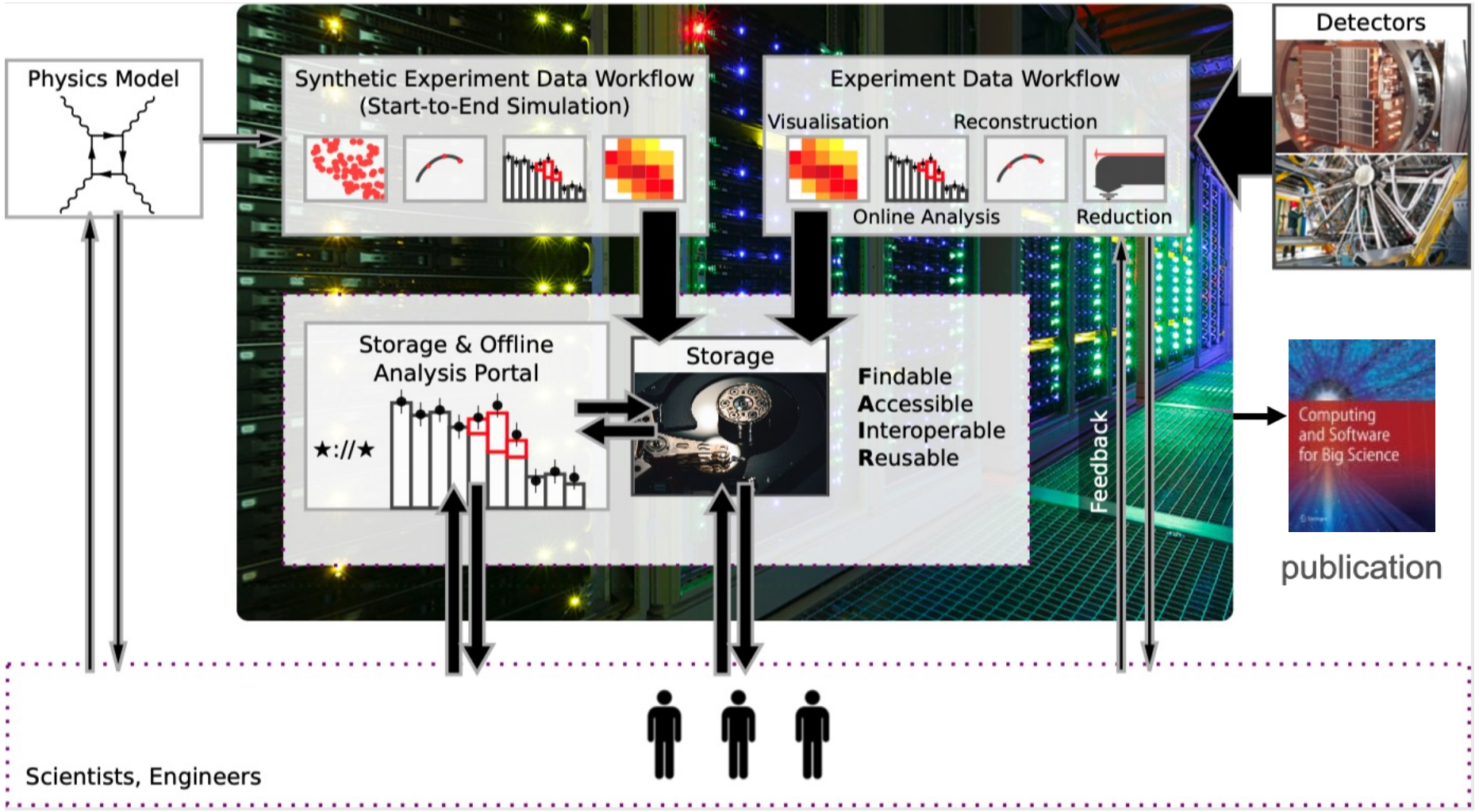
Merging High Performance Computing (HPC) and Tier-2 Clusters





Single infrastructure open for all scientists in Matter

Mission of the IDAF: enable the full analysis lifecycle



Provide scientists with:
- resources
- services
- support

over the whole data analysis lifecycle

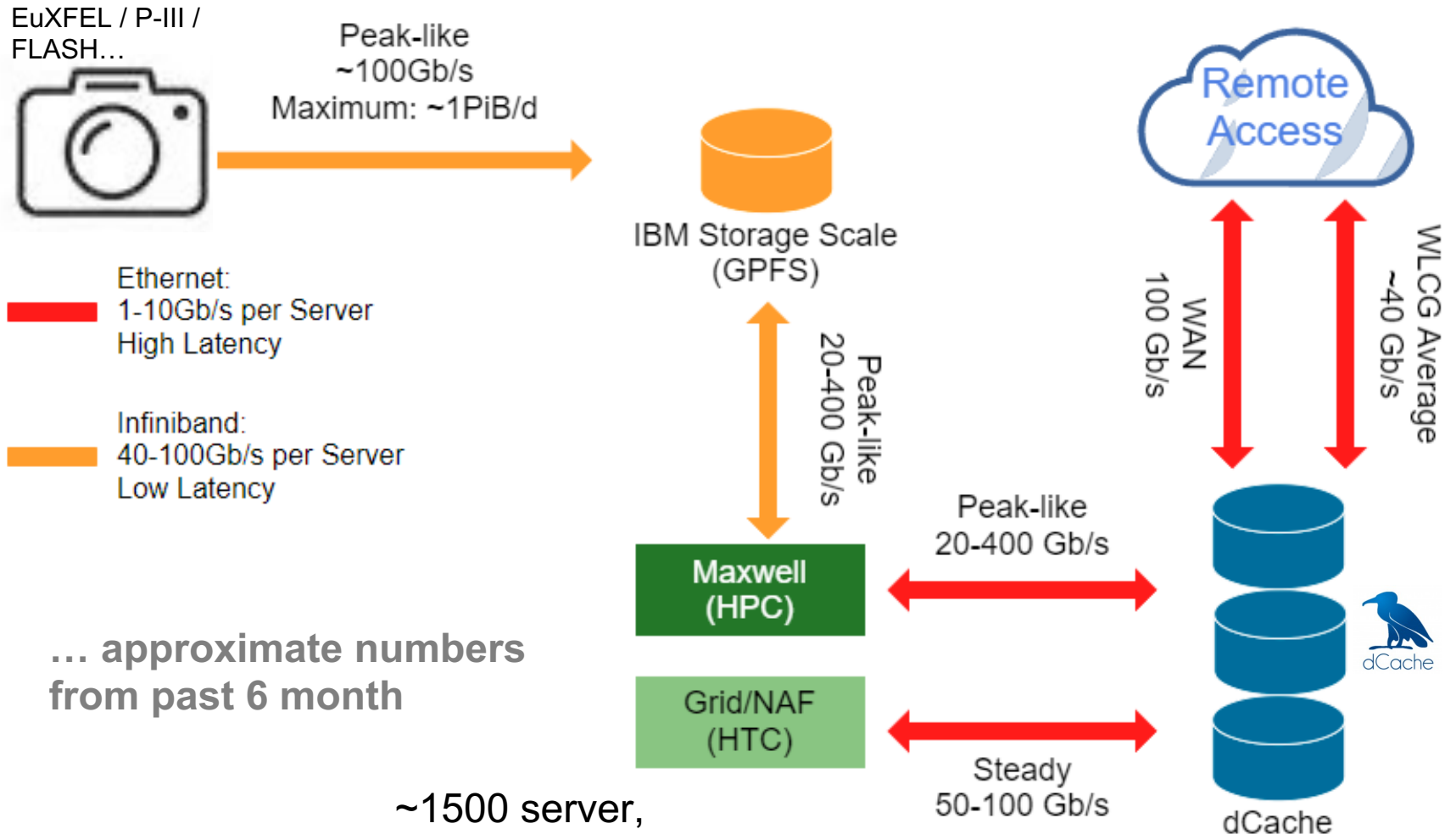
in an integrated & federated facility

for interdisciplinary scientists from Matter

Paradigm: Scientific Analyses are Data Driven

Strategy: Keep the Paradigm that Made the Tier-2 Successful

- Example: Traffic pattern in IDAF, approximate numbers from 2023H1

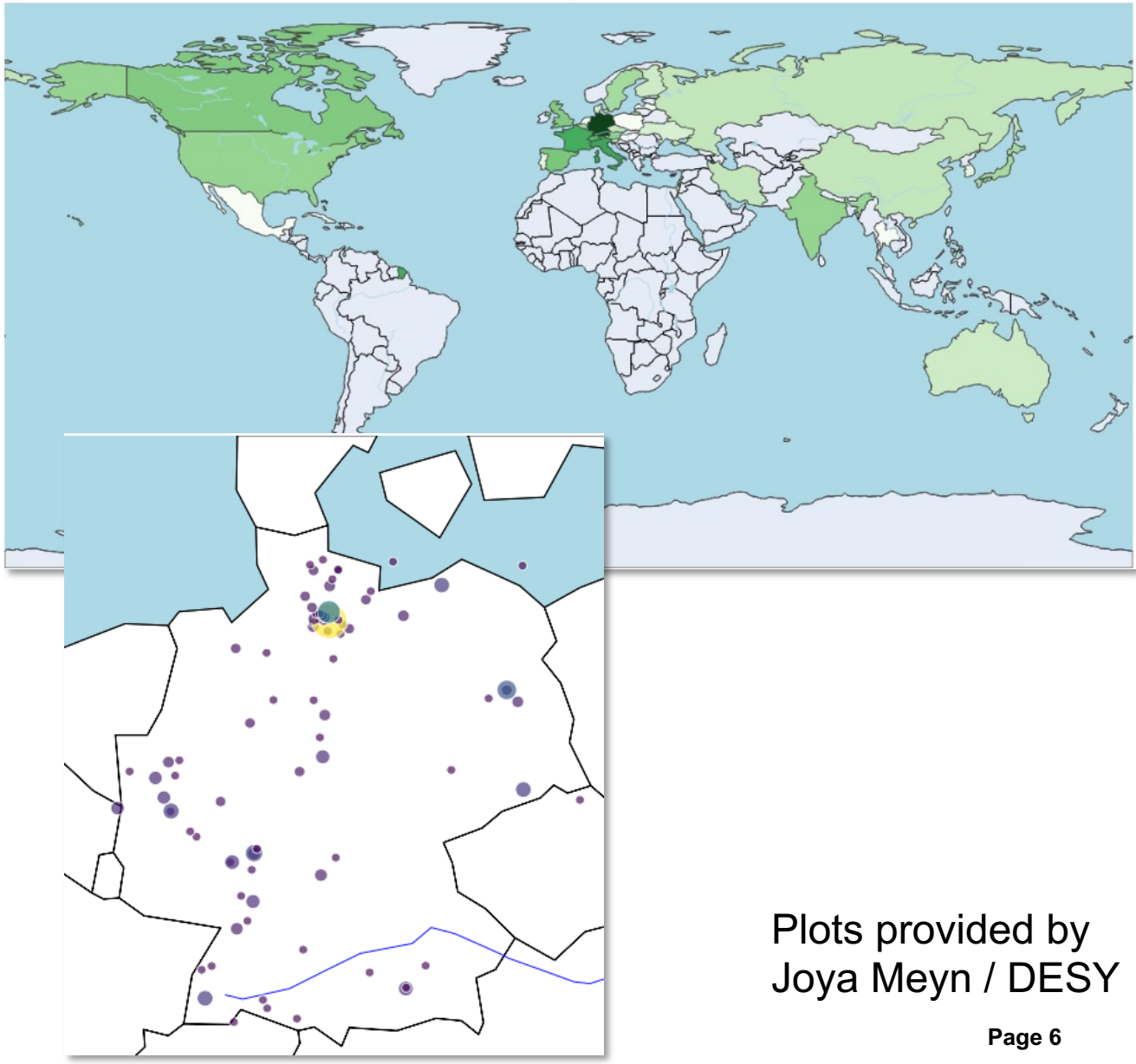


… approximate numbers from past 6 month

~1500 server,
~80k cores & ~250 GPU

IDAF is an instrument for the German and international community

- Interactive usage of the IDAF (Photon Science, HEP, Acclerator, …)
  - Truly used throughout Germany and the World!
  - IP adresses of ssh access to NAF & Maxwell HPC between 15.9-1.10.
  - World map: the darker, the more logins
  - Germany map: larger circles – more logins
- Grid: ATLAS, CMS, Belle II, ILC, …
  - worldwide community
  - usually submission using pilot jobs from central frameworks



Plots provided by Joya Meyn / DESY

Services in the IDAF … some highlights

For MU communities:

- WLCG-Tier2 & Belle II raw data center
- Recalibration of Belle II data

For MML communities:

- Direct connection & Tier-0 for MML LKII facilities at DESY FLASH / Petra III / EuXFEL
- Support for complete data lifecycle

For MT communities:

- Offer storage resources to accelerator division for operating and simulation resources for R&D
- Support for DESY TEST BEAM.

Services for all communities

- Interactivity & fast turn-around: Login-nodes, Jupyter, FastX remote desktop
- GPU resources
- Software installation & distribution, support
- Support of custom containers

Services on the roadmap → MT DMA

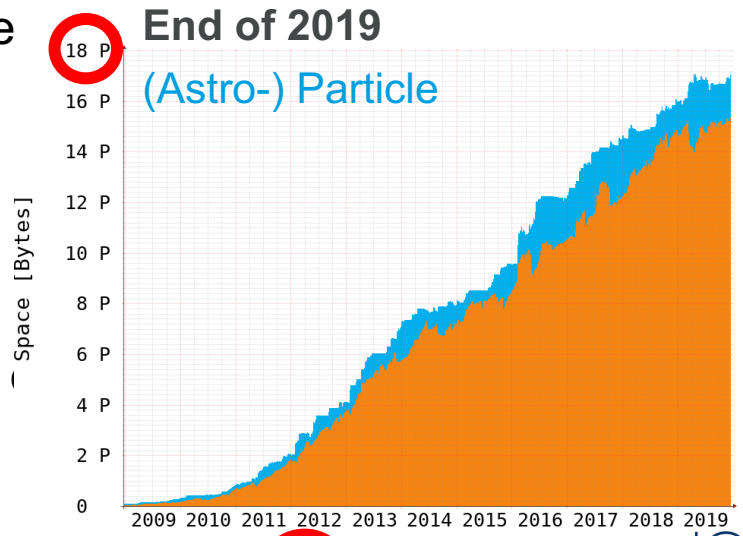
- Integrate data flow pipelines incl. data reduction
- Offer modern analysis workflows (e.g. Spark)
- Integration of catalogues & portals
- Support for OpenData & FAIR

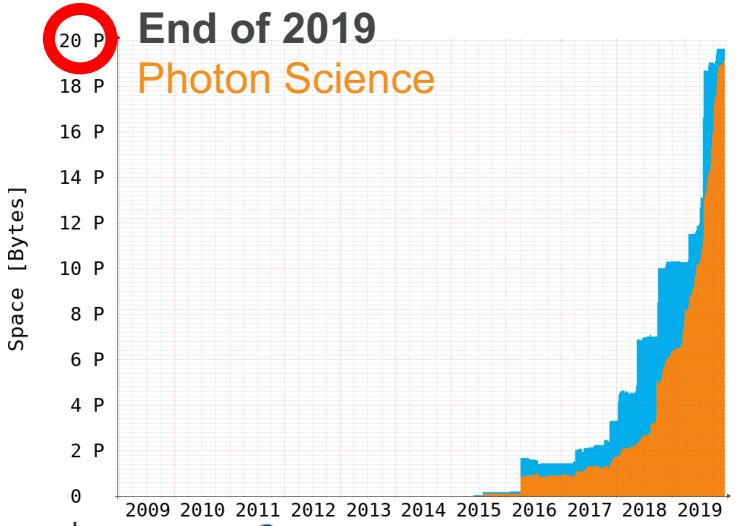
some of the challenges ahead

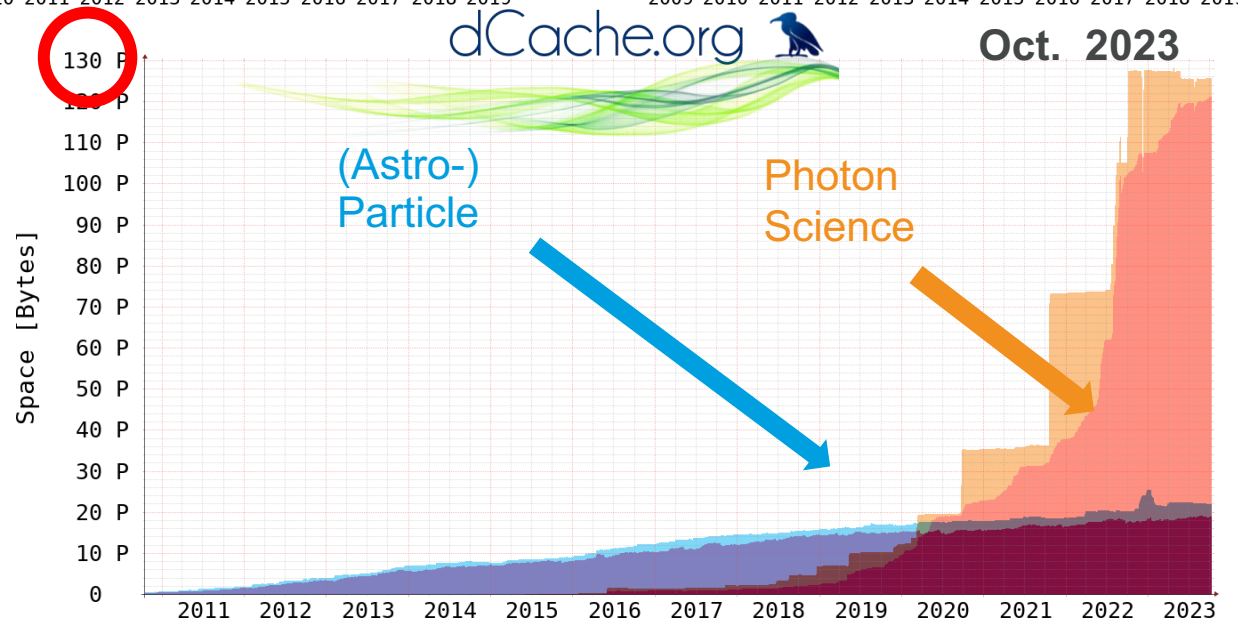
Challenges: Data Deluge in Photon Science

Photon Science and Especially European XFEL Continued to Grow Exponentially

- Date stored since beginning of PoF IV more than doubled
- **Accelerator division starts to contribute**
- HPC cluster storage similarly increased
- Capacity growth slow down/halt during end 2022 due to funding situation
- Alternative usage of existing capacity
- **More heavy involvement of tape storage** (as done by ATLAS in the WLCG)
- European XFEL still expects to collect 50PiB in 2024
- **Data reduction** essential! Integrate data reduction workflows
- **Observe scaling issues for the IDAF**







Challenges: Sustainability

How to Make the Infrastructure more Sustainable

Constant improvement on PUE in DESY CC and infrastructure on DESY Campus … ongoing since years

- Hardware life cycle under close watch

Compute: Adapt hardware availability to power availability and/or user needs

Storage: Unused data on tape → Tape?

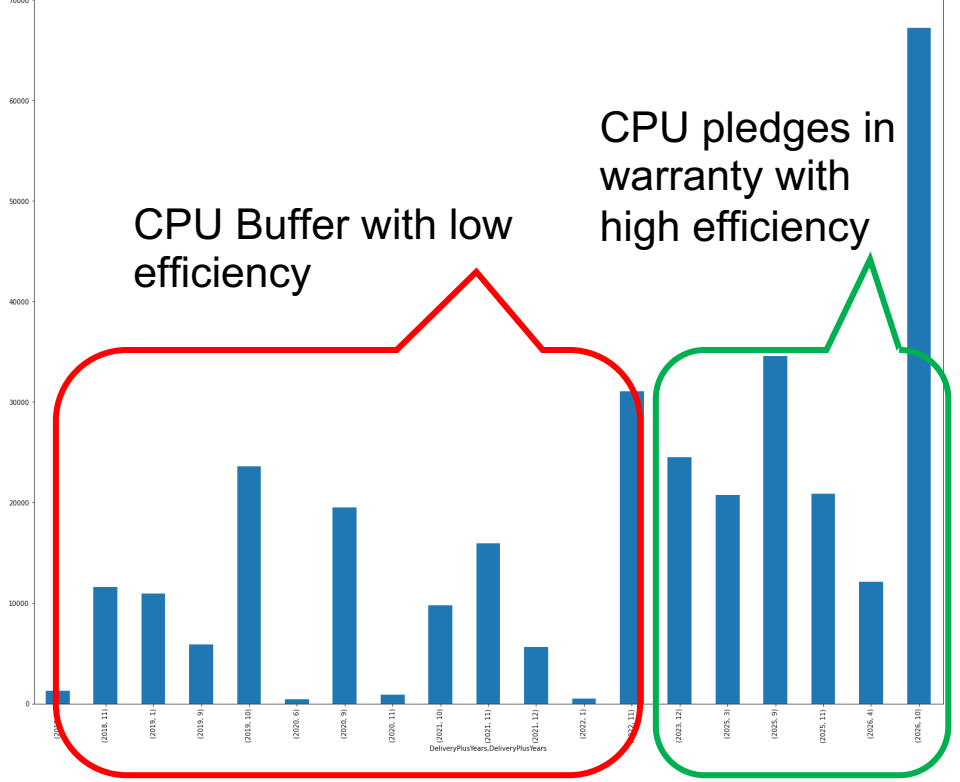
Raising **awareness** of users

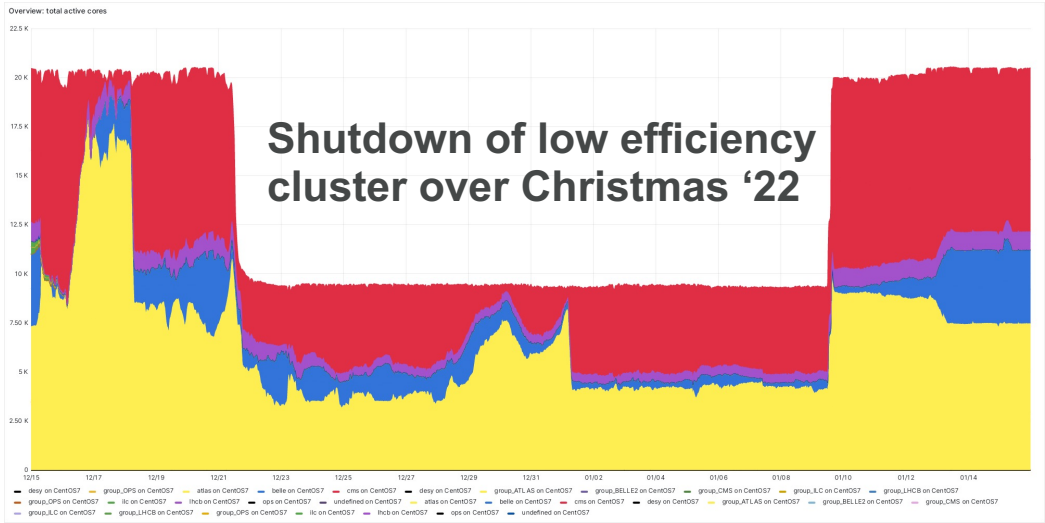
Train users on most efficient use of IDAF

Train users on tooling and optimal algorithms

Interactivity and fast reaction come with inefficiencies:

- Re-evaluate how much is needed
- Eventually tax users
- Work on scheduling and availability

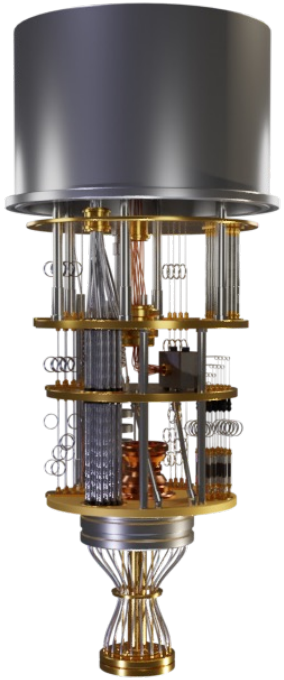




Provided by T. Hartmann

Challenges: Hardware evolution and Person Power

Difficulty Acquiring Hardware and Filling Open Positions



Hardware evolution

- Short-term: Supply chains have still not returned to full capacity after end of pandemic
- Short/mid-term: GPU: NVIDIA dominance is not healthy, need combined effort to overcome
  - many interesting architectures / accelerator products out there, we should be more open and flexible
- Mid/long-term: Cloud providers driving technology … and making it private
  - Started to offer tape for ‘ultra-cold storage’ ➜ profound effect on design of tape libraries not well suited to the IDAF
  - Some architectures already now only available in commercial clouds
- Mid/long-term: First quantum computer commercially available. Bring QC into the IDAF

Person Power

- More and more difficult to fill open positions and attract people for IDAF operation & development

Summary, Outlook:

- Providing resource, services and support for MU, MML & MT
- Enabling new technolgies
- Large, stable, scalable core at the center
- Important asset for Science in MATTER