BSBF 2022

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Parallel Session A4: ICT Challenges

Mark JOHNSON – Institut Laue Langevin

IT @ ILL: an overview

ILL

- is a large SME (500+ staff) operating a research reactor that delivers the world's most intense neutron beams
- is a 'user facility' with about 1500 user visits/year from a community of ~10 000 → user services
- Performs ~1500 experiments/year → data management & services

→ 3 ICT-related services:

- IT, Instrument control, Scientific Computing

IT @ ILL

Serving the ILL, its users and the experimental programme

- Equipments
  - Desktop/Laptop (~ 2K equipments)
  - Servers (Virtualisation infra, HPC, Bare-metal...)
  - Light equipments (videoprojectors, meeting room video equipment, digital signage...)
- Data storage
  - Institutional data (emails, shared docs, applications data...)
  - Scientific storage
- Network
  - Wired network access to multiple buildings
  - Wi-Fi
- Telephony
  - Phones system with wireless phones (~2k lines)
  - Mobile phones
  - Specific communication equipments
- Physical security systems
  - CCTV
  - Physical access control
- Software solutions (except for science)
  - Classical third party applications
  - In-house developed applications
- User support
  - proposal evaluation, experiment scheduling,…

IT @ ILL

Future projects

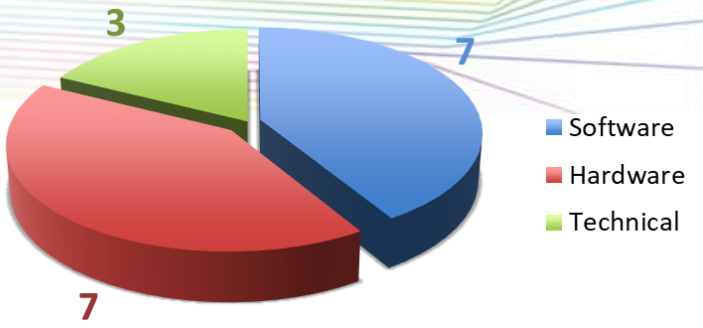
- Hardware
  - Increase remote data analysis capacity (Openstack compute nodes) every year
  - Scientific storage Part 1 (2023 - Call for tenders is closed)
  - Scientific storage Part 2 (2025 - 4PB)
- Network
  - Redeploy wired copper cables globally on site 2023-2025
  - Refresh/replace Wi-Fi solution (currently CISCO) 2023-2024
- Software solutions
  - Switch to a Kubernetes / microservices (k8s infrastructure+training) - 2023

IT Procurement volume

Year	Procurement volume (million EUR)
2023	1.5
2024	0.8
2025	0.8
2026	1.2
2027	0.8

Instrument Control

Developing & driving instruments, smart delivery of data



Hardware/electronics

- Digital and Analog electronics
- Data acquisition
- Motion control
- Chopper control
- Detectors (HPGe, Scintillators)
- Sensors
- Special sample environments
- Power units
- Cabling

Software & Data

- Instrument control
- Data visualisation
- Data storage
- Mobile devices
- Electronic logbook
- Instrument web survey
- Instrument computers
- Remote experiments

Instrument Control

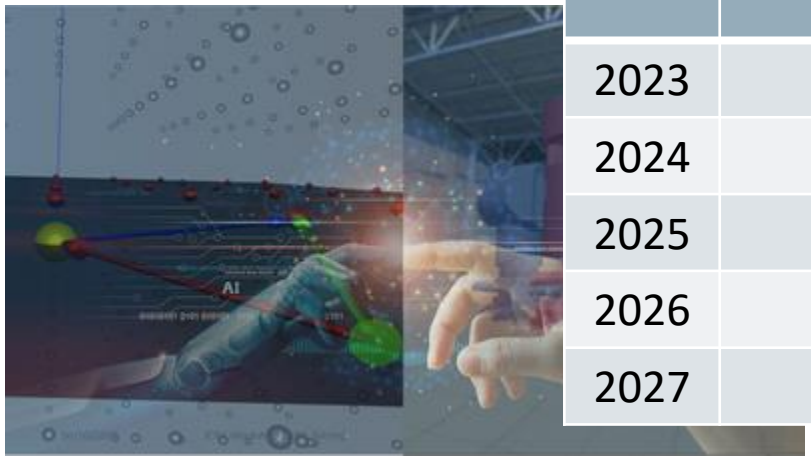
Future Plans - HARDWARE

- Detectors: CMOS cameras, Pixel detectors, Si-PM
- Digital electronics for charge-division detectors
- Digital CFD for picosecond timing
- ZYNQ based board for data acquisition
- Low noise, low consumption, fast response analog preamplifier
- Robot for sample positioning and handling
- Framework for continuous scan
- Adaptive neutron optics

Instrument Control

Future Plans - SOFTWARE

- On-line data reduction
  - Generate consistent data sets
  - Automate decisions during experiment
  - Reduce data size
  - Speed-up analysis
- Remote instrument control
  - More connected devices
  - Remote clients
  - Distributed environment
- Autonomous measurements with machine learning
- Full experiment simulation including instrument digital twin



Year	Instrument Control Procurement volume (million EUR)
2023	0.4
2024	0.4
2025	0.4
2026	0.4
2027	0.4

Scientific Computing

Data analysis, simulating instruments and samples

- Collaborative data treatment software development e.g. Mantid
- Integration with instrument control & autonomous experiments
- Hardware for simulations (provided by IT)
  - CPU clusters, GPU capability
  - Periodic ~100 k€ investments

Please get in touch…

Contact people

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THANK YOU FOR YOUR ATTENTION

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