ACDC Kick-Off Program

12:45 – 13:00	Welcome & Registration	
Introductions		
	Opening	Daoud Sie and Katy Wolstencroft
13:00-13:10	Core Facility Sector Plan	Rogier Postma
13:10 – 13:25	The Science Case – Multi-omics and visual omics research at AUMC	Eric Reits
13:25 – 13:45	The ACDC platform	Daoud Sie & Katy Wolstencroft
Research support for Omics & Bioimaging		
13:45 – 14:00	A FAIR outlook for AUMC researchers	Elize Vlainic
14:00 – 14:10	Funding Opportunities for Core Facilities in grant applications	Laura Manca
Coffee Break		
ACDC Ongoing projects & User stories		
14:30 – 14:40	Automating metadata structuring for Metabolights submission	Karen Sap
14:40 – 14:50	Genomics data pipelines with iRODs	Bilgehan Nevruz
14:50 – 15:00	Proteomics and pooling data for analyses	Alex Henneman
15:00 – 15:10	Making Flow Cytometry Flow	Alberto Miranda Bedate
15:10 – 15:20	QuPath Analysis on HPC	Giulia Bergamaschi
15:20 – 15:30	Genomics analysis on HPC	Yongsoo Kim
15:30 – 15:40	Biomero – compute and imaging	Przemek Krawczyk
15:40-15:50	Q & A all project talks	
Wrap-up & Close		
15:50 – 16:05	ACDC Roadmap	Katy Wolstencroft and Daoud Sie
16:05 – 16:15	Wrap-up and close	
16:15 – 17:30	Drinks	

Amsterdam UMC
Universitair Medische Centra

Core Facility Sector Plan

Rogier Postma – Managing director division 9

Amsterdam UMC

A Healthy Future For All

Multi-year strategy Amsterdam UMC

Today's challenges

Growing demand for care
Aging population
Tight labor market
Climate change
New pandemics

Impulses

Acting today for a better tomorrow
Health and sustainability are part of our DNA
Digital transformation for all
Flexibility for employees

Discovering Tomorrow's Healthcare Together

Core values

Caring
Proactive
Inquisitive

Core tasks

Research
Care
Education & Training
Valorization

Our ambitions

Our role

- We're taking action to help shape the health-care of the future.
- Stronger networks and alliances.

Our colleagues

- Diversity is our strength.
- Social connection is key.
- We're harnessing tech-nology to change the way we work.
- We trust each other

Our content

- Connecting core tasks for innovation
- Towards a healthy and sustainable future.

Amsterdam UMC

What do you mean, rocket science?
There's nothing we can't do together.

Join us!

Imaging & Omics Core Facilities

- **Imaging & Omics Core Facilities**
  - Cellular Imaging
  - Proteomics Core Facility
  - Core Facility Metabolomics
  - Microscopy and Cytometry Core Facility
  - Core Facility Genomics





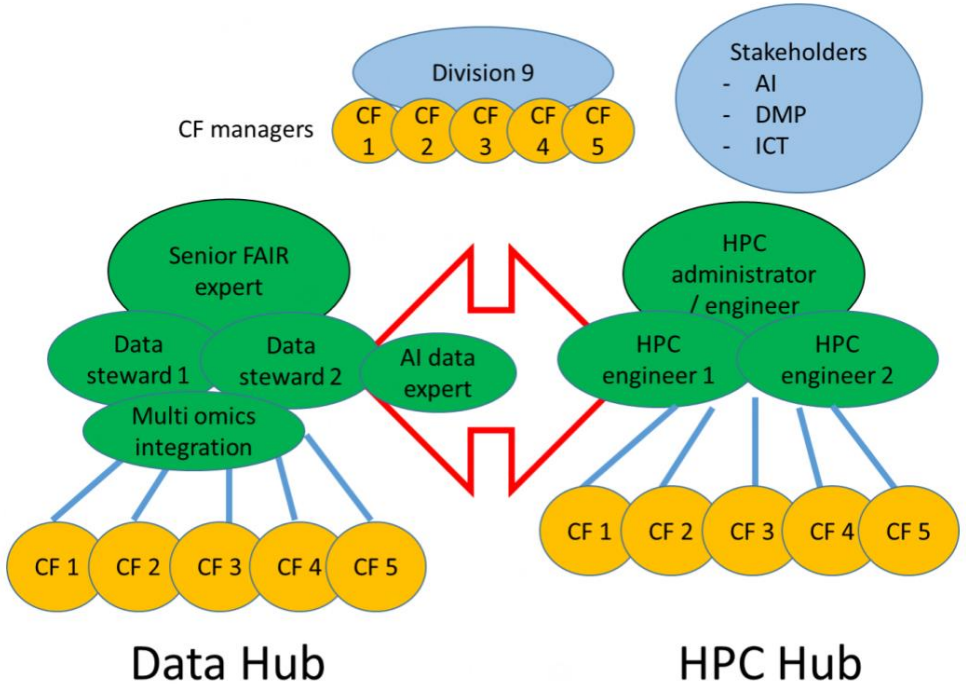
Core facilities Amsterdam UMC outlook 2023

- The rapid developments in advanced imaging and omics technologies and AI data analysis in life sciences are facilitated by the 5 Amsterdam UMC Core Facilities (CFs) covering flow cytometry, microscopy, genomics/transcriptomics, proteomics, and metabolomics. State-of-the-art technologies, professional training and support, optimal quality control, and efficient use of instruments enable scientific breakthroughs by the Amsterdam UMC research community, yet the harmonized core facilities are faced with a number of challenges that need strategic investments.

- We propose to create a 1) Data Hub to integrate CF data (FAIR and AVG compliant) and a 2) High-Performance Computing (HPC) Hub for all CF data, enable pipelines and applicable for scientists. Integrating data from imaging and omics core facilities will catalyze innovations, minimize impact on costs for researchers, and enhance the visibility of Amsterdam UMC in the Dutch and European research infrastructure landscape. Strengthening the Amsterdam UMC core facilities and combining the advanced data-management and AI-driven data analyses, the Amsterdam UMC can take on ambitious challenges in life sciences and beyond, enabling breakthrough impacts in research towards new therapies in personalized and regenerative medicine.

Omics & Imaging Data & Compute Hub

- Integrated data and compute platform
- Consolidate local solutions
- Enable multi-omics and AI research
- For the core facilities and their users



Amsterdam UMC
Universitair Medische Centra

Multi-omics & visual-omics research at Amsterdam UMC

Kick-off – 10-03-2025

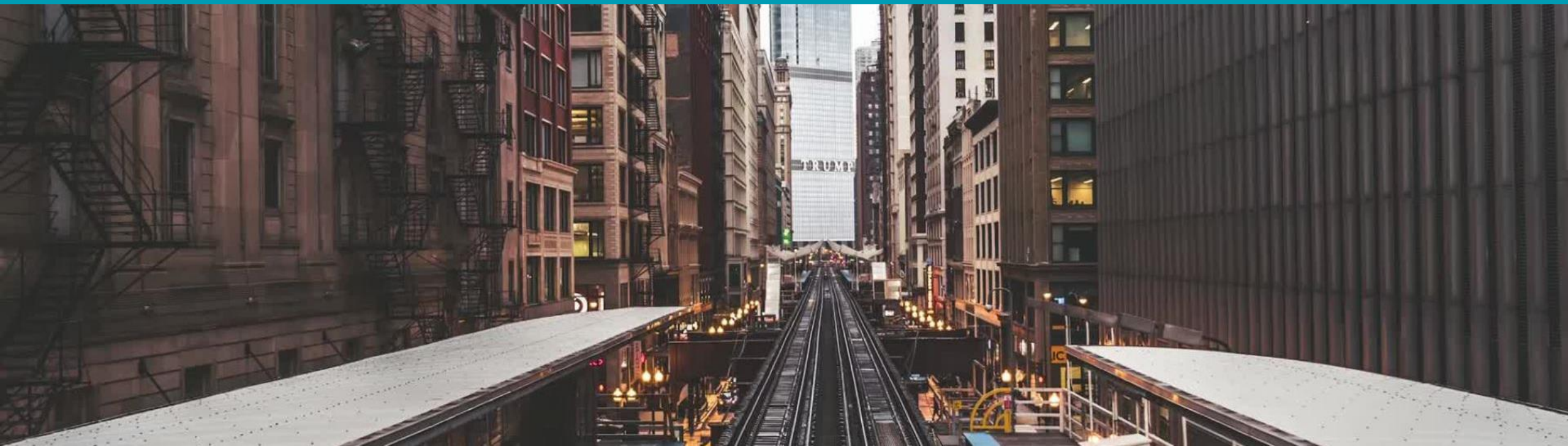
Prof dr. Eric Reits – Facility director Cellular Imaging

Amsterdam UMC
Universitair Medische Centra

The Advanced Compute & Data Core

Dr. Daoud Sie

Dr. Katy Wolstencroft



AC

Daoud Sie

DC

Katy Wolstencroft

Alex Henneman

Bilgehan Nevruz

Karen Sap

Alberto Miranda Bedate

Infrastructure to Provide

FAIR Research Management

Omics, bioimaging and multi-omics

Integration and reuse

High Performance Compute

Omics and bioimaging expertise

For AI and LLM training

For Big Data analysis

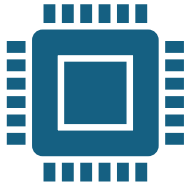
Sustainability

Efficient use of common resources

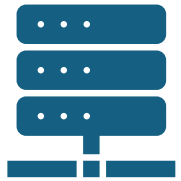
Continuity and collaboration

Components of the ACDC Infrastructure

Data: formats, size, storage, archive, backup, accessibility



Compute: CPU, GPU, accessibility/security, software



Metadata: protocols experiments, models, instruments, raw data, derived data, workflows

Analysis Workflows: provenance, data links, reproducibility

Design Principles

Reuse components

Build on existing software

Adopt community standards

Incremental Approach

Immediate bottlenecks in each CF

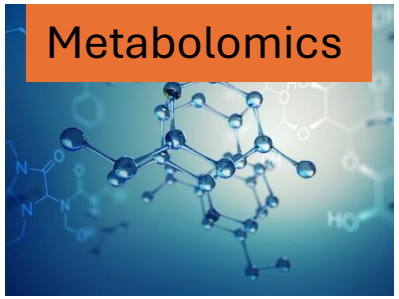
Improve the FAIRness of each CF

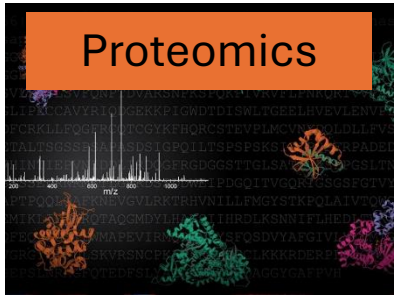
Pilots first, get feedback, then extend

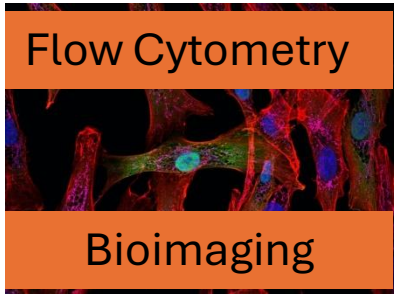
Minimise extra work

Automation and integration

We like DM and HPC, but its not for everyone!





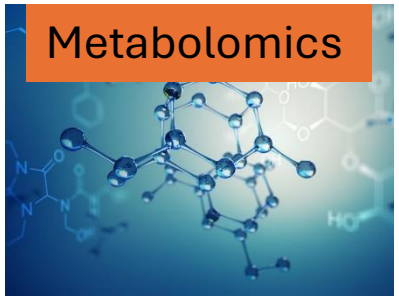
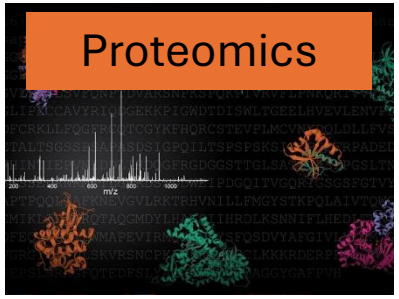


Supporting the Data Life Cycle

Build on existing standards and tools

- AUMC RDM, ICT compute and storage, data privacy, data policy
- FAIRSharing.org – standards registry
- ELIXIR Research Data Management Toolkit – recommended tools

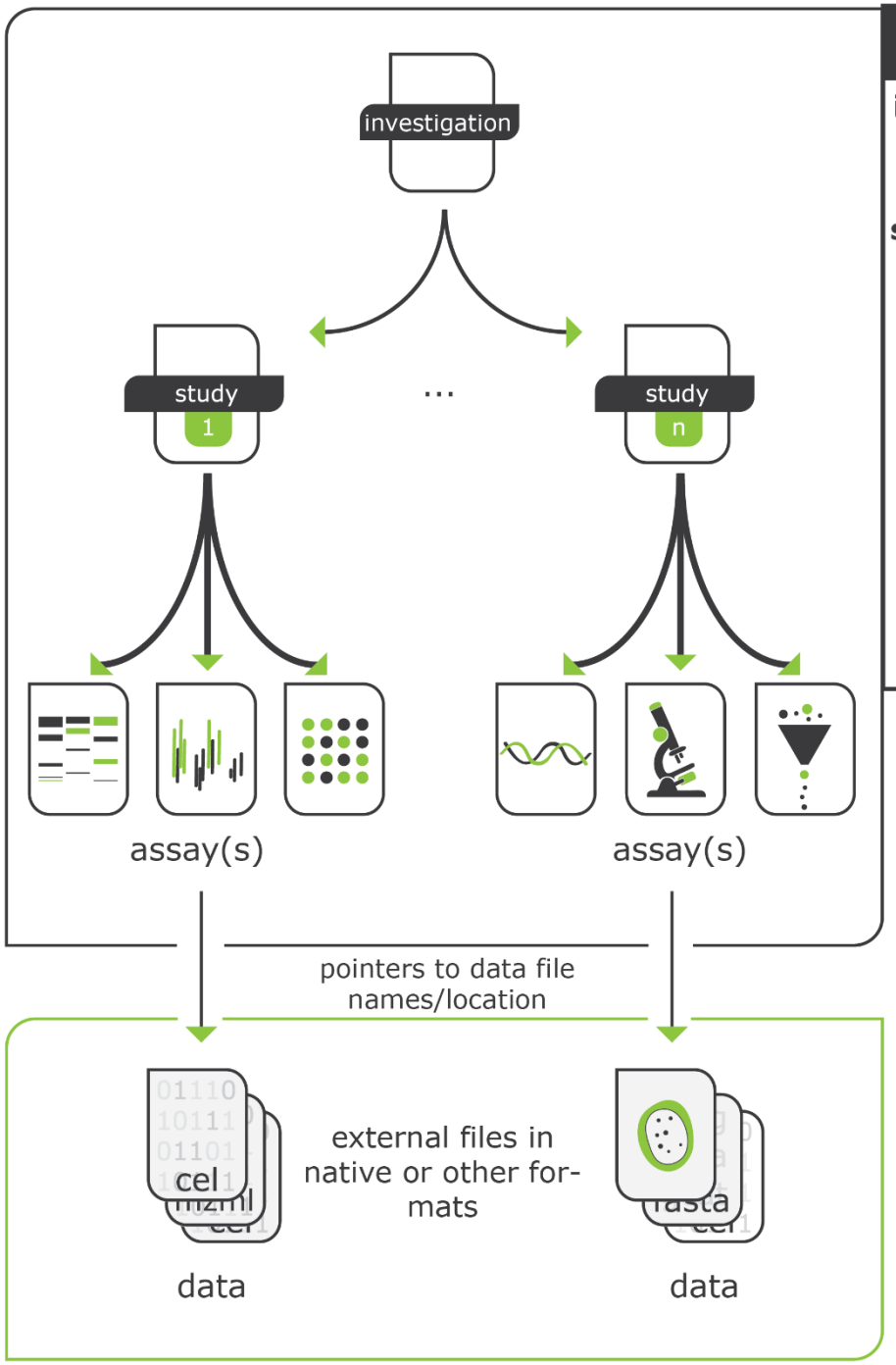
Gap Analysis and Harmonisation

	Standards	Data Formats	Repositories	Community
 Metabolomics	ISA-TAB ChEBI	mzML	MetaboLights	MSI
 Proteomics	MIAPE-MS MIAPE-MSI MIAPE-Quant PSI-MS	mzML mzIdentML mzQuantML	Proteome Xchange	PSI HUPO
 Genomics	MIxS, MINSEQE SO	Fastq Bam Bed	ENA EGA	INSDC, HUGO, GSC
 Flow Cytometry	MiFlowCyt FlowCL	FCS/ACS	Flow Repository	ISAC
Bioimaging	REMBI Fbbi	OME-TIFF/Zarr	BioImage Archive	OME, image.sc

Multi-omics ISA Investigations Studies Assays

Recommended and used by:

- Public repositories, e.g. Metabolights
- ELIXIR and RDMKit
- Health-RI Omics working group
- Netherlands X-Omics



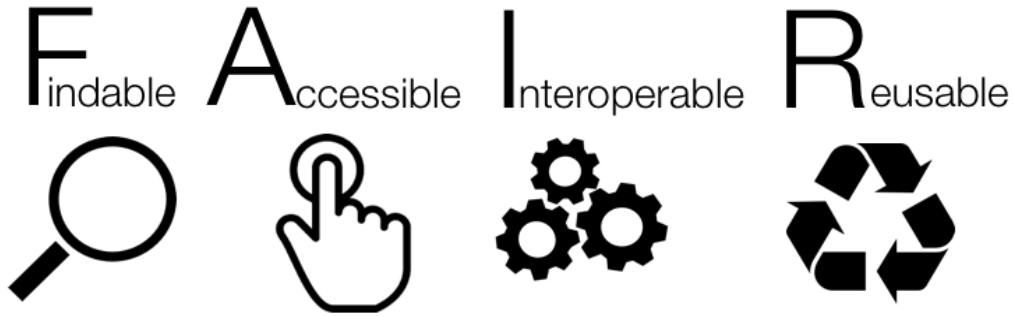
isa

investigation
high level concept to link related studies

study
the central unit, containing information on the subject under study, its characteristics and any treatments applied.

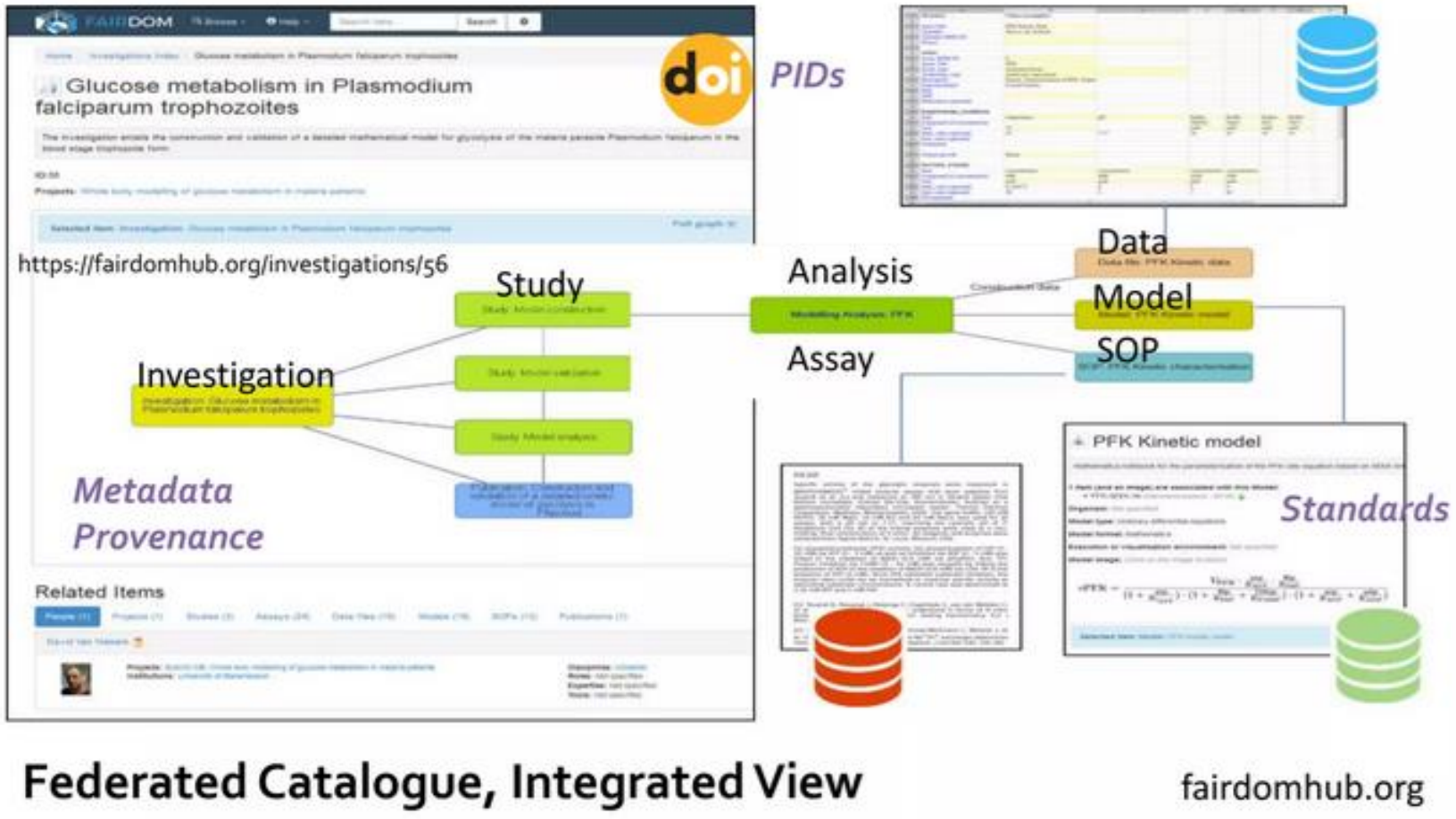
*a study has associated **assays***

assay
test performed either on material taken from the subject or on the whole initial subject, which produce qualitative or quantitative measurements (data)



Findable	Accessible	Interoperable	Reusable
F1: **(Meta)data** with unique PID F2: Rich **Metadata** F3: **Metadata** include ID of data F4: **(Meta)data** indexed in searchable resource	A1: (**Meta)data** retrievable by ID, protocol is open, authentication and authorisation where necessary A2: **Metadata** are accessible, even when data is not	I1: Shared formal language for **knowledge representation** I2: **(Meta)data** use FAIR vocabularies I3**: (Meta)data** include qualified reference to other **(meta)data**	R1: (**Meta)data** are richly described with: - **Data usage license** - **Clear provenance** - **Meet relevant community metadata standards**

FAIRDOM SEEK: Experimental Context



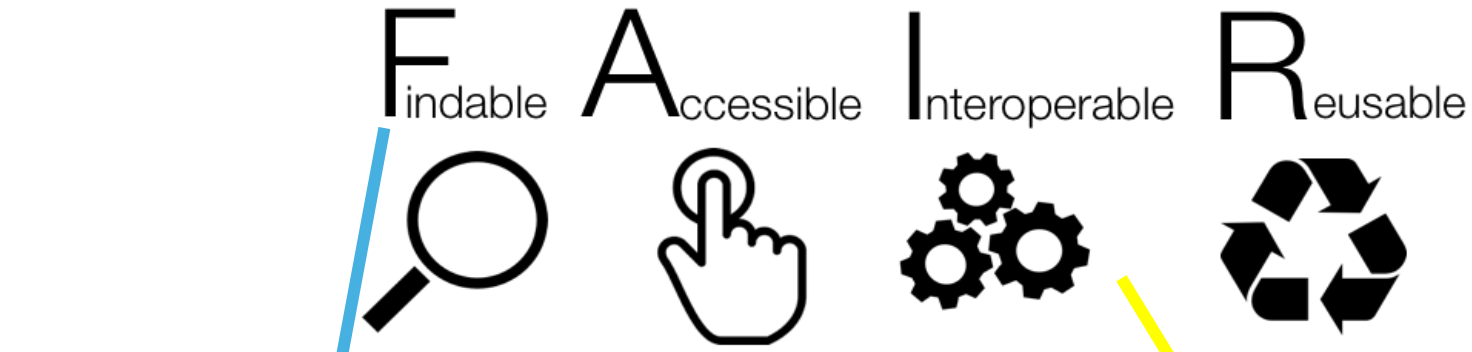
FAIRDOM-SEEK software is:

- Natively ISA
- Open-source software
- BSD License.
- Source code on GitHub

- Recommended in RDMKit
- Widely adopted

- A repository and a registry

Wolstencroft et al, Nucleic Acids Research (2017)

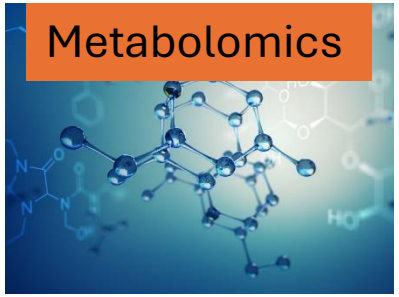


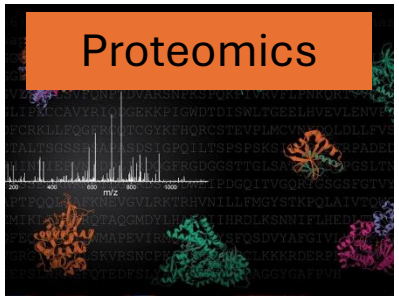
Reuse metadata templates
Guided by ACDC
Helped by AI agents

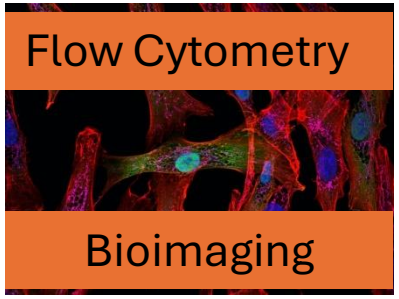
Decide who can see your data and in what circumstances

Infrastructure provides!

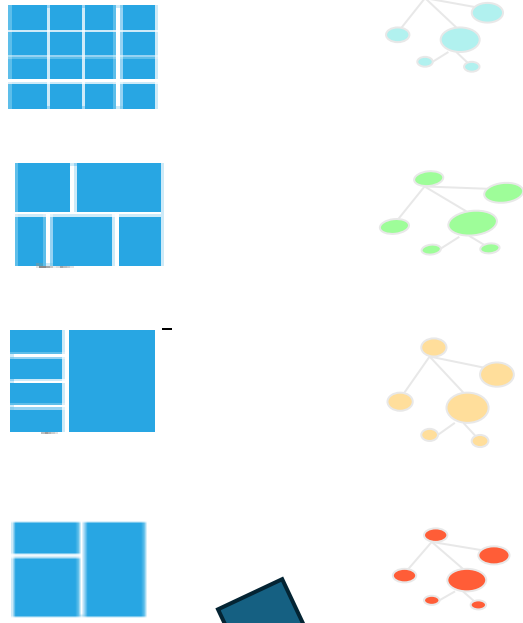
Link data and analyses
Licenses
Public repositories



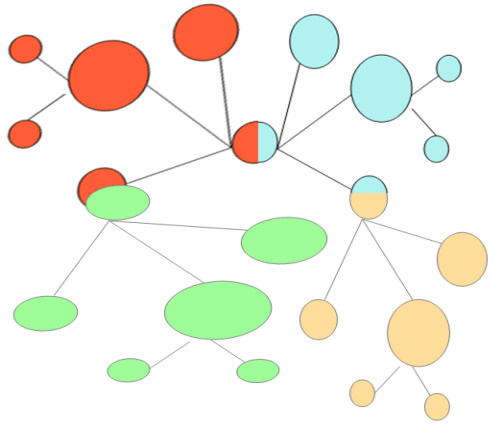




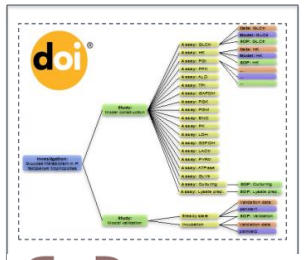
Catalogue of **Findable** Research Assets



Interoperable research assets and results. RDF FAIR Data Point



Reuse: Package, integrate and publish and archive



Accessibility
Permissions and Tiering

health RI
enabling data driven health

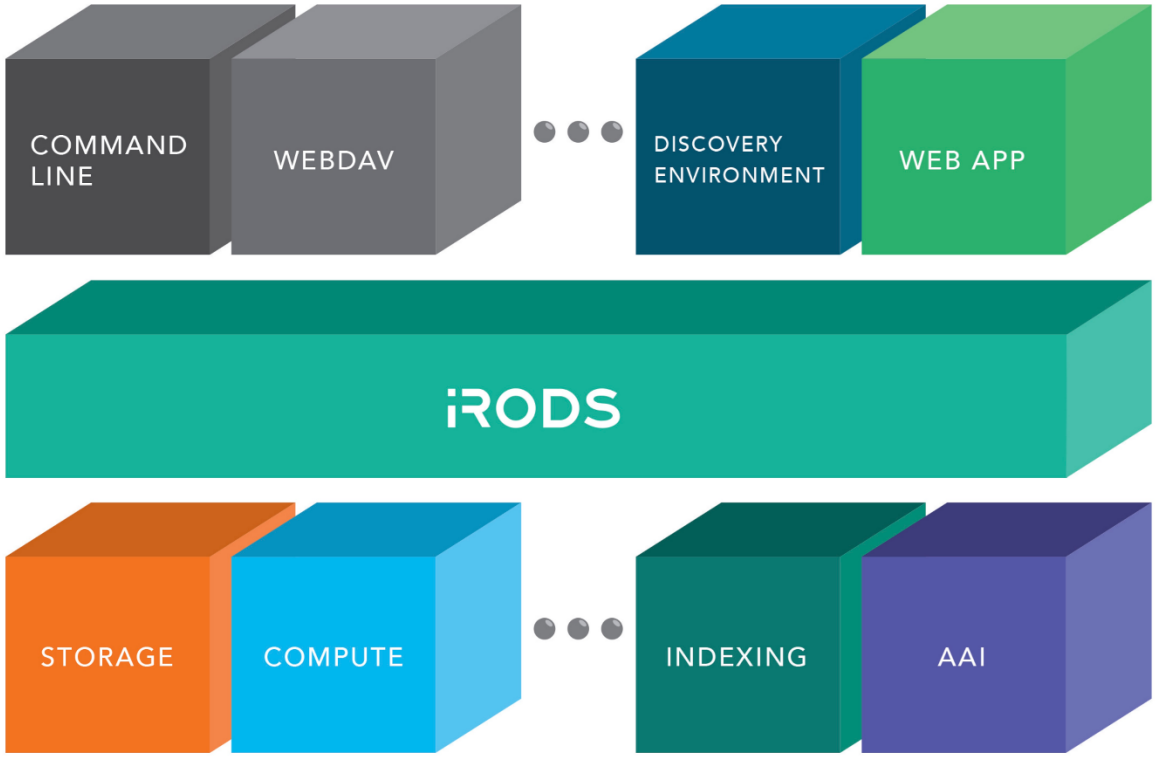
SURF

Amsterdam UMC

MetaboLights

FLOW Repository

Reuse of Data Infrastructure
iRODS: Integrated Rule Oriented Data System

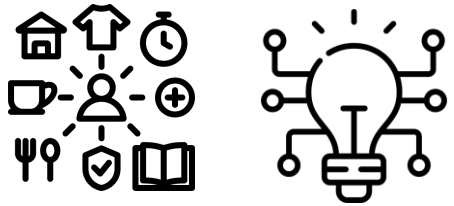


Open-Source and widely adopted

- **Data Virtualisation** – automated ingest, backup and tiering
- **Data discovery** – simple metadata associated with data objects
- **Workflow automation** – rules engine determines actions triggered
- **Secure collaboration** – permissions and federation

High Performance Compute Core

- Granted innovation budget by board of directors
  - *"Impuls Digitalisering en Technologische Innovatie"*



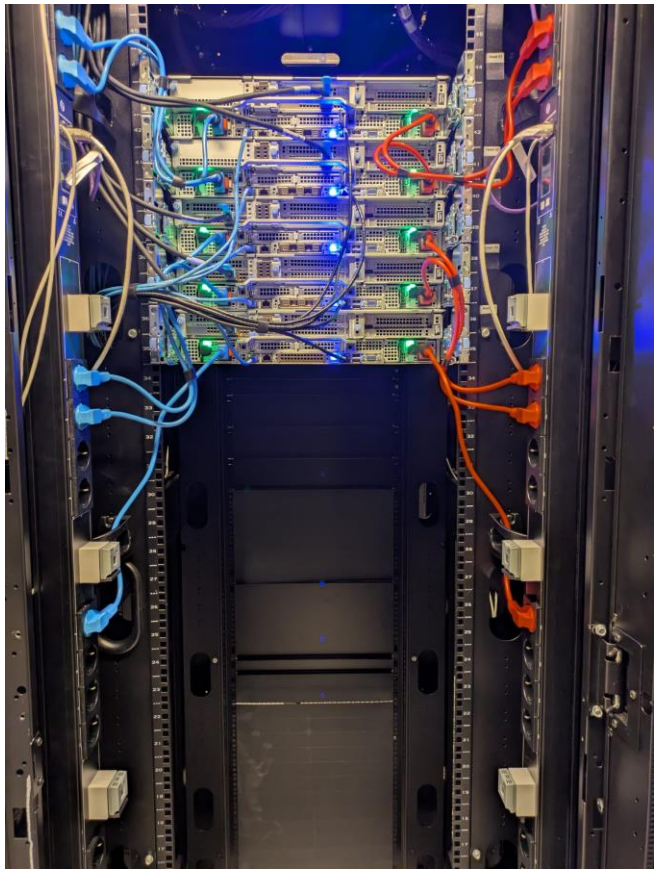
- Pre-funding to:
  - Invest in base HPC infrastructure
  - Respond to user needs
  - Respond to innovations in the field

- Privacy, security & compliancy
  - To support both research & diagnostics

- Sustainable
  - Consolidate siloed HPC resources

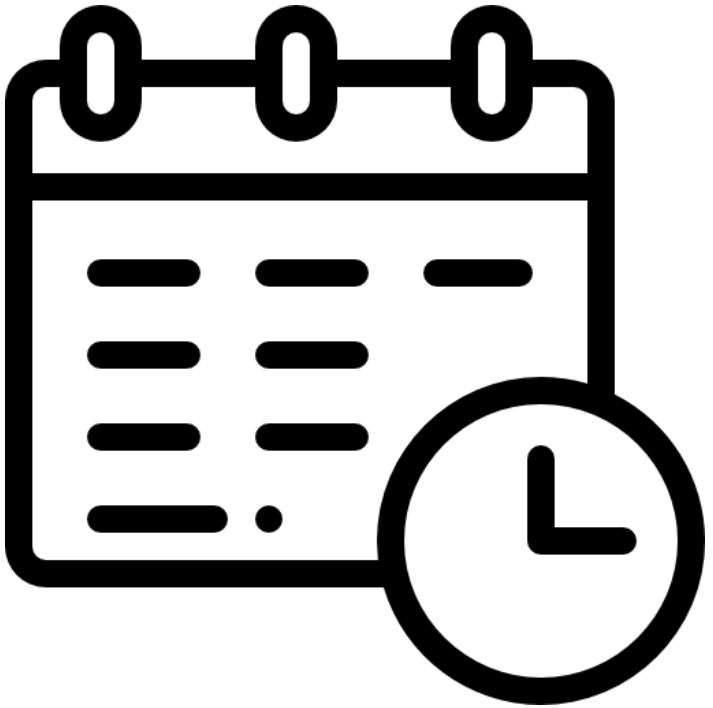
Boelelaan MedFac

Meibergdreef Datacenter



Planning

- **31th of March 2025 :** Release new HPC cluster
  - Validated with diagnostic pipelines
  - Validated with standardised pipelines
  - Start migration of users
  - Consolidation of siloed HPC Resources



Support & admin team:

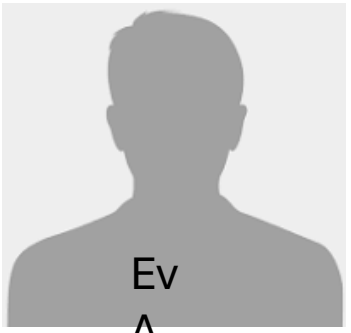
- Collaboration of many departments:
  - **ACDC**
    - Human Genetics
    - Radiology & Nuclear Medicine
    - ICT
    - Research Support / RDM
    - Zorg Support (EvA / ICT)
- To provide:
  - User group meetings
    - Updates & feedback (bi-directional)
  - MS Teams page
  - Training & education

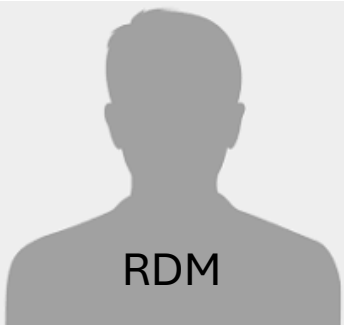


Humane Genetica



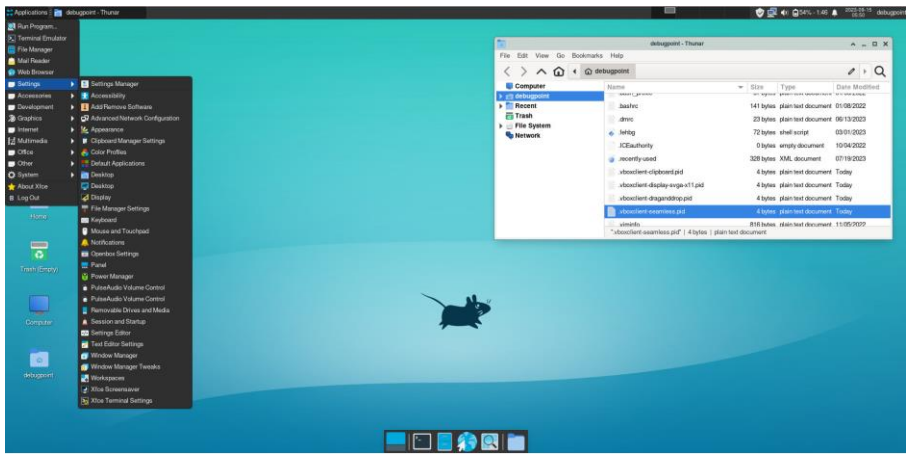
Radiologie en Nucleaire Geneeskunde





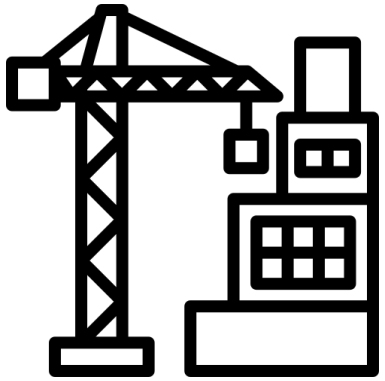
Applications

- Terminal interface
  - MobaXterm (SSH client with X server)
- Desktop interface
  - Remote XFCE desktop (RDP)
- Web interface
  - OpenOnDemand
    - VisualStudio Code / Pycharm (websocks)
    - Matlab (webVNC)
    - RStudio / Posit (websocks)
    - Jupyter notebook (websocks)
    - Remote XFCE desktop (webVNC)



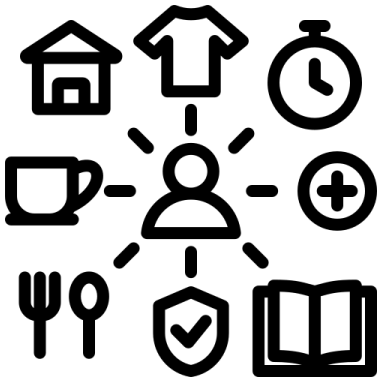
In summary

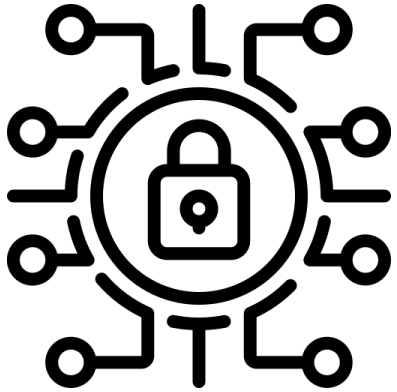
- High Performance Compute Infrastructure
- Data Management Infrastructure



- Expertise
- Support community

- Applications – user interface
- Safety & security
- Privacy & compliancy





Today's speakers

BioImaging, Genomics, Proteomics
Przemek Krawczyk

DMP - Elize Vlainic RDM
Grant Support – Laura Manca
All CFs

Proteomics, Metabolomics, BioImaging, RDM
Karen Sap

Metabolomics, Proteomics, Bioimaging
Karen Sap & Przemek Krawczyk

Genomics and Flow Cytometry
Bilgehan Nevruz and Giulia Bergamaschi

Genomics, Flow Cytometry
Alberto Miranda Bedate
RDM, Privacy

Genomics, Proteomics and Flow Cytometry: Bilgenhan Nevruz, Yongsoo Kim,Alex Henneman & Giulia Bergamaschi