



ASTRO - NFDI

Astronomy, Astrophysics, Astroparticle Physics
Astrophysics in the NFDI

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on behalf of ASTRO - NFDI

Community

- Rat Deutscher Sternwarten
- More than half of German astronomical institutes are actively participating in Astro-NFDI, others support the consortium
- LRZ, KIT, FZJ as HPC (and data storage) providers are involved
- participating in ESCAPE, SOLARNET and other European roadmap projects, as well as in EOSC
- involved in many international collaborations (instrument and facility building, surveys and satellite projects)
- International Virtual Observatory Alliance via



13.06.2019 / Astro-NFDI DPG

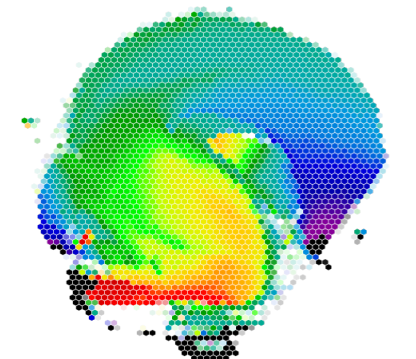
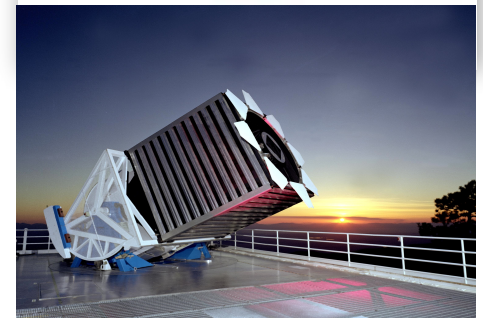


Our data is highly diverse

- Highly varying observational data types from
 - Various frequency ranges of EM spectrum
 - Gravitational data
 - Particle (decay) data
 - simulation data
 - cosmological simulations
 - starformation processes
 - Magneto Hydro Dynamical processes
 - experimental data
- + biological, geophysical, meteorological data
- almost no commercial value
 - no privacy protection problems



$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{4\pi G\rho}{3} - \mathbf{K} \frac{c^2}{a^2}$$



What can we contribute to the NFDI?

- Connecting and working with multitudes of data structures and distributed archives
 - Collaborative use of distributed data archives
 - International reuse of data collections
 - Collaborative Research Environments
- Standardised data exchange protocols and metadata schemata
 - partially used and proved
 - International Virtual Observatory Alliance (+GAVO) travails (almost 20 years)
 - standardized access to data collections, interoperability, (partially FAIR)
 - registries for services and data archives
- Open Source Software
 - sustainable scientific software development
- Interdisciplinary contributions
 - Research Data Management Organiser (RDMO)

What do we need/expect building and collaborating in NFDI ?

- Extension of FAIR data policies in our discipline
 - Interoperable, interdisciplinary standards und metadata, DOI
 - Support and enabling of collaborative research in national and international collaborations
- Building sustainable competence/data centers for (astronomical) data
 - Data management (curation, provenance, publication)
 - Data publication software
 - Solutions for ‚last dirty mile‘ (small data collections)
- Code to the Data:
 - Collaborative Research Environments (CRE) ,
 - Machine learning
 - Distributed data processing
- Scientific Software Support
 - supporting generic Open Source Software (e.g. astropy)
 - managing data and connected software as units
- Resolving lossy data problems and managing ‚live data‘
- Connecting data and publications

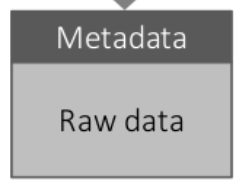
Eco-System of scientific data



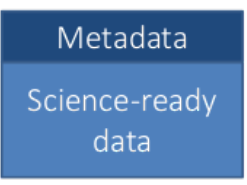
Data sources: Observations
Expected data production:
several Exabyte/year



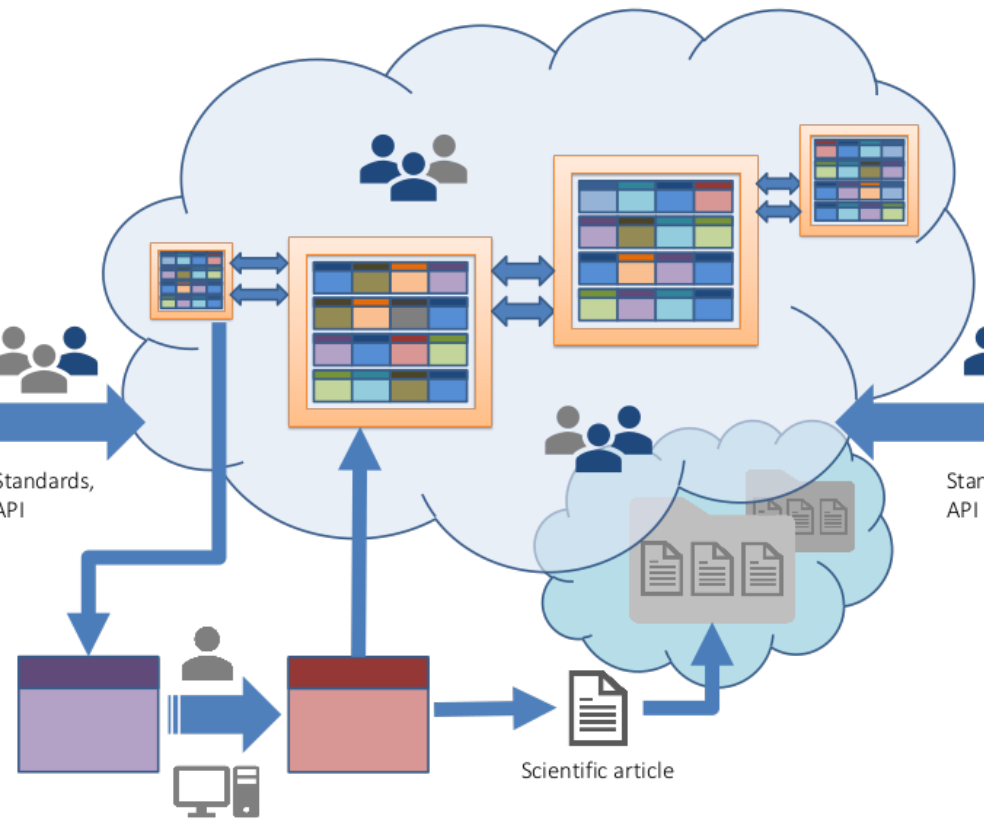
Data sources: Simulations
Expected data production:
several hundred Petabyte/year



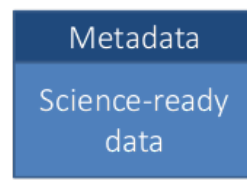
Quality Control
Processing
Curating



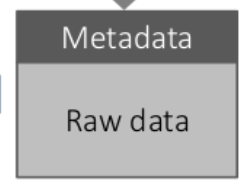
Standards,
API



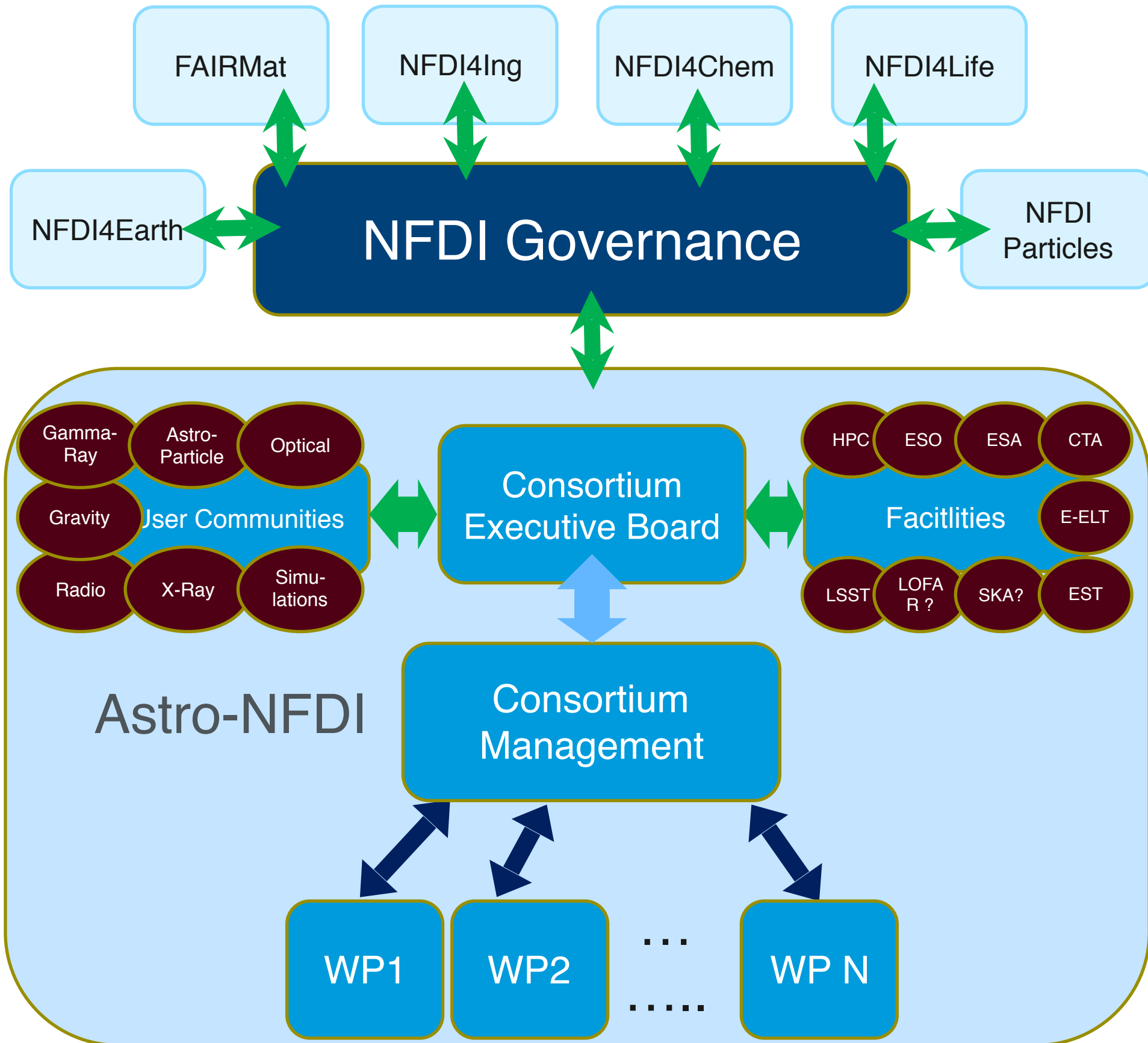
Standards,
API



Quality Control
Processing
Curating



Scientific article



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Astro-NFDI: Consortium Workpackages

Current Workpackages

1. Governance, Consortium Management
2. Distributed Services and Structures
3. Data Workflows
4. Software for Data
5. Data Irreversibility Challenges
6. Synergies / Interaction with other consortia
7. Training, Summerschools etc., (Education)

Astro-NFDI: WP Governance, Organisation

Structure of consortium

- * organisation
 - starting structures
 - intermediate target structures
 - longterm target structures

- * NFDI interaction
- * European and International interaction

- * policy development and implementation

Astro-NFDI: WP Distributed Services and Structures

Available resources and facilities:

assessment + development

Virtual Observatory

data archives

available services

interactions of facilities and users

applied metadata systems

Digital Data Identifiers

Metadata packages,

FAIR data requirements

Provenance

changing requirements:

‘real time’ astronomy vs. ‘conventional’ astronomy

Astro-NFDI: WP Default Data Workflows

- from ‚fresh‘ data to science ready data
- from science ready data to science data

- * required metadata, components
- * pipelining, verification
- * curation, preservation, publication

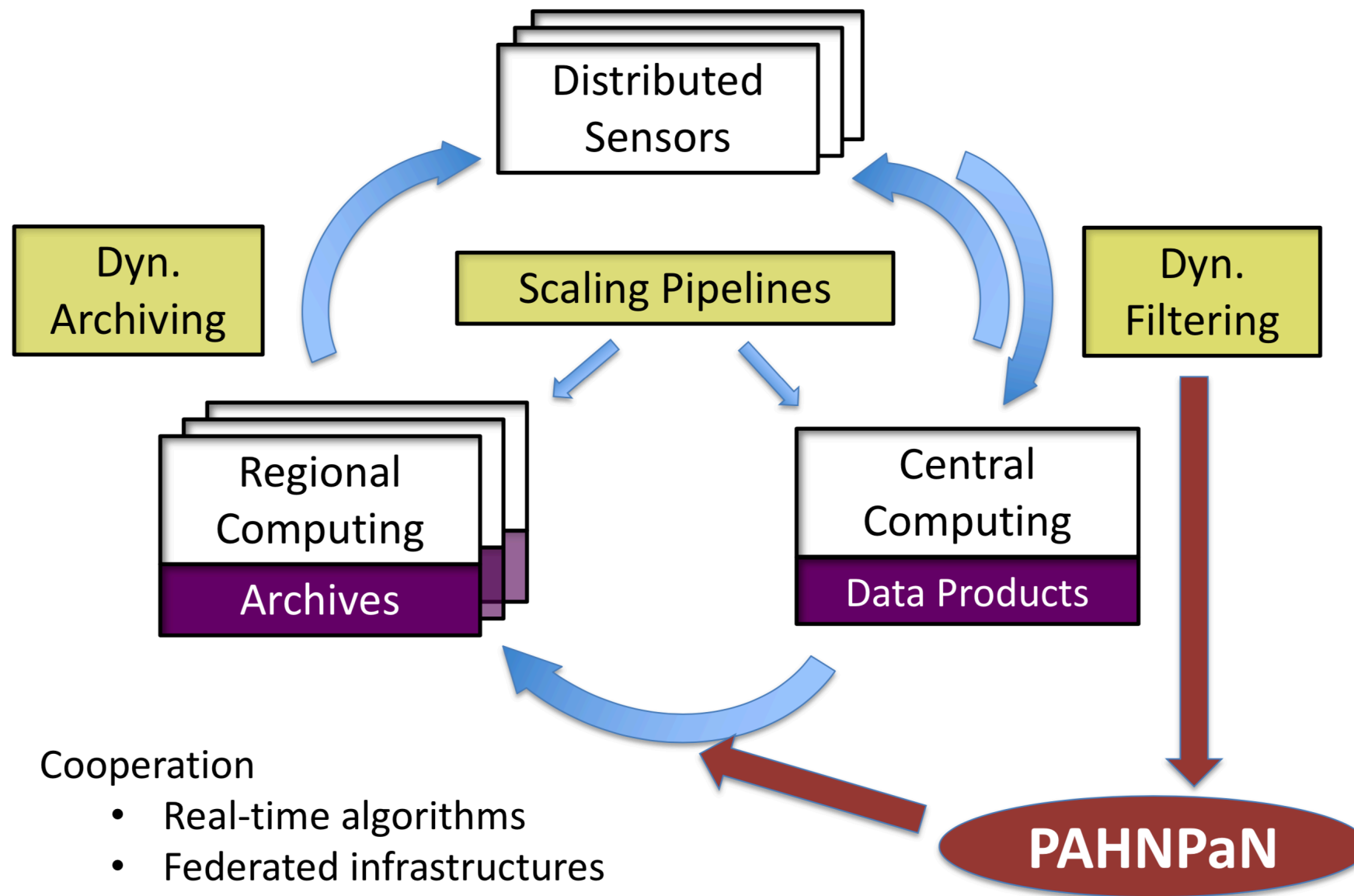
- * enabling small(er) data collectors

metadata packages,
FAIR data requirements

Astro-NFDI: WP Software in data access and processing

- * (collaborative) access to remote data collections
- * (collaborative) access to distributed data collections
- * lossy data taking / processing vs. data integrity
- * software for data management and maintenance

Astro-NFDI: WP Challenges in Data Irrevisibility



M. Kramer

Astro-NFDI: WP Synergies

Intersection with other consortia:

- common approaches / data structures
 - form a working group between consortia (in physics at least)
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- data management workflows
 - metadata systems
 - methods
 - management of data access
 - software development (simulations)
 - lossy data vs. reproducibility