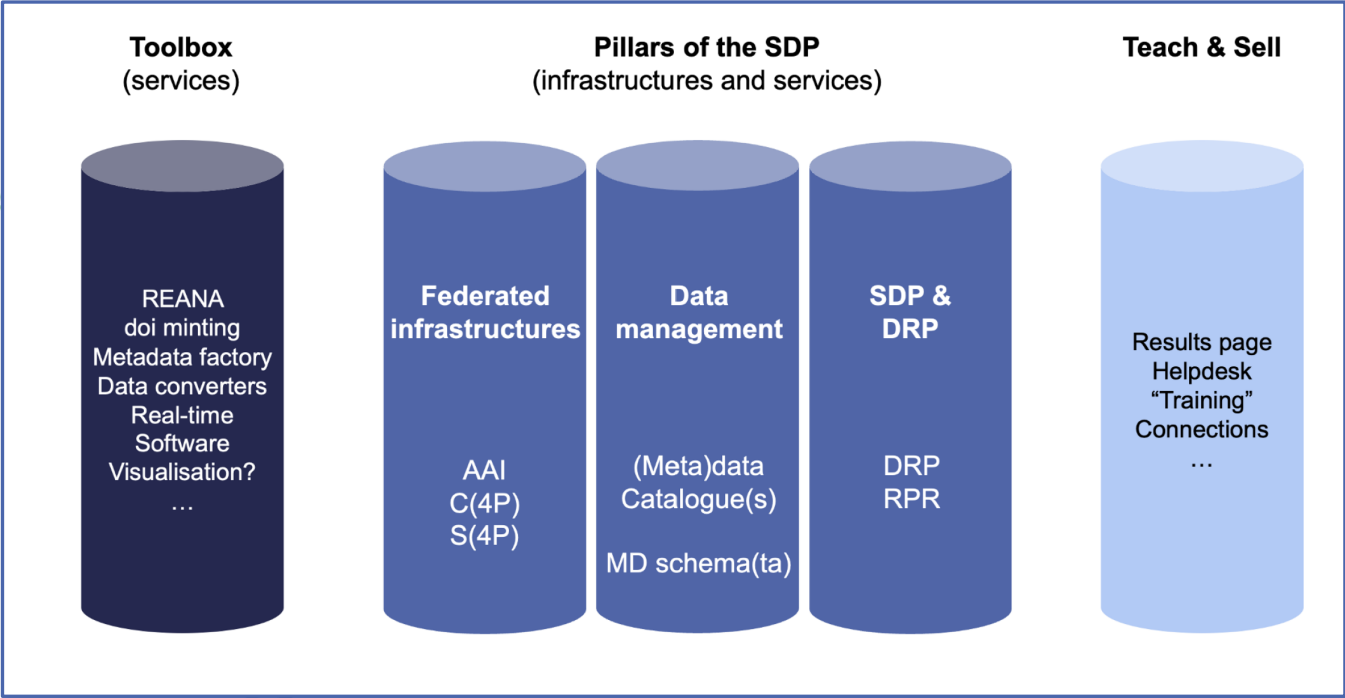
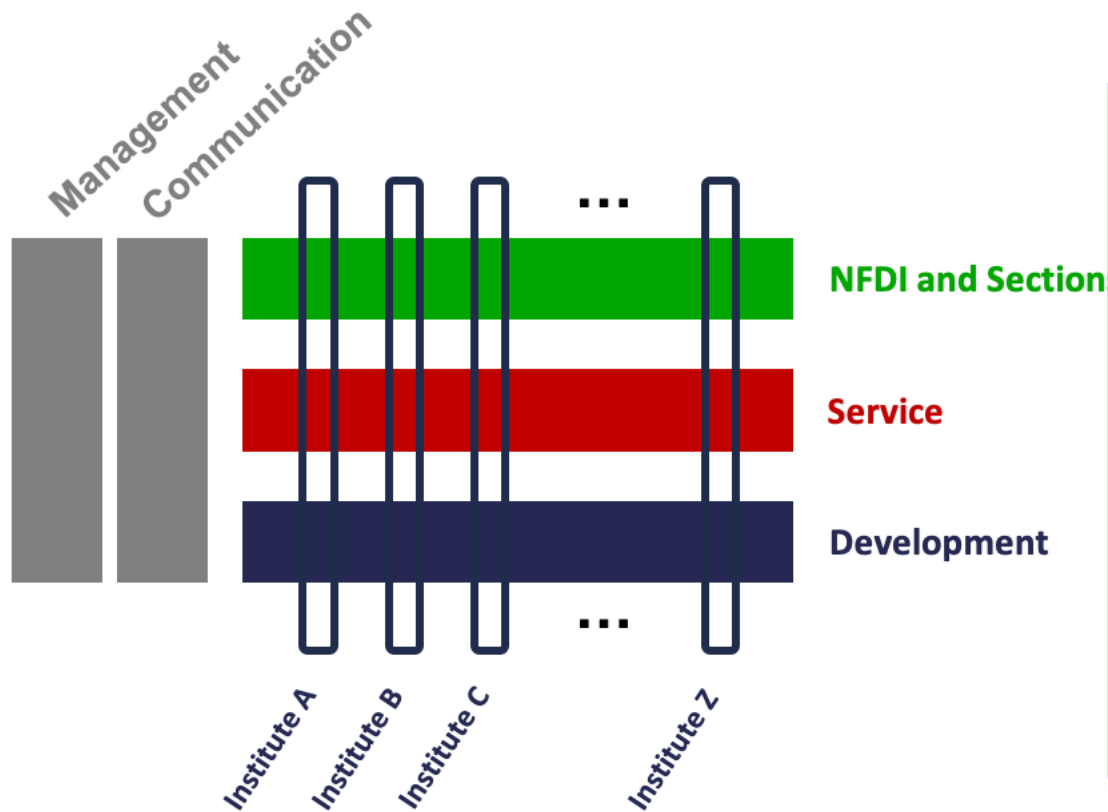


PUNCH-2.0 – Planning for the Future



PUNCH-2.0 – Toolbox

Uni Hamburg:

- service for researchers unfamiliar with machine learning, **services in ML data analysis**.
- specialized **consulting service to facilitate the application of ML** in astrophysics/particle physics research.
- offer expertise in important areas such as data pre-processing, model selection and evaluation, algorithm implementation, and the interpretation of results. The service will operate as a collaborative hub.
- **Workshops and training sessions** will be conducted to enhance the computational skills of researchers, fostering a self-sustaining, knowledgeable community.
- offer **support for the use of large language models (LLMs)**. We will test/tune/share models and act as consultants for the use of LLMs in teaching (e.g. specialised chatbots) and research (e.g. interface for data inference, statistics and plotting).

PUNCH-2.0 – Toolbox

TUM:

- has been **organizing AI block courses** and knowledge transfer events as part of EXC ORIGINS.
- has experience in **large-scale data processing** with e.g. dataframe based / python tools, where we can put in more development work

DZA:

- will provide R&D on **algorithms for selecting rare events in real-time out of huge astronomical data streams**, for analysing huge data objects, for data visualization, and for Smart Green Computing.

FZJ:

- will contribute to **ML methods in general**, in particular in **optimizing the use of HPC computing** (GPU-computing and energy considerations).

FZJ, DESY, UBi and UR:

- will contribute the development of the **user and administration toolbox for a modular distributed (meta-)data management**, including GUI.

PUNCH-2.0 – Toolbox

DESY:

software as a service for critical software infrastructures:

Software and workflows are critical parts of the research infrastructure and strongly intertwined with data.

framework for identifying and supporting and further **improve software tools**.

Examples: Key4hep (future collider software; included tools like LCIO, Marlin, DD4hep)

astropy (base package for astronomical community); CORSIKA (air-shower simulations);

A software layer is required to allow an **experiment-independent data acquisition and management framework** at DESY in the context of the local experiments, supporting seamless data storage, aggregation, and metadata handling for experimental detector and control systems.

Workflows using standardized workflow languages (e.g., CWL) allow to share and connect research data, software, and services.

contribute to **scientific workflow development** (languages and engines) and to provide a powerful platform for workflows (e.g., using the REANA workflow engine connect punch storage and compute resources).

PUNCH benefit: Services (built on Punch4NFDI 1.0): workflow engine (e.g., REANA), version control (git), CI/CD pipelines (with access to Compute4Punch and Storage4Punch), package/container managers, documentation hosting

PUNCH-2.0 – Toolbox

DESY:

improved build and test infrastructures for PUNCH software projects:

Analyze the existing build, test, and deploy infrastructure used by the **dCache project**;

Analyze centrally provided services by DESY for migration to the new infrastructure and identify required functionality; Harden DESY (or PUNCH) **Gitlab and Kubernetes services** for evergrowing demand on software development and testing infrastructure, etc.