

The PUNCH4NFDI Consortium

Particles, Universe, NuClei and Hadrons for the NFDI

Thomas Schörner (DESY)

AG Meeting, Bremen, 15 September 2022





Gemeinsame
Wissenschaftskonferenz
GWK

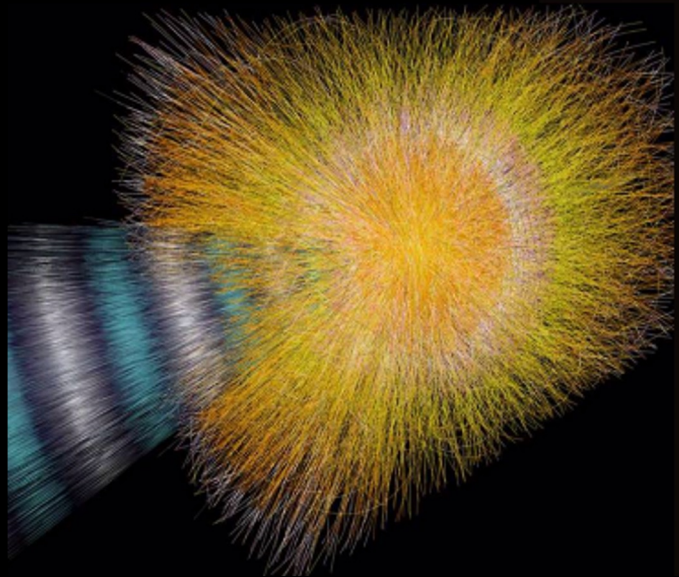
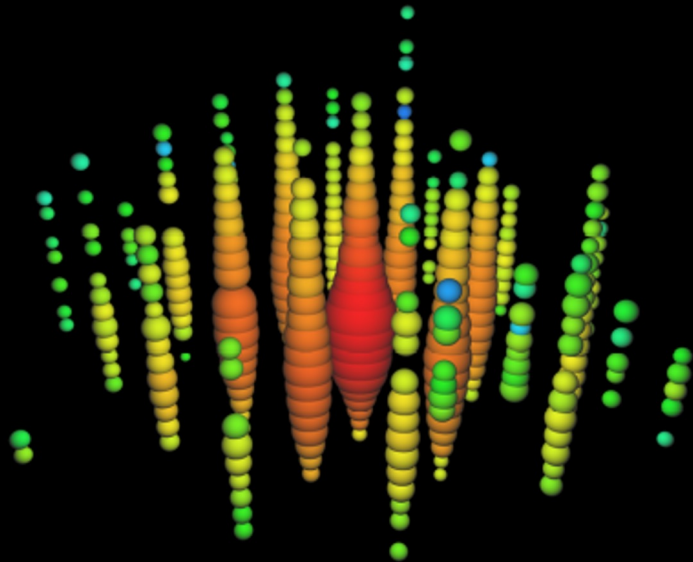
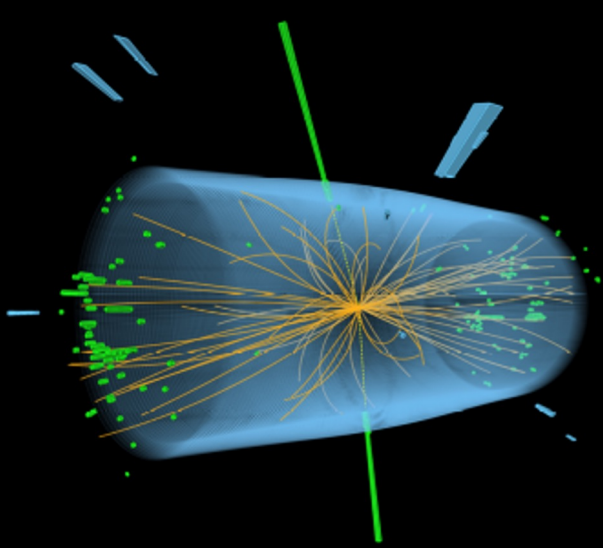


Deutsche
Forschungsgemeinschaft

Nationale Forschungsdaten- infrastruktur (NFDI)

- Sustainable utilisation of research data
- Establishment of FAIR data management
- Connection to European and international efforts (like EOSC)
- Bottom-up approach of (30) independent consortia
- 5 (+5) year funding; 85 MEUR / year

See also [DFG.de/nfdi](https://www.dfg.de/nfdi) and [nfdi.de](https://www.nfdi.de)

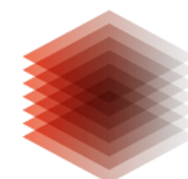
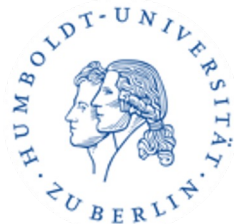


**Particles, Universe, NuClei and
Hadrons for the NFDI**
(42 partners, 10k scientists, support
from KET, KAT, KHuK, RdS)

The prime goal of PUNCH4NFDI is the setup of a federated and "FAIR" science data platform, offering the infrastructures and interfaces necessary for the access to and use of data and computing resources of the involved communities and beyond.

Who We Are

Universities, Helmholtz, Max Planck, Leibniz



PUNCH data are diverse

- in size and rate
- in complexity and purpose
- in abstraction level

PUNCH4NFDI expertise

- Big data and open data
- Data irreversibility and reduction
- Harnessing heterogenous resources
- Highly collaborative globally distributed data management

data generated by SKA

Global Internet Traffic

FAIR@GSI
Online data
30 EB

FAIR@GSI
Physics
300 PB

searches on Google
98PB

updates to facebook
180PB

business emails sent worldwide



3,000PB
(3EB)



420EB



4EB
SKA1 mid
archive

urvey

Low

Mid



15.6ZB

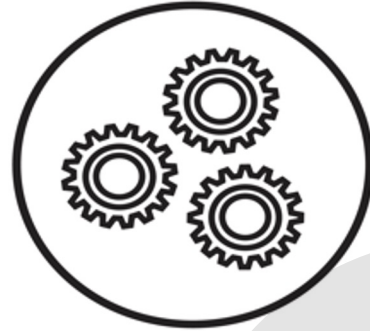
HL-LHC

Challenges

- FAIRification: data & workflows
- "big data" and "open data"
- Irreversibility challenge and data loss
- heterogeneous data & infrastructures
- transfer of knowledge

Task Areas

TA 2: Data management



TA 3: Data transformations



TA 1: Management and governance



TA 4: Data portal



TA 7: Education, training, outreach, citizen science



TA 5: Data Irreversibility



TA 6: Synergies & services



...

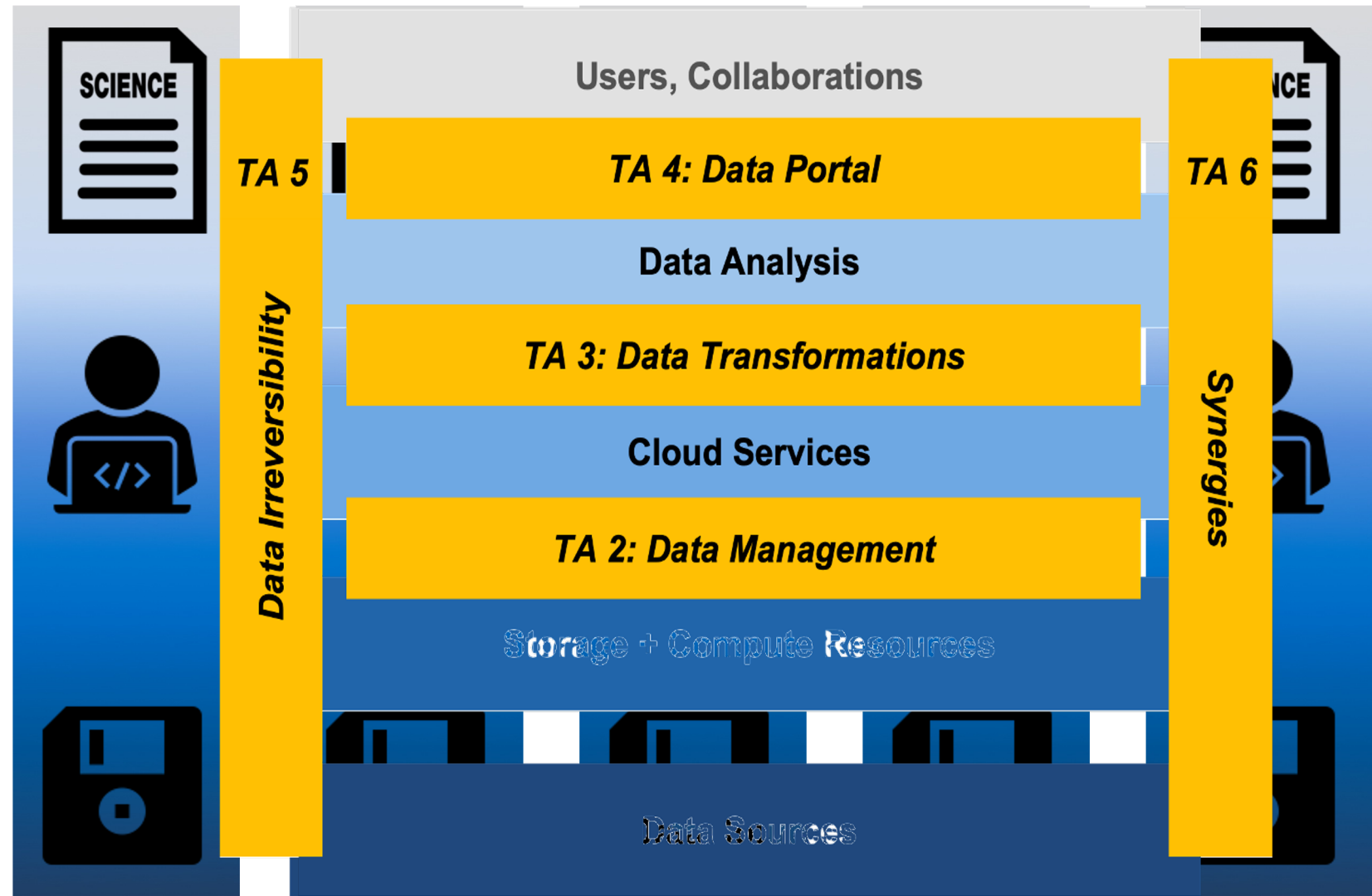
Analysis tools

Compute resources

Data access

Data storage

Data sources



Flexibility, efficiency, scalability:
data volumes, number of users and analyses, heterogeneous resources; data combinations

You!

AAI

Portal

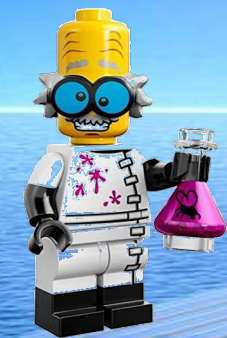
Research products

Data & code registry

Transformations

Container registry

Gitlab



REANA & other workflow managers



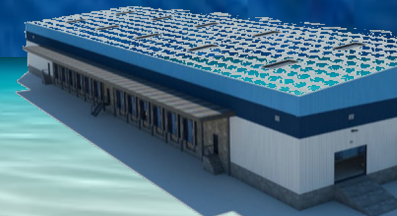
Data Experiments



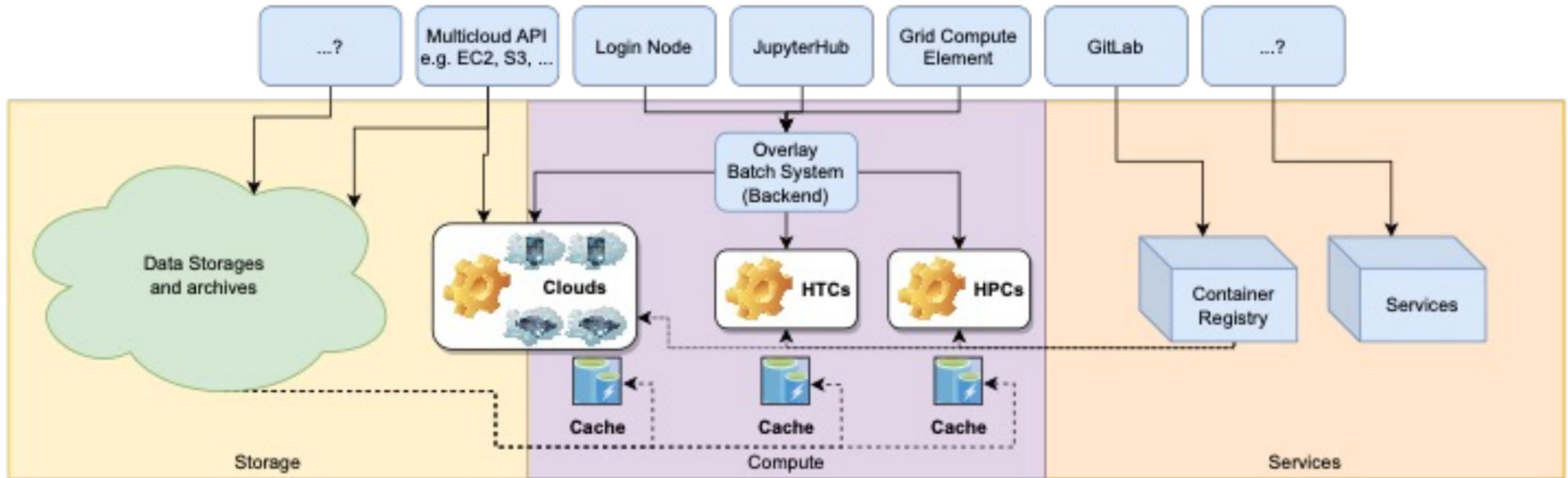
C4P



S4P



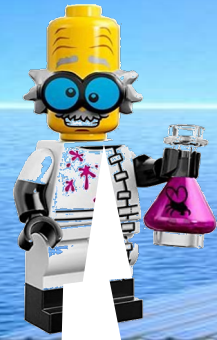
...a more technical view ...



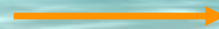
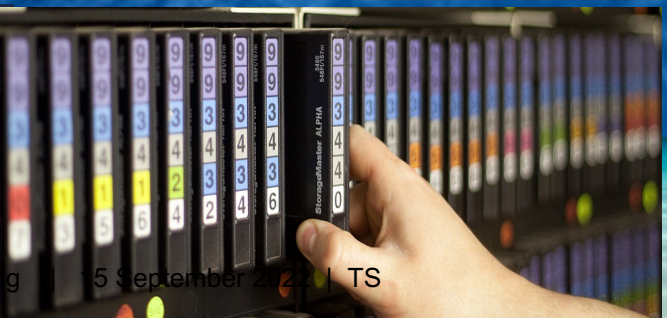
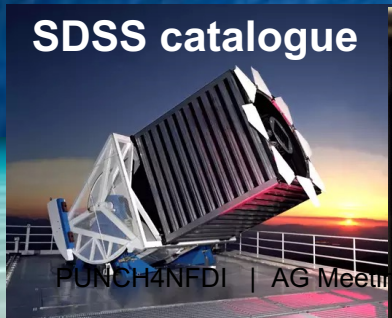
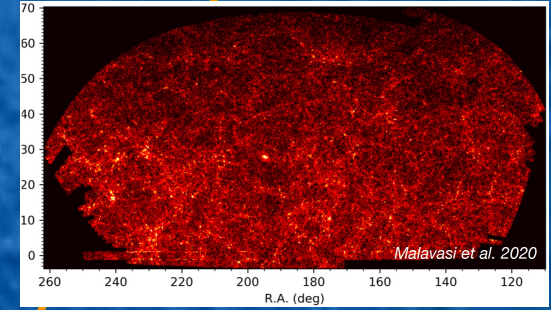
SciTrace

SciTrace research product

Thanks!



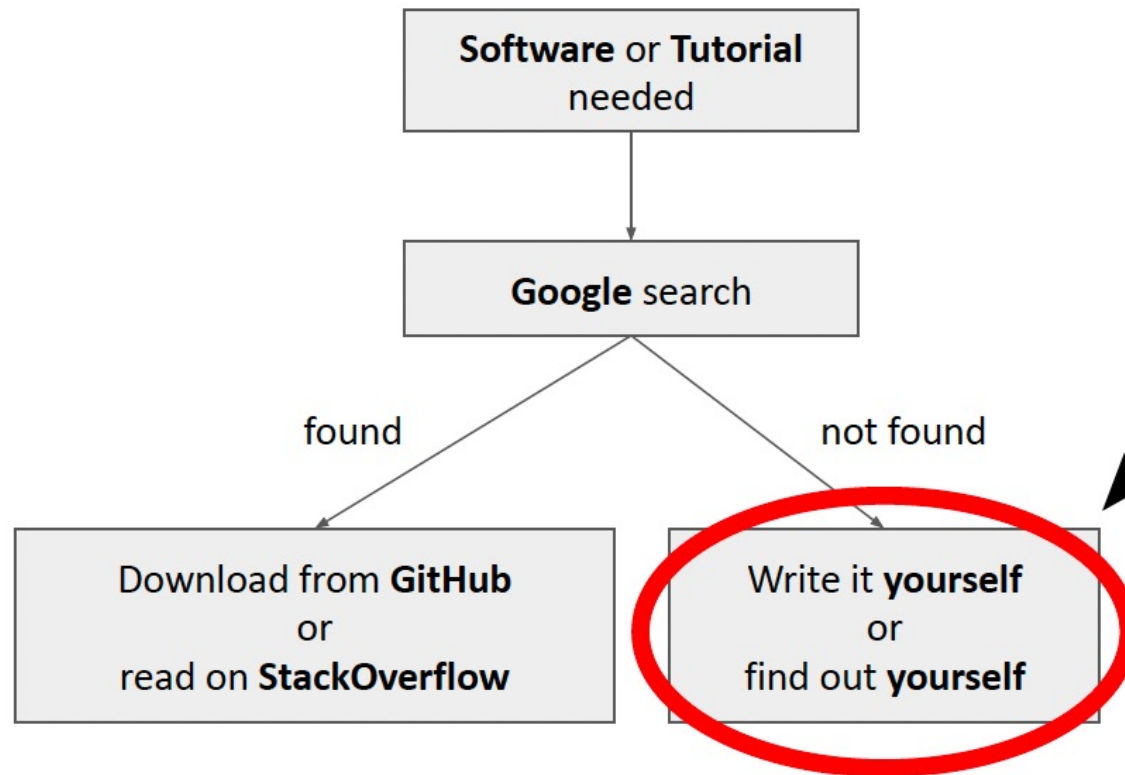
I want to use SDSS data for exploring the cosmic web (and reproducing Malavasi et al. 2020)



The PUNCH4NFDI Marketplace

Addressing fundamental problems of daily work

Scientists want software or tutorials



A platform for collecting & managing requests:

- Users create requests
- Users search and comment requests
- Users vote for requests → impact?

Advantage for PUNCH4NFDI:

- No need to develop → use existing resources
- No need to host anything → cheap and easy
- Content can be generated from now now!

inefficient:

- lots of manpower in the scientific community
- but also lots of parallel development

instead:

coordinate creation of desired software/tutorials



Recent questions and answers



how do we bring Compute4Punch into service level ?

asked Jan 7 in **Software** by Kilian Schwarz | 3 views

software

services

0 votes 0 answers

fast compression of 8 bit MeerKAT/SKA data

asked Dec 15, 2021 in **Software** by landessternwarte (180 points) | 3 views

library

compression

c

c++

radio data

+1 vote 0 answers

How to download Meerkat data?

asked Nov 22, 2021 in **Tutorials** by landessternwarte (180 points) | 1 view

data

meerkat

0 votes 0 answers

How to analyze HESS data with gammapy?

asked Nov 19, 2021 in **Tutorials** by landessternwarte (180 points) | 2 views

tutorial

data analysis

hess

gamma-ray

gammapy

+1 vote 0 answers

Welcome to PUNCH4NFDI Marketplace, where you can ask questions and receive answers from other members of the community.

All categories

Software 2

Tutorials 2

Recent questions and answers

Help get things started by [asking a question](#).

Gitlab in PUNCH4NFDI (1)

A multi-purpose application

PUNCH4NFDI Gitlab



Use the PUNCH4NFDI AAI !

If your institution is not member / registered with DFN-AAI or any other AAI

PUNCH4NFDI AAI can accommodate identification from your account on

ORCID GitHub Google

Please read the Registration Instructions for the PUNCH4NFDI AAI:

https://www.punch4nfdi.de/sites/sites_custom/site_punch4nfdi/content/e117438/e142359/e149152/PUNCH-AAI-registration.pdf

Username or email

Password

Remember me [Forgot your password?](#)

Sign in

Sign in with

Remember me

Understands OAUTH2 (→ talks with AAI)

Carries another communication tool:
Mattermost

Major purposes:

- code management for software with versioning, branching, releases (tagging)
- support testing and code integration for distributed teams

Combined with **continuous integration (CI)**, this allows to build and manage containerised software installations

- Built-in capabilities for container registries
- Built-in registry for packages (various code languages: python, java ...)

Combines with e.g. workflow engine
REANA

Gitlab in PUNCH4NFDI (2)

PUNCH4NFDI intranet

PUNCH4NFDI Intranet documentation [edit page on gitlab](#)

Particles, Universe, NuClei and Hadrons for the NFDI

Home Consortium NFDI TA2 TA3 TA4 TA5 TA6 TA7 Marketplace

Overview

The task areas of the PUNCH4NFDI consortium.

- TA 1: Management and governance
- TA 2: Data management
- TA 3: Data transformations
- TA 4: Data portal
- TA 5: Data Irreversibility
- TA 6: Synergies & services
- TA 7: Education, training, outreach, citizen science

ESience@AIP Leibniz Institute for Astrophysics, An der Sternwarte 16, 14482 Potsdam, Germany, Tel: +49-331-7499-0

Gitlab ‘webhook’ capability using md files; combined with web server application (built on Caddy software)

Allows for:

- collective editing of intranet content
- implementing editorial hierarchy
- fulfills all requirements of a content managing system

GitLab Logo Menu

- Projects
- Groups
- Milestones
- Snippets
- Activity

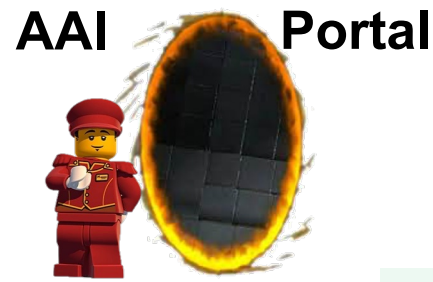
Search: doc

- intra-docs-content punch
- intra-docs punch-dev
- intra-docs-rp punch-dev

0 Tags 5

PUNCH4NFDI AAI

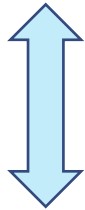
Authentication & Authorisation Infrastructure



Goal: single sign-on!

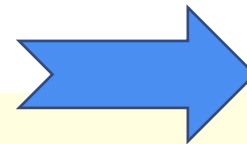
Authentication: (step 1)

- should be possible via institution of PUNCH co-workers and users
 - modern interface: OAUTH2
 - enables Identity-Providers (IdP)
 - home institution (DFN, CERN, ...)
 - ORCID
 - Google (and other Social accounts)
- to provide the verification of the identity (usually based on email)



Infrastructure: Helmholtz-AAI

- Web interface for user
- Web interface for resource provider
- valid (web) services via API



Authorisation: (step 2)

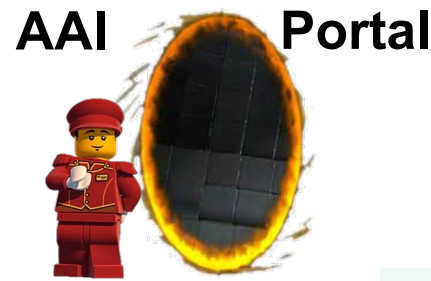
- authenticated users get access to services
 - access rights are connected by the account
 - groups
 - roles
- are used to map (internally) account to access rights



all co-workers, all users of resources
resource provider register valid services (certificates, keys)
draw information from AAI to provide (validated) services

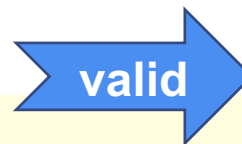
PUNCH4NFDI AAI

Authentication & Authorisation Infrastructure



Authentication: (step 1)

Authorisation: (step 2)



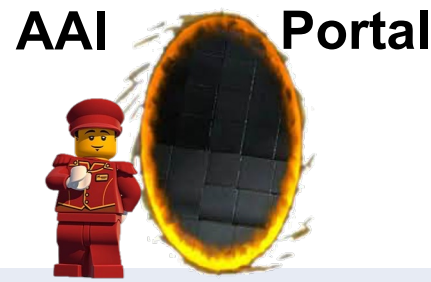
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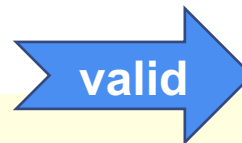
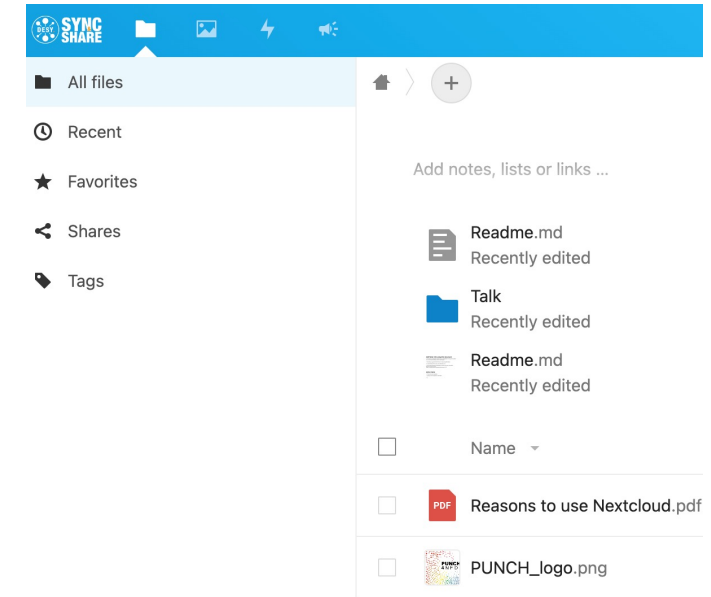
PUNCH4NFDI AAI

Authentication & Authorisation Infrastructure



AuthenticatioAuthorisation info for another service with intermediate AAI instance

Keycloak / DESY



Infrastructure: Helmholtz-AAI + DESY SSO

- Web interface for user
- Web interface for resource provider
- valid (web) services via API

all co-workers, all users of resources
 resource provider register valid services (certificates, keys)
 draw information from AAI to provide (validated) services

The PUNCH4NFDI Portal

... later entry point to the science data platform SDP

Also provided so far: collection & links of frequently used software for astro, HEP, lattice, ... in the PUNCH4NFDI intranet.

PUNCH4NFDI Intranet documentation [edit page on gitlab](#)

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List of Astrophysics Codes

This is a list of some of the Astrophysics codes that are on the current priority list for being adapted for easy use on HPC machines. Please click on the code name to be linked to the code webpage.

- [BHAC](#) on gitlab.itp.uni-frankfurt.de
BHAC (the Black Hole Accretion Code) is a multidimensional general relativistic magnetohydrodynamics code based on the MPI-AMRVAC framework. BHAC solves the equations of ideal general relativistic magnetohydrodynamics in one, two or three dimensions on arbitrary stationary space-times, using an efficient block based approach.
- [Bonsai](#) on [GitHub](#)
Bonsai is a GPU gravitational [Barnes-Hut]-tree code. There also exists a version for SPH application.
- [CASA](#)
CASA, the Common Astronomy Software Applications package, is the primary data processing software for the Atacama Large Millimeter/submillimeter Array (ALMA) and NSF's Karl G. Jansky Very Large Array (VLA), and is frequently used also for other radio telescopes. The CASA software can process data from both single-dish and aperture-synthesis telescopes, and one of its core functionalities is to support the data reduction and imaging pipelines for ALMA, VLA and the VLA Sky Survey (VLASS).
- [CASTRO](#) on [GitHub](#)
CASTRO is part of the AMReX suite of astrophysical hydrodynamics codes that collectively provide the simulation capabilities to model explosive astrophysical phenomena. Castro specializes in near-sonic and supersonic flows, where reactions can be an important driver of the dynamics. Radiation and magnetic contributions are supported. A lot of emphasis is placed on accurately coupling reactions and hydro, with a variety of time-stepping techniques available.

Thank you!

The PUNCH4NFDI Consortium

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