

FAIR Facilities & Instruments Workshop #3, Boulder, CO Sept. 22-24, 2025

Matt Mayernik, Andrew Johnson, Renaine Julian,
Claudius Mundoma, Matthew Murray, and Adi Ranganath,



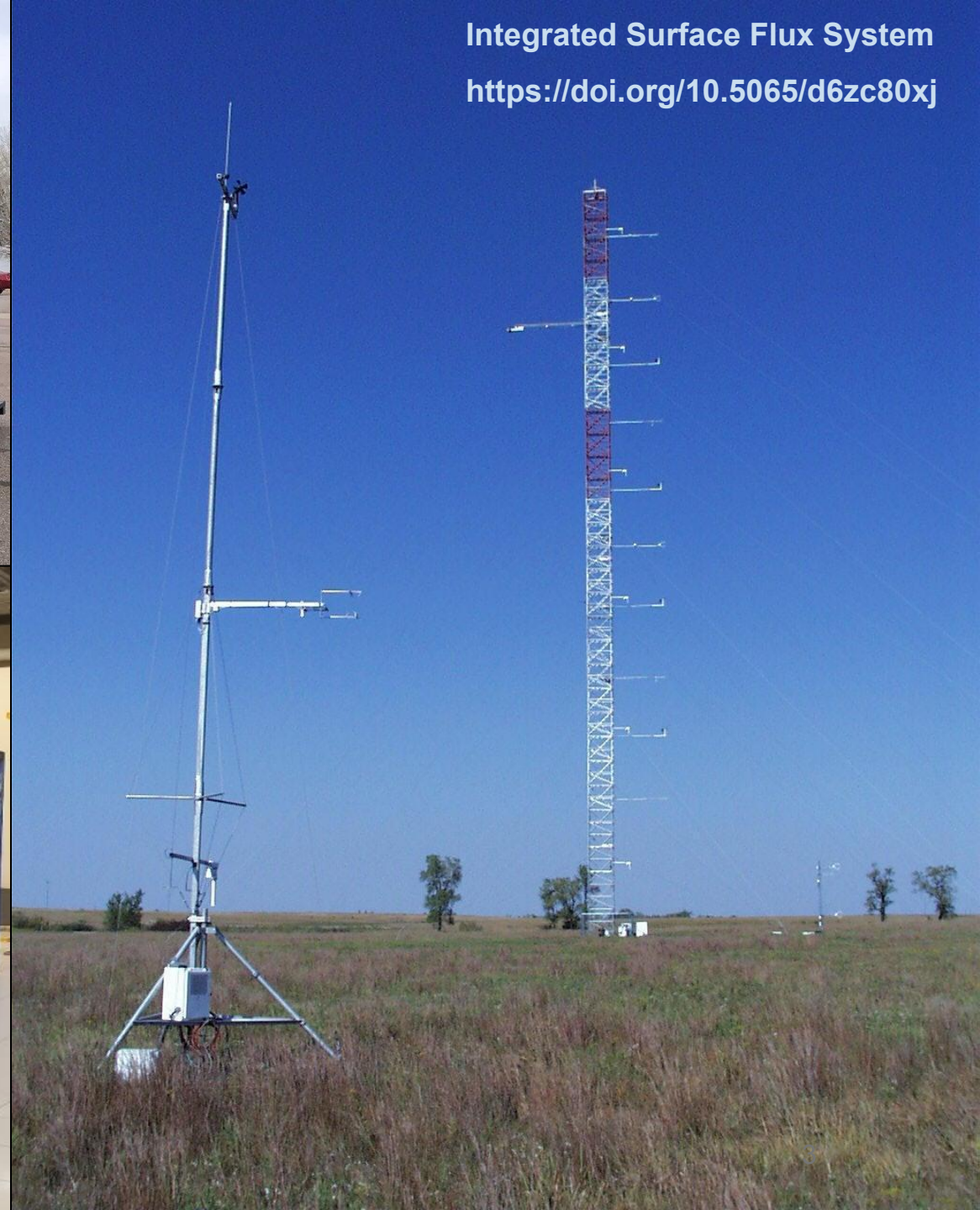




MicroPulse DIAL (Lidar)
<https://doi.org/10.5065/d6st7nkg>



Derecho Supercomputer
<https://doi.org/10.5065/qx9a-pg09>



Integrated Surface Flux System
<https://doi.org/10.5065/d6zc80xj>

KEY LINKS

- [Zoom connection](#) for remote speakers and attendees
- Workshop [Code of Conduct](#)
- [Draft project recommendations](#) [please review prior to the workshop]
- [Collaborative notes document](#)
- [Breakout discussion notes](#)
- [Speaker slides](#)

WORKSHOP AGENDA - Note, all times are in [Mountain Daylight Time](#)

SEPT 22 - DAY 1 PM 12:30-5:00 PM : Introductions and High-Level Insights

- 12:30 - 1:00 Participants arrive and check-in
- 1:00 - 1:45 Workshop introduction & Project Progress
 - FAIR Facilities and Instruments (FAIR F&I) Project Overview
 - Discussion of key goals for the workshop
- 1:45 - 3:00 General Recommendations & PID Systems
 - Overview of general recommendations by FAIR F&I project team
 - (virtual) Maria Gould, DataCite
 - Amanda French, Research Organization Registry (ROR)
 - Anita Bandrowski, Research Resource Identification, RRID, initiative
- 3:00 - 3:30 Break
- 3:30 - 4:30 [Breakout groups sessions - Topic: general recommendations](#)
- 4:30 - 5:00 Breakout group reports and preview tomorrow

Project Organizations & Personnel

NCAR | NATIONAL CENTER FOR
ATMOSPHERIC RESEARCH

Matt Mayernik
Greg Stossmeister



University of Colorado **Boulder**

Andrew Johnson
Aditya Ranganath
Matthew Murray

NSF Awards



2226396

2226397

2226398



FLORIDA STATE UNIVERSITY

Renaine Julian



Stanford University

Claudius Mundoma

Project website: <https://ncar.github.io/FAIR-Facilities-Instruments/>

Project Advisory Committee

- **Anita Bandrowski** - founder and CEO of SciCrunch
- **David Butcher** - FAIR data management specialist at the National High Magnetic Field Laboratory
- **Matthew Buys** and **Kelly Stathis** - Executive Director and Technical Community Manager at DataCite
- **Zach Chandler** - Director of Open Scholarship Strategy, Stanford University
- **Nate Herzog** - CoreMarketPlace project lead at Vermont Genetics Network
- **Kevin Knudtson** - President of the Association of Biomolecular Resource Facilities (ABRF)
- **Giri Prakash** - Section Head of the Earth System Informatics and Data Discovery section at Oak Ridge National Laboratory
- **Dylan Ruediger** - Senior Analyst at Ithaka S+R
- **Shawna Sadler** - Head of Outreach & Partnerships at ORCID
- **Shelley Stall** - Sr. Director for Data Leadership at American Geophysical Union (AGU)

Project Goals

Develop	Compile	Facilitate	Produce
Develop a Research Coordination Network (RCN) focused on the assignment of Persistent Identifiers (PIDs) to research facilities and instrumentation	Compile use cases for why and how PIDs might be assigned to facilities and instruments	Facilitate the generation of expertise and guidance on the key topics of interest	Produce & refine recommendations and lessons learned targeted toward the specific use cases

Key Questions for the Workshop

What are your main reasons for assigning PIDs to facilities and/or instruments?

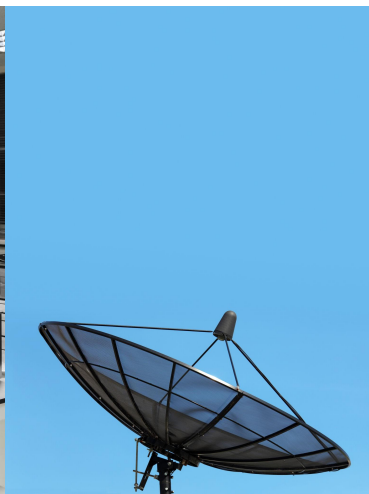
What questions do you have? What guidance do you want/need?

What outcomes and products from the workshop and project overall would be most useful for you?

Note on Terminology

Definitions are important - but are not consistent

- a. What is a “facility”?
- b. What is an “instrument”?
- c. What other terms are used? (platform, site, core, device, ...)
- d. When does it matter?





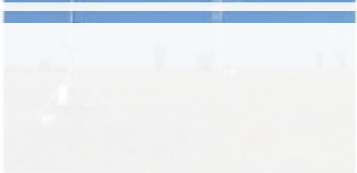
Motivating Examples

PIDs for Facilities and Instruments - NCAR



Integrated Surface Flux Sy

ISFS DESCRIPTION



NSF/NCAR C-130

Aircraft Overview

The Lockheed C-130 "Hercules" aircraft is a four-engine, medium-size utility aircraft that has proven to be one of the most well-known and versatile aircraft ever built. The NSF/NCAR aircraft is a model EC-130Q, similar to the more common model C-130H model except for electrical and air-conditioning modifications. The aircraft is an all-weather, low-level, high-speed, short-field aircraft. It is equipped with four turbo-prop engines. It is equipped with dual-wheel, bicycle landing gear with the main gear wheels arranged in tandem and the nose gear arranged side-by-side. The C-130 maintained and



C-130

NSF/NCAR C-130

NSF/NCAR C-130 Investigator Handbook
Airborne Instrumentation

NSF/NCAR C-130 Request Guidance

Aircraft Schedules

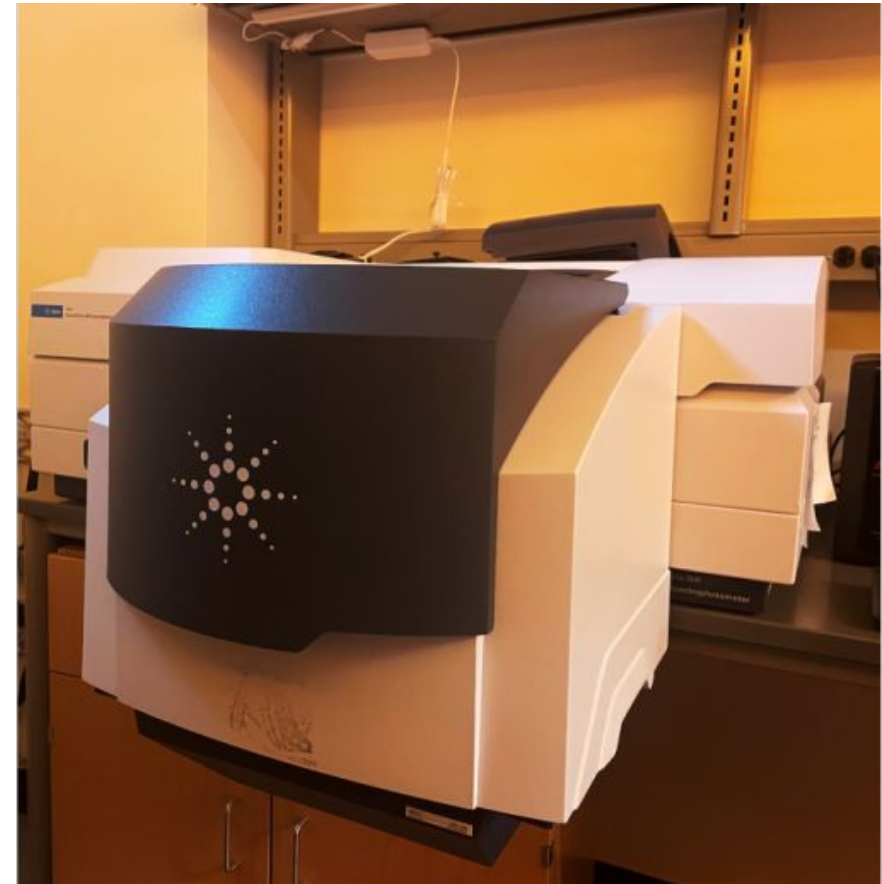
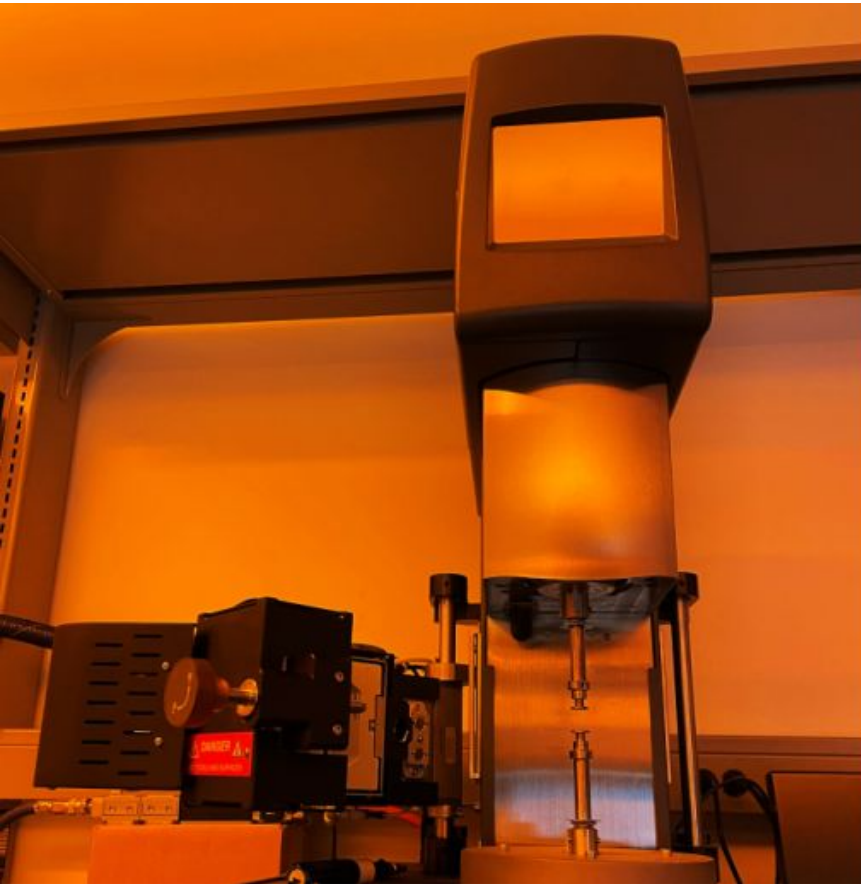
Request the NSF/NCAR C-130

Contact RAF

Example: doi Implementation

University of Colorado Polymeric and Optical Materials Characterization Shared Facility

https://scicrunch.org/resolver/RRID:SCR_022288



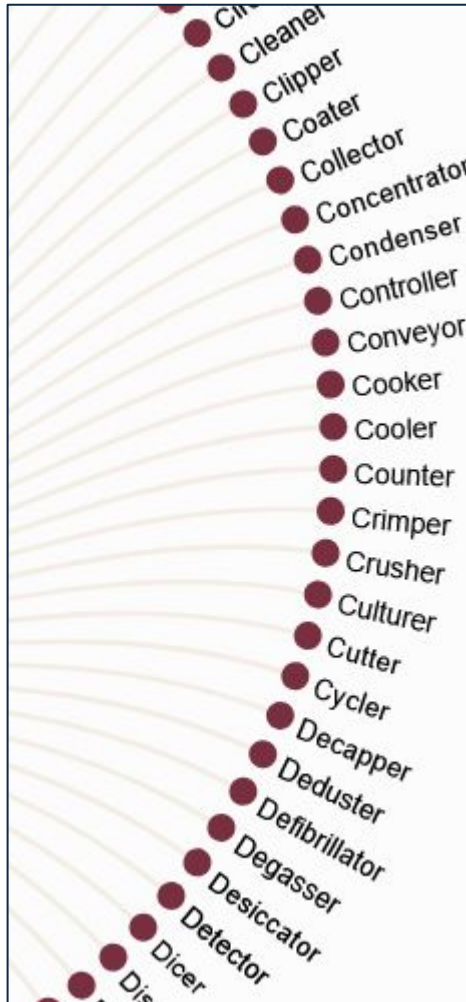
RRID Implementation at Stanford

Stanford
Microfluidics
Foundr

https://scicrunch.org/resolver/RRID:SCR_024527



Florida State University



<https://myweb.fsu.edu/aglerum/usedit/usedit-taxonomy.html>



National High Magnetic Field Laboratory Electron Magnetic Resonance Core Facility
https://www.scicrunch.org/resolver/RRID:SCR_017359

Connecting Facilities, Instruments, & Data



NSF NCAR HIAPER Gulfstream GV

<https://doi.org/10.5065/D6DR2SJP>

ACCLIP NSF/NCAR GV Instrument Data Merges - 10 Second

<https://doi.org/10.26023/2HAX-YPQB-GG0Q>

FAIRO-1 Ozone Data

<https://doi.org/10.26023/S3FA-R52G-ZS11>

HIAPER Atmospheric Radiation Package (HARP) CCD Actinic Flux Spectrometers Photolysis Frequencies

<https://doi.org/10.5065/D6MP51N7>

...

[686 datasets]

Research Computing

OFFICE OF INFORMATION TECHNOLOGY



Resources

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The Preserve

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Events and Training

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PetaLibrary

The PetaLibrary is a University of Colorado Boulder service that provides any researcher affiliated with the University of Colorado Boulder with a secure, scalable, and reliable storage solution for their research data.

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Petalibrary Citations

Acknowledgement for use in publications

Use the following language to cite or acknowledge the PetaLibrary in any published or presented work whose data was stored in the PetaLibrary:

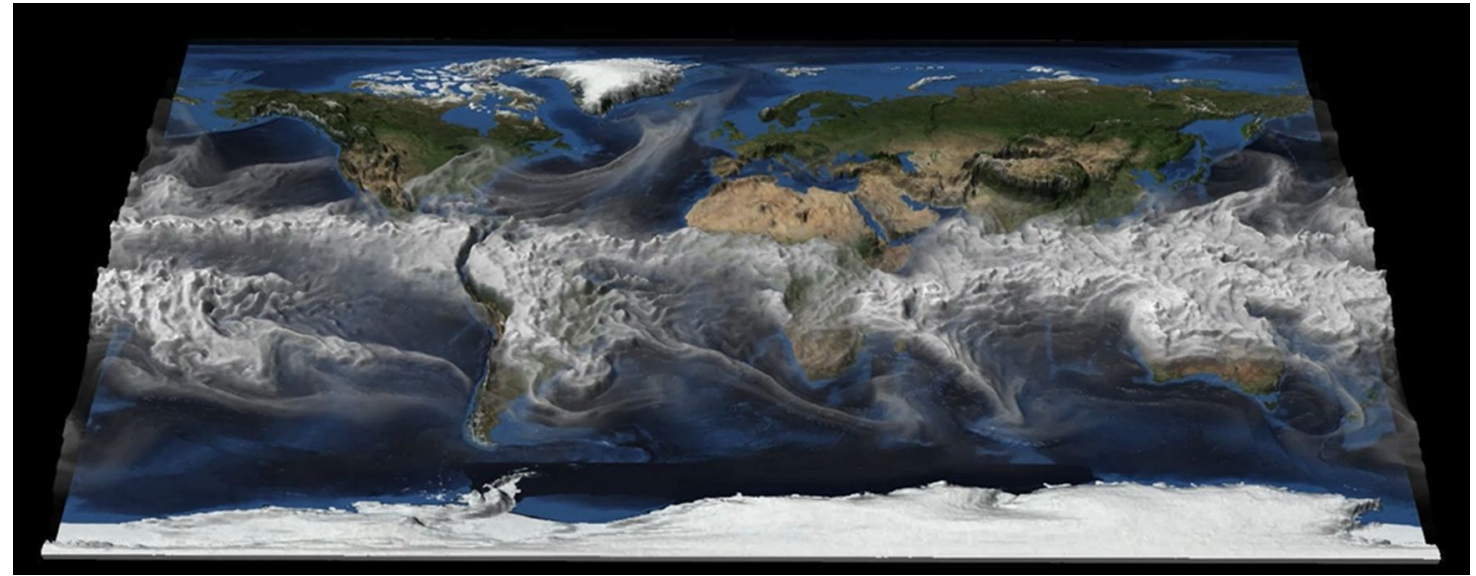
Data storage supported by the University of Colorado Boulder "PetaLibrary"

NCAR - Community Earth System Model (CESM)

Community Earth System Model Developers And Affiliates. (2017). *Community Earth System Model - CESM2.0*. UCAR/NCAR - Climate and Global Dynamics Laboratory. <https://doi.org/10.5065/D67H1H0V>

Danabasoglu, Lamarque, Bacmeister, Bailey, DuVivier, Edwards, Emmons, Fasullo, Garcia, Gettelman, Hannay, Holland, Large, Lauritzen, Lawrence, Lenaerts, Lindsay, Lipscomb, Mills, ... Strand. (2020). CESM-release-cesm2.1.2 (release-cesm2.1.2). Zenodo. <https://doi.org/10.5281/zenodo.3895328>

Craig, C. A., Bacmeister, J., Callaghan, P., Eaton, B. E., Gettelman, A. R., Lauritzen, P. H., McInerney, J., Medeiros, B., Versteinsten, M., & Vitt, F. M. (2021). *CAM6.3 User's Guide*. https://www.cesm.ucar.edu/models/cesm2.0/cam/docs/user_guide/index.html



Acknowledgements in CESM Papers

When you use CESM simulations in your publications, it is very important to acknowledge our primary sponsor, the U.S. National Science Foundation (NSF).

Appropriate acknowledgment of the NSF sponsorship:

The CESM project is supported primarily by the U.S. National Science Foundation.

UC Davis/NIH NeuroMab Facility



RRID

https://www.scicrunch.org/resolver/RRID:SCR_003086



<https://neuromab.ucdavis.edu/>



<https://ror.org/00fyrp007>



University of Cape Town (UCT)

Published October 19, 2023 | Version v1

Physical object

Open

UCT HPC Facility

University of Cape Town (Hosting institution) ; Carr, Timothy (Data manager)¹ Lewis, Andrew (Data manager)¹ [Show affiliations](#)

The University of Cape Town's High Performance Computing Facility provides a multidisciplinary Linux-based SLURM cluster for UCT researchers. The UCT HPC Facility is being developed and maintained by Timothy Carr and Andrew Lewis, High Performance Computing Engineers at the University of Cape Town. See also <https://ucthpc.uct.ac.za>

Files

README.txt

The University of Cape Town's High Performance Computing Facility

UCT HPC provides a multidisciplinary Linux based SLURM cluster for UCT researchers.

See: <https://ucthpc.uct.ac.za>

<https://doi.org/10.5281/zenodo.10021613>

Key Questions

F

Findable - How do we enable people (both users and providers) to find information about facilities or instruments?

A

Accessibility - How do we enable facilities and instruments to be accessible by wider audiences?

I

Interoperability - How do we consistently capture relationships between persistent identifiers?

R

Reusability - How can we incorporate information about facilities and instruments into data set provenance metadata more consistently?

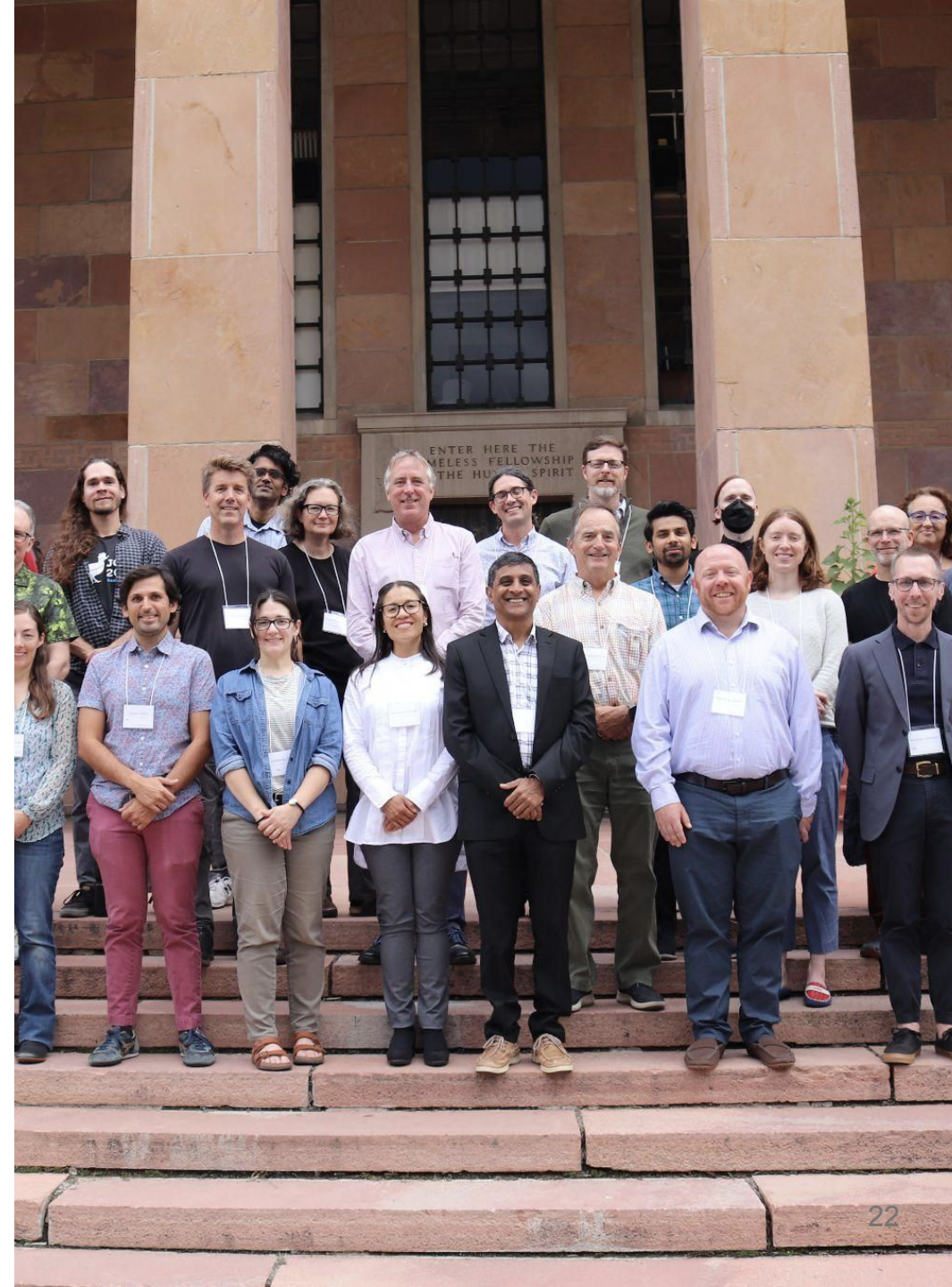
Project Activities

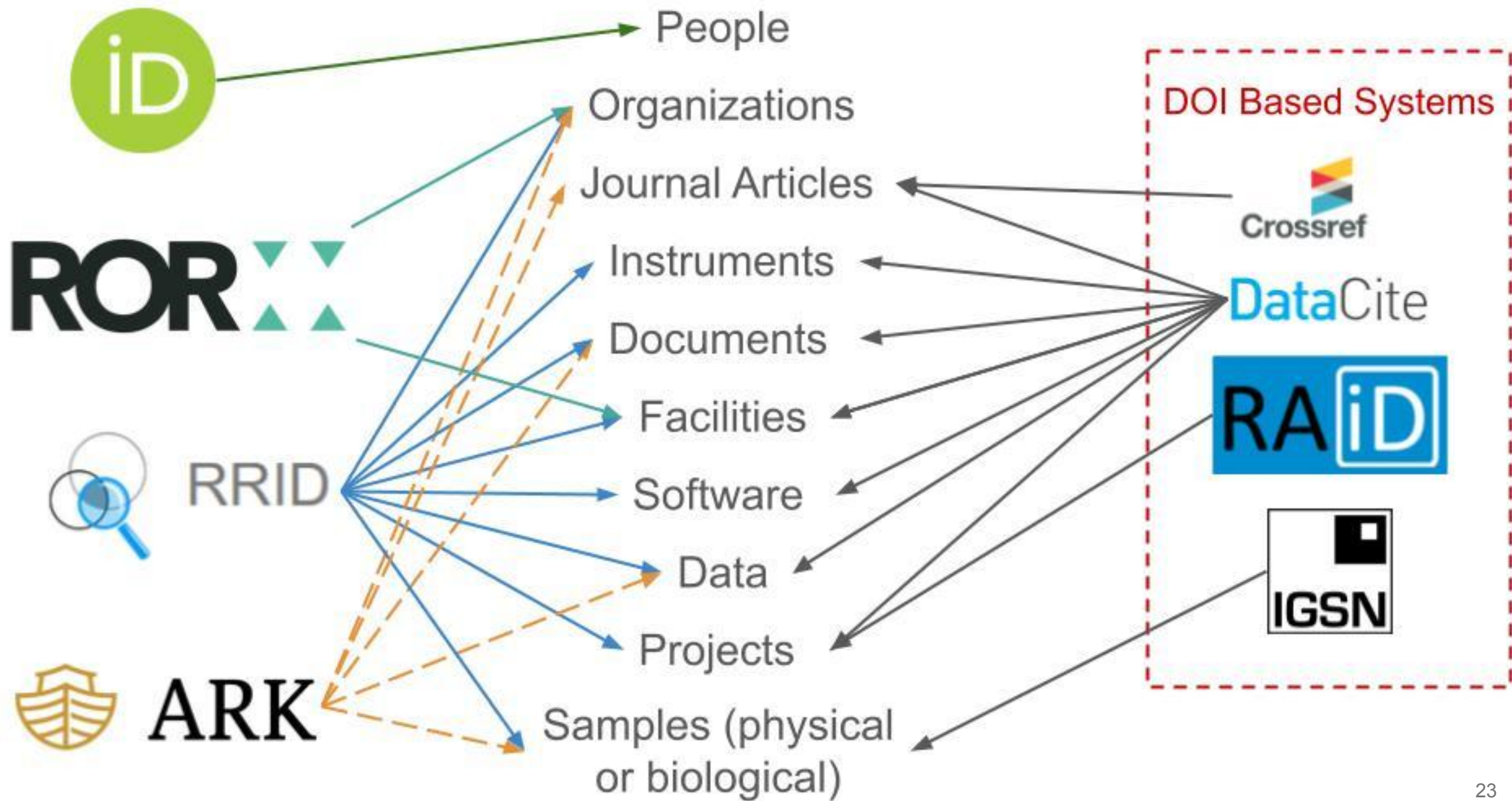
- Focus groups & presentations to relevant groups
 - NSF FAIR Open Science RCN project cohort
 - Earth science facility providers and users
 - FSU & CU campus facilities staff
 - CI Compass - FAIR Data Working Group
 - Data Curation Network
- Conference engagement - AMS, ABRF, ESIP, IASSIST, RDA, RDAP, Year of Open Science
- Sept 2023 Boulder Workshop - 35 participants
- Aug 2024 Tallahassee Workshop - 35 participants

Workshop #1: September, 2023 – Boulder, CO

- **Need:** PIDs are essential for scientific reproducibility, data provenance, and crediting instrument providers
- **PID Systems:** Current PID usage is scattered and inconsistent across different systems used for research instrumentation
- **Adoption:** The focus should be on lowering adoption barriers and communicating value rather than choosing specific PID systems
- **Metadata:** Consider metadata alongside PIDs - PIDs alone cannot solve all challenges
- **Granularity:** Start simple with granularity and evolution tracking, then increase complexity only as needed
- **Resources:** Instrument/facility providers face significant resource limitations in assigning and managing
- **PIDs Value:** Demonstrating clear value to users is critical for driving PID adoption and citation
- **Incentives:** Different stakeholders (researchers vs administrators) require different incentives for PID adoption

Workshop #1 report: <http://doi.org/10.5065/zgsx-2d06>





Workshop #2: August 2024- Tallahassee, FL

Emerging topics

- Need for facility and instrument PID recommendations as part of a national PID strategy
- Need for more robust infrastructure and services for facility and instrument PIDs
- Engagement needed with instrument manufacturers to adopt PID-supporting practices
- Engagement needed with journal publishers and editors on PID incorporation

Workshop #2 report:

<http://doi.org/10.5065/jea7-yf24>



Multiple Stakeholders - Distributed Responsibilities



Academic research institutions



National laboratories



Nonprofit organizations



Instrument manufacturers



Facility and instrument operators



Research scientists/users



Publishers and editors



PID system providers (RRID, DOI, ROR)

Common Themes

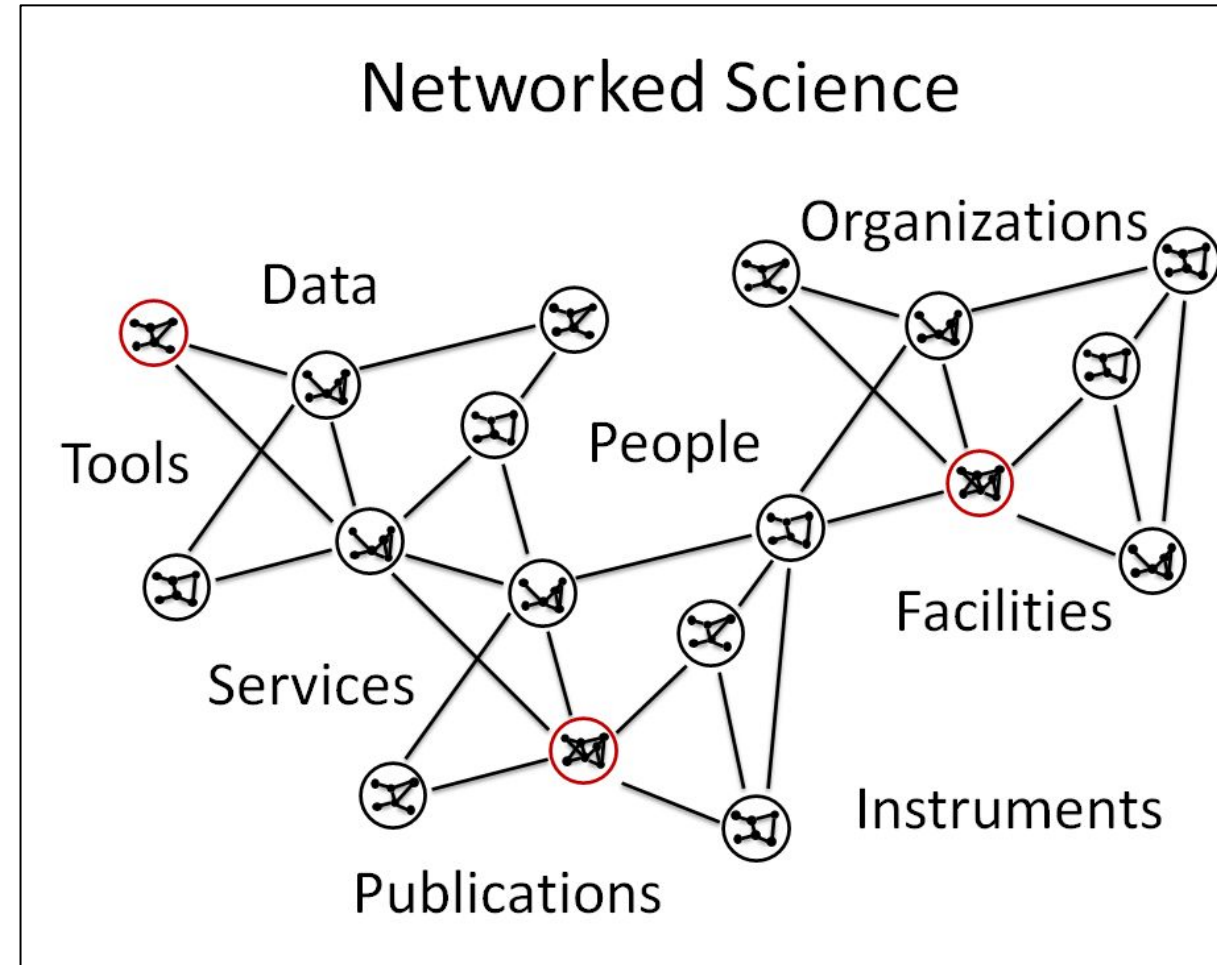
1. Use cases matter
 - a. Reproducibility and Replicability
 - b. Data provenance
 - c. Attribution: Track impact and citations
 - d. Discoverability and Collaboration: Find and share resources
2. PIDs are a starting point
 - a. Making PIDs and citations visible and actionable for researchers who use facilities and instruments is critical
 - b. Value from PIDs comes from integrating them into other systems (metadata systems, institutional systems, publishing systems)

Recurring questions

- What metadata needs to be included? Where should the metadata be collected and made available?
- At what granularity should PIDs be assigned?
 - Does every element/configuration of an instrument need it's own PID?
 - Do you need a general PID for the instrument or do you need a PID specifically for components?
- The Scientific Instrument of Theseus
 - Instruments and facilities evolve over time
 - When is a new PID issued vs. metadata updated?
 - New software? New hardware?

Creating and Maintaining PIDs?

- Instrument and facility providers often face significant resource limitations that make assigning, managing, and promoting PIDs challenging.
- How can we ensure PIDs are created and up to date?
- How are connections between PIDs to be created and maintained?
- Where is funding going to come from?





DataCite

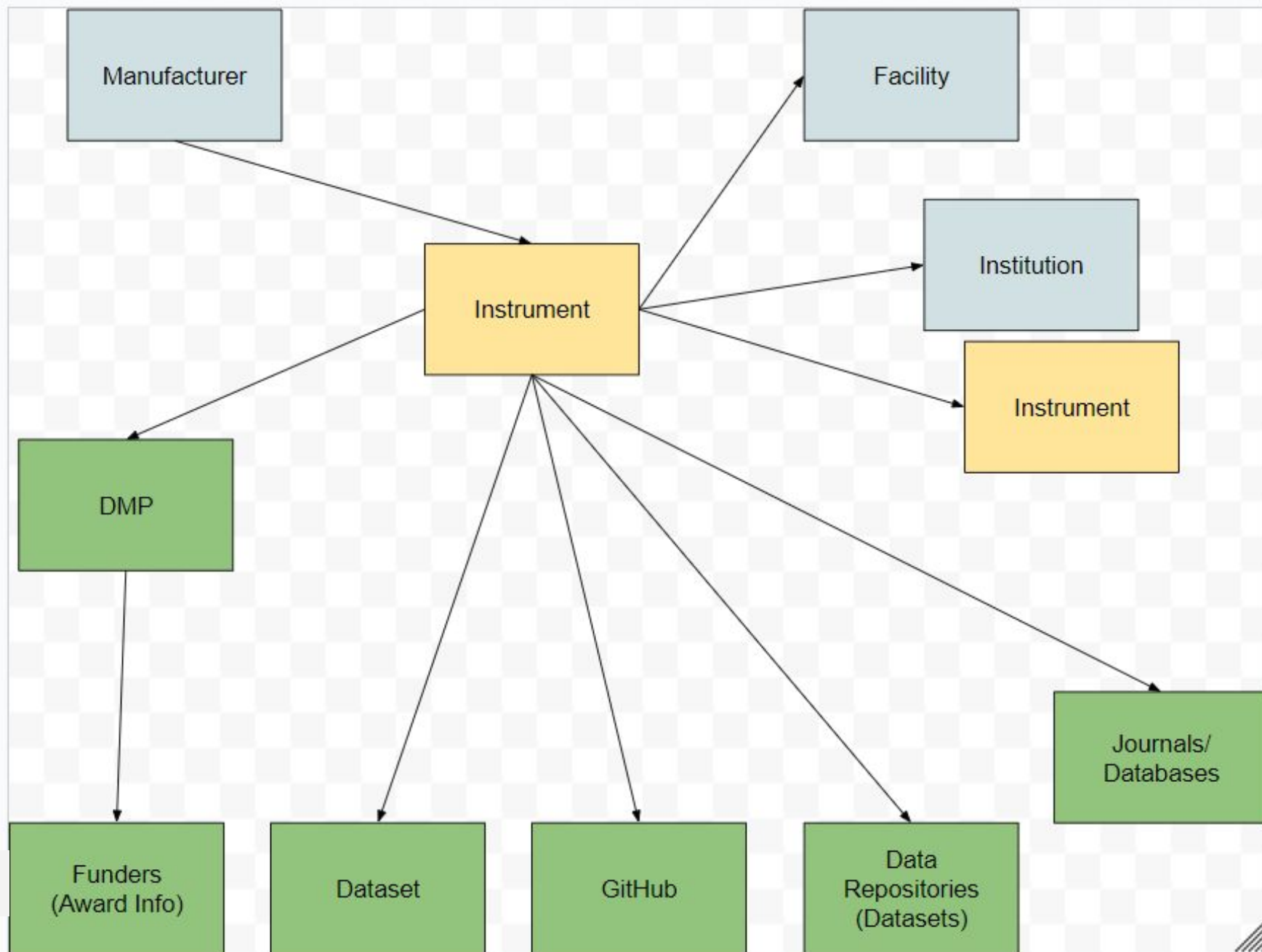


ROR



RRID

Open Funder Registry (OFR)



Broader Community Initiatives

- Research Data Alliance - Working Group on Persistent Identifiers for Instruments (PIDINST)
 - Mar. 2022 [Metadata schema](#)
 - Aug. 2025 [White paper](#)
- Australasian Identifiers for Instruments Community of Practice (i4iOZ)
 - Mar. 2023 [Best Practices document](#)
- Instrument registries
 - NERC Vocabulary Server (UK) [SeaVoX Device Catalogue](#)
 - B2INST [Instrument Registry](#)

Beyond the Workshop

Finalizing

- Finalizing PID strategy recommendations for facilities and instruments

Creating

- Creating practical implementation guidelines

Building

- Building relationships with specific groups like publishers and manufacturers

Documenting

- Documenting cases of simple and complex instrument and facility PID implementations

Questions?

Draft Recommendations - Overview

- Trying to find a balance between general vs. specific guidance
- All comments, suggestions, edits are welcome
- Ideas for visuals?
- “Draft 4” - Calls with three groups before the workshop to revise and refine the draft

Pre-Workshop Calls

David Butcher
Karolien Deneff
Moira Downey
Joe Dragovon
Maria Esteva
Adrian Gestos
Isabelle Girard
Matthew Harp
Nate Herzog
Kassidy Hof-Mahoney
Rebecca Hudak
Seonyoung Kim

Kevin Knudtson
Meghan Kraft
Ryan Leib
Sara Ostrowski
Mark Parsons
Lauren Phegley
Rebecca Ringuette
Sarah Siddiqui
Thayumanasamy Somasundaram
Caterina Strambio
Huajin Wang



Draft Recommendations