DIDs Supporting Research Data Ecosystems

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AGRI-FOOD DATA CANADA
AT THE UNIVERSITY *of* GUELPH

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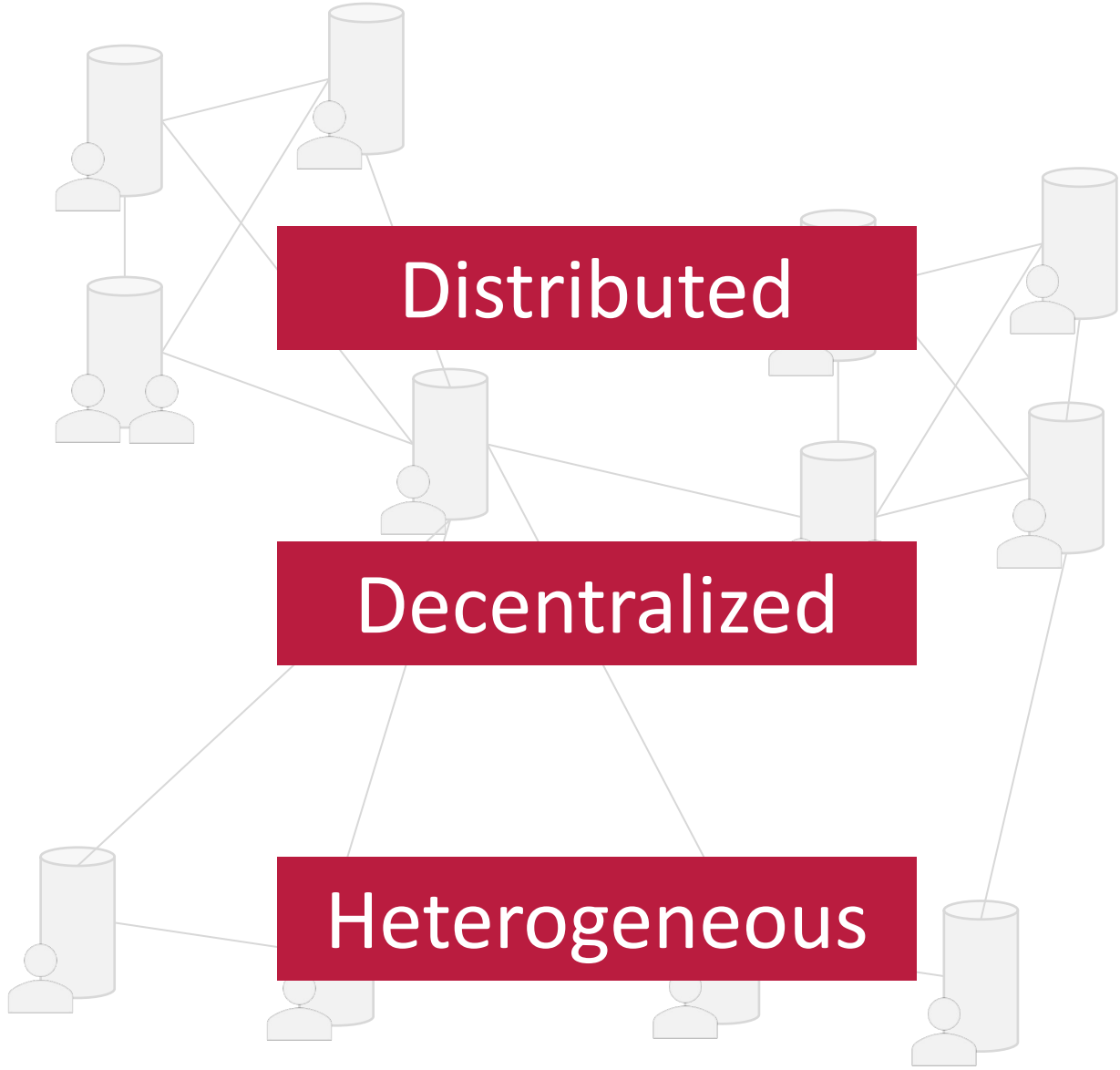
AGRI-FOOD DATA CANADA

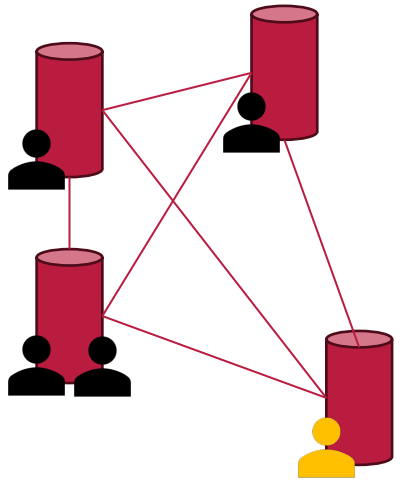
Research data infrastructure



ADC

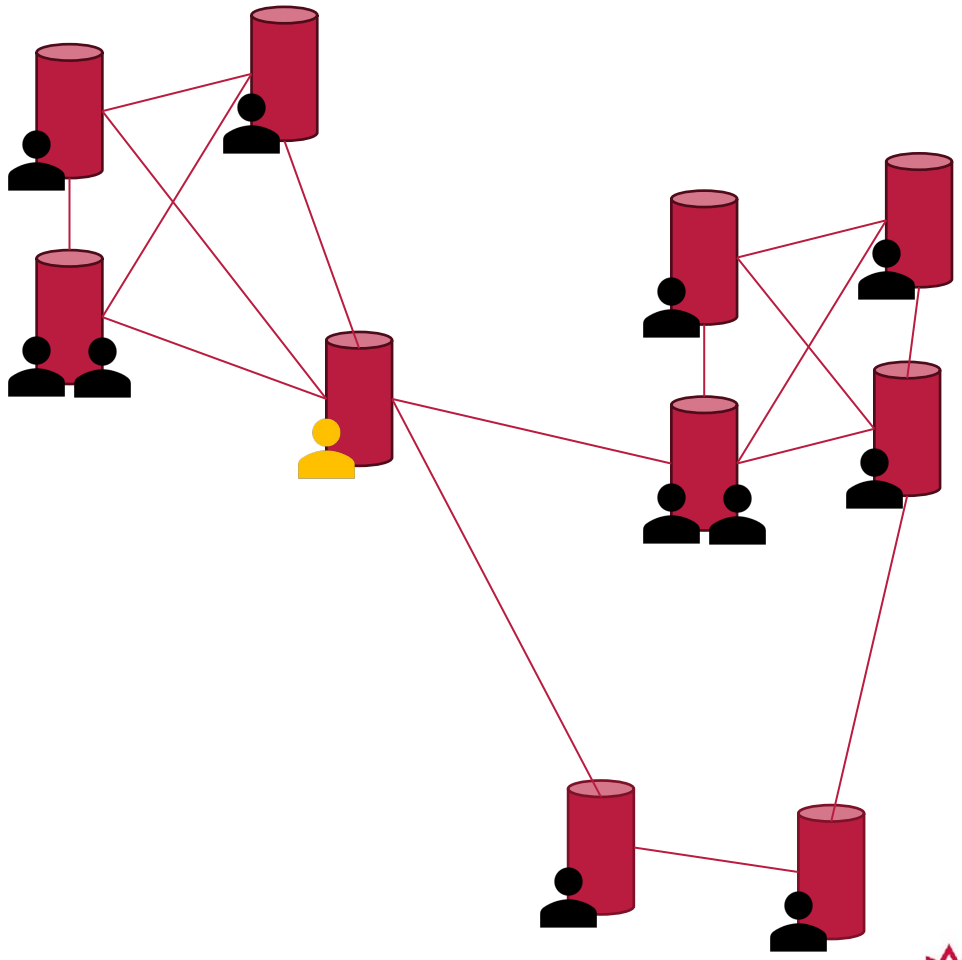
Research collaborations organized in projects

- A researcher is often part of a funded team to address a specific grant topic
- They may share resources, send data files, develop shared infrastructure



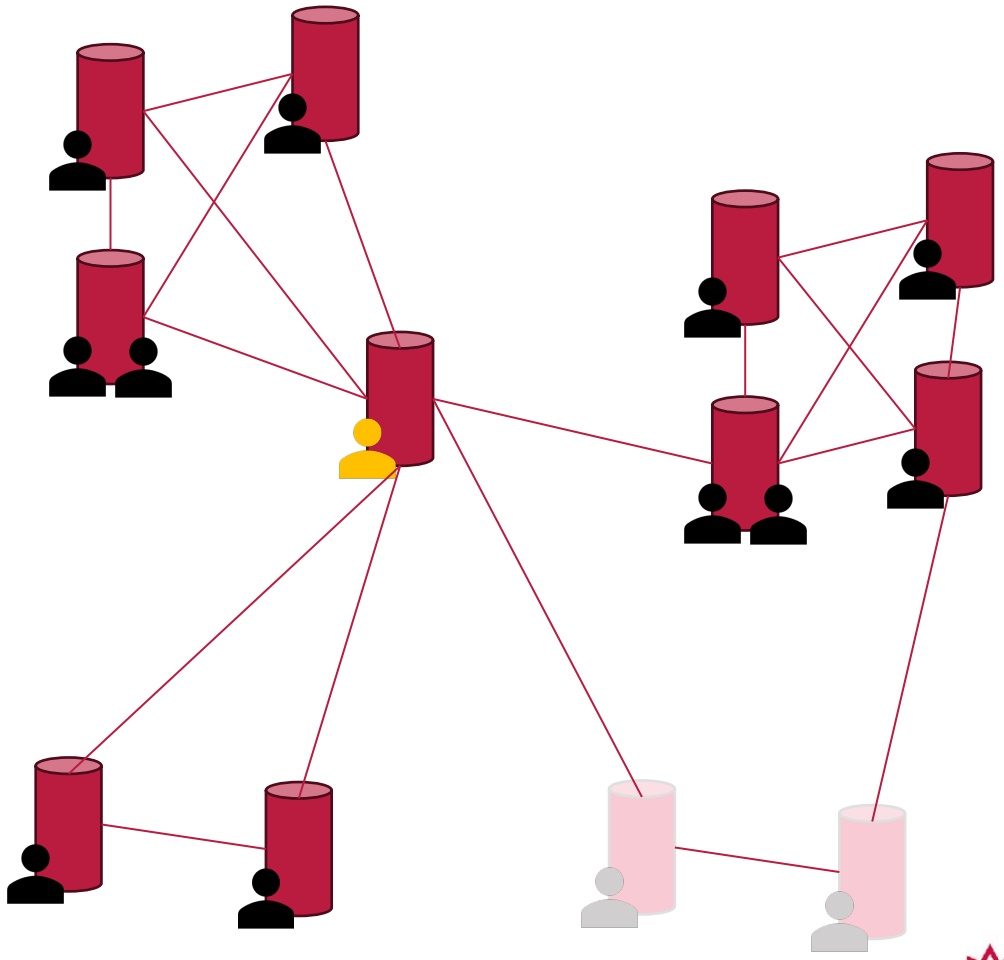
Research ecosystem complexity increases

- Researchers can be part of several projects at the same time



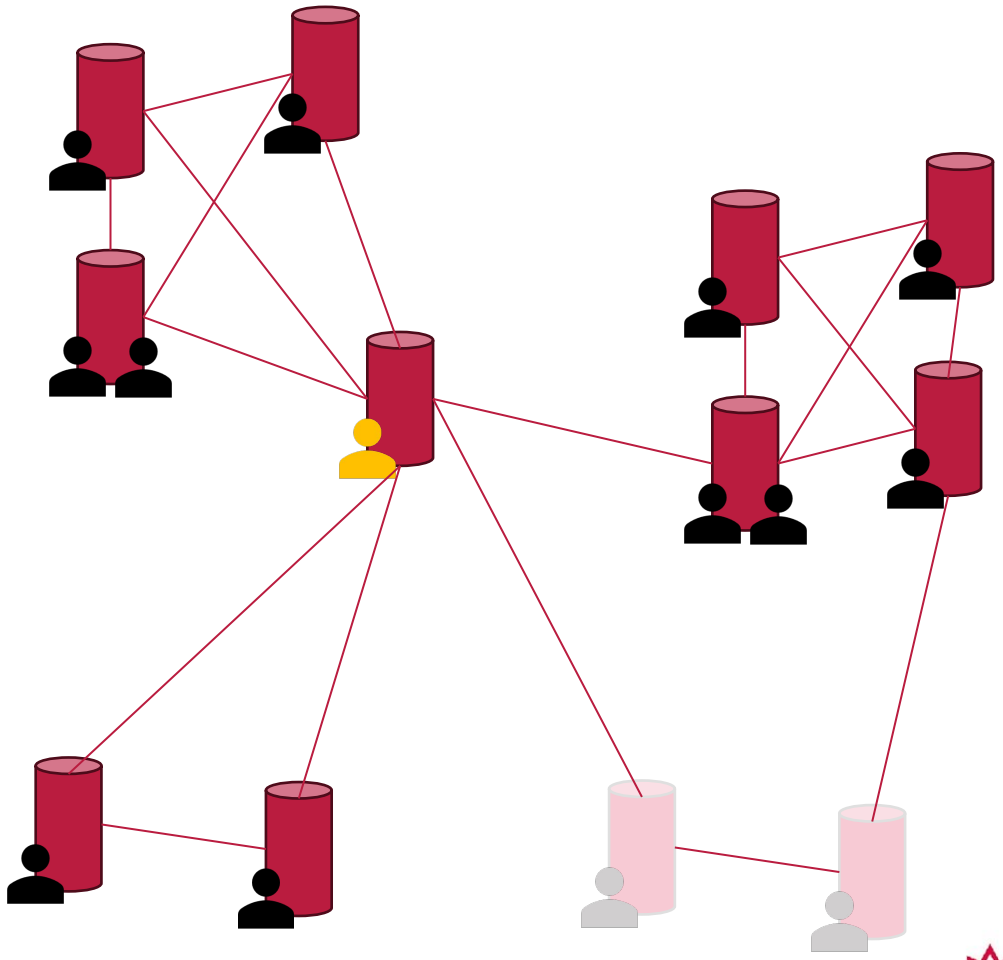
Research structure is dynamic

- Research projects are always in the process of forming and dissolving.



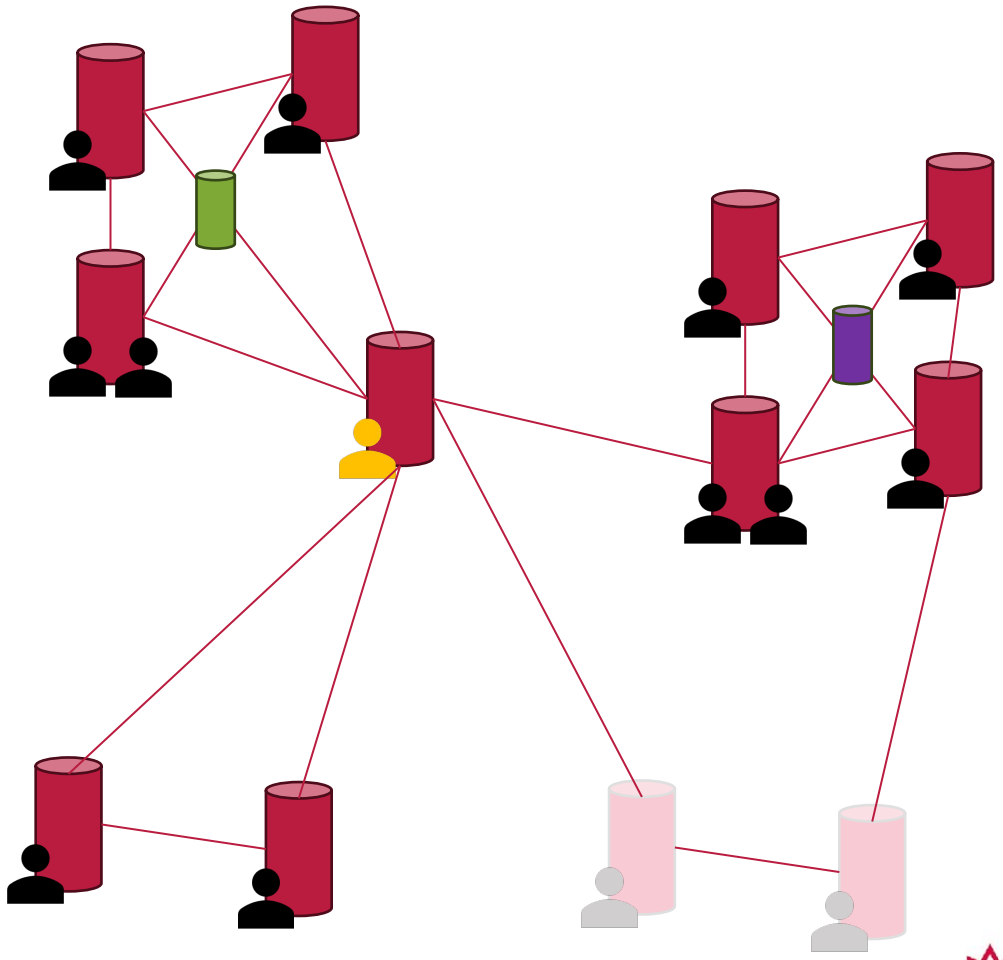
Data Complexity Considerations

- Some data is sensitive
  - E.g. health data, commercial data, indigenous data, personal data
- Some data is very large
- Diverse realities and opinions on data openness



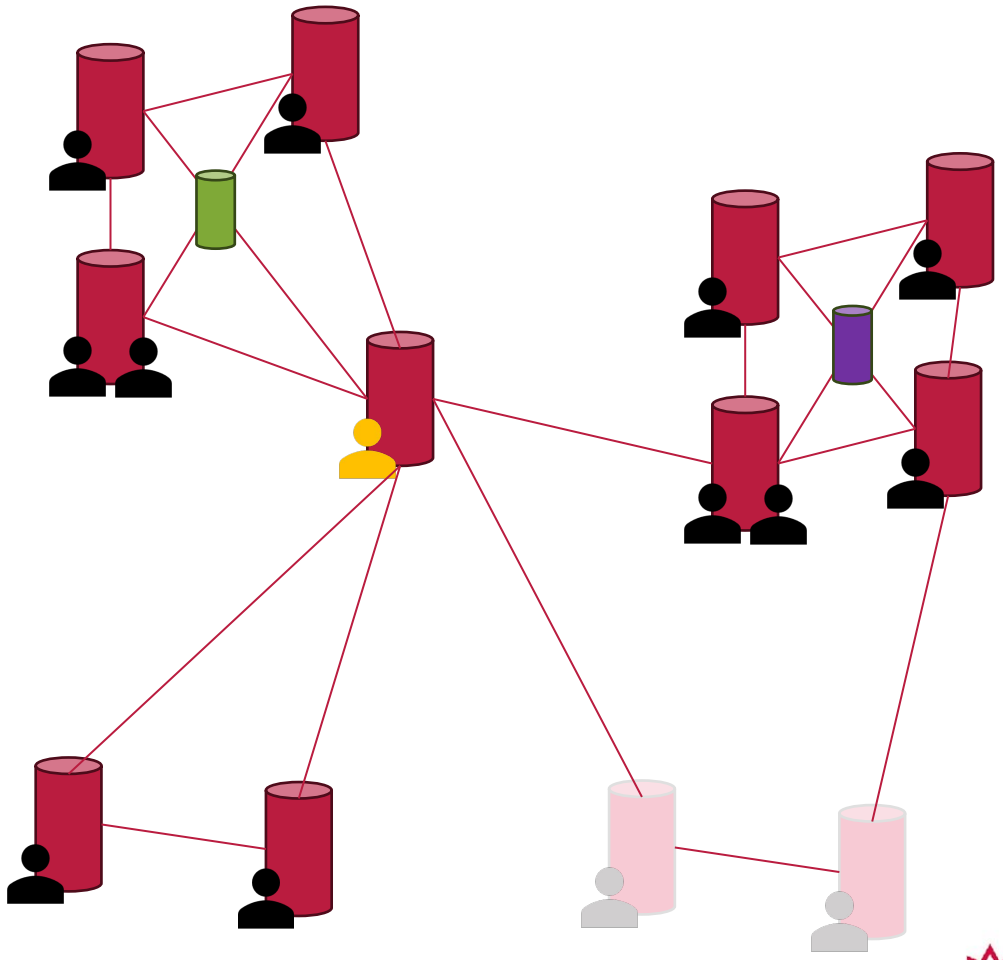
Challenge 1: Data Access

- Data access a mixture of solutions
  - Given a copy of the data (or subset, anonymized, etc.)
  - Given login credentials to multiple systems
  - Create new centralized infrastructure to serve a specific project.



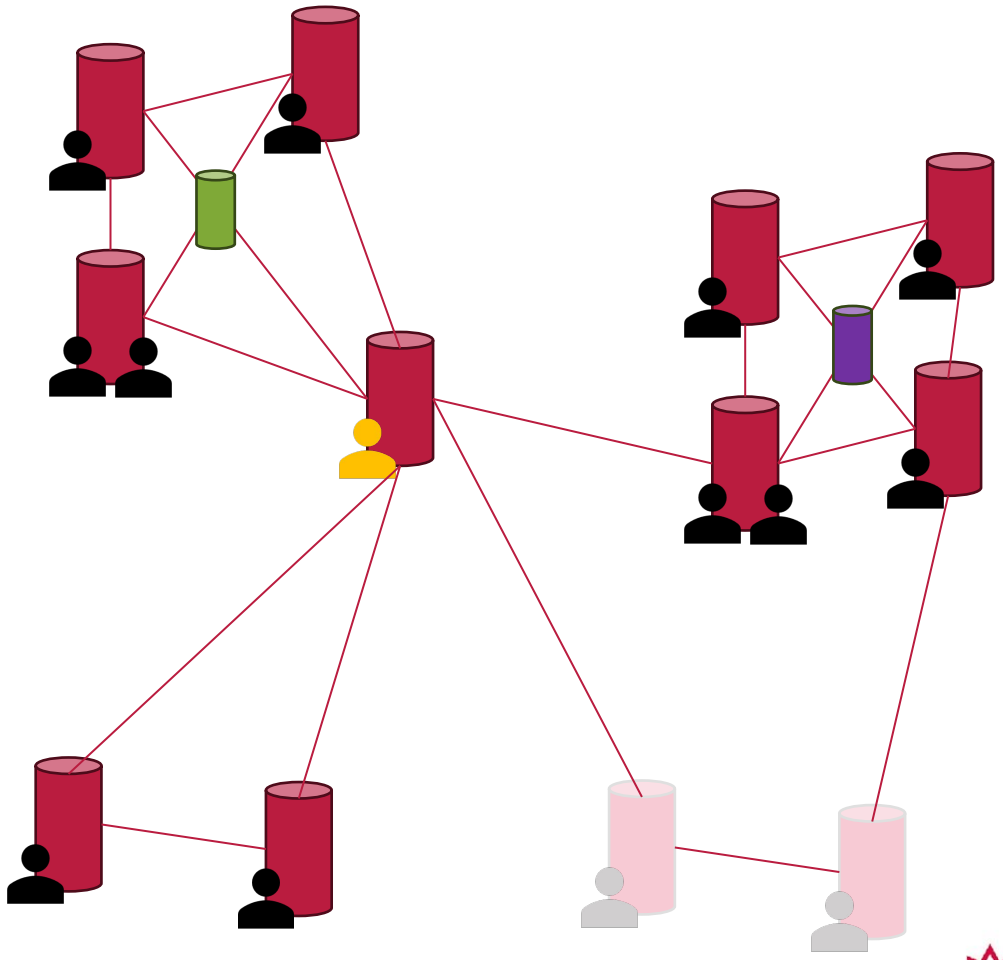
Challenge 2: Provenance Tracking

- Infrastructure to build global provenance tracking is lacking
- Currently built on citations and statements in publications
  - May use DOI identifiers of the datasets



Challenge 3: Secure Data Transfer

- Not widely used across all scientific disciplines
  - Discipline specific strength
  - Globus for secure file transfer in Canada
  - Other sharing includes Dropbox, OneDrive, Google Drive, email etc.

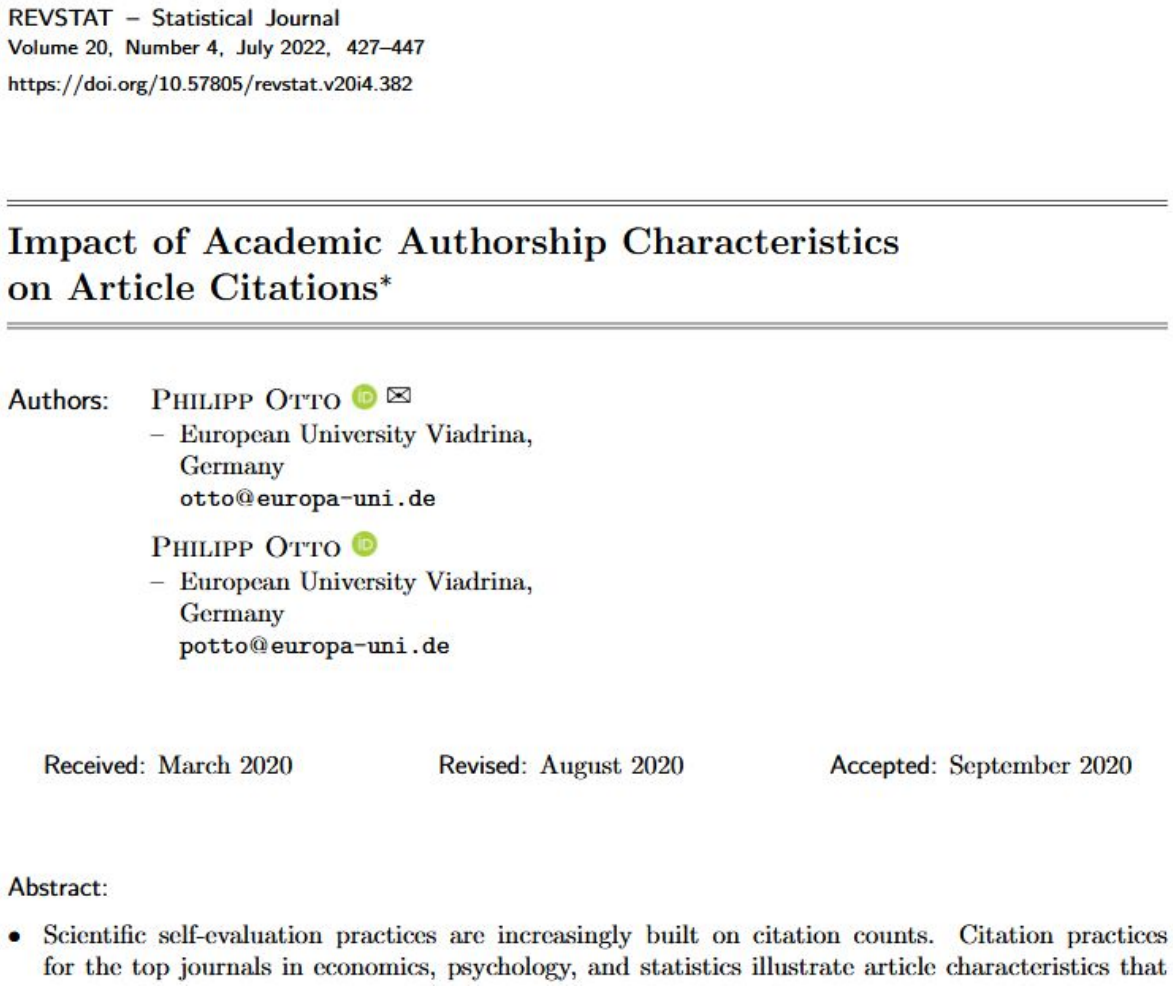


Researcher ecosystems use identifiers

- Persistent Identifiers: PIDs
  - Research infrastructure for unique global identifiers
  - ORCIDs, DOIs, ARKs, RORs, PURLs, RAiDs
    - Most popular are DOIs for research outputs including publications and datasets

ORCIDs for People

- Open Researcher and Contributor ID (ORCID)
  - Non-profit registered in USA
- ORCID is a persistent identifier for people in the research ecosystem
- Researchers own their ORCID records
- Global PID



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Impact of Academic Authorship Characteristics on Article Citations*

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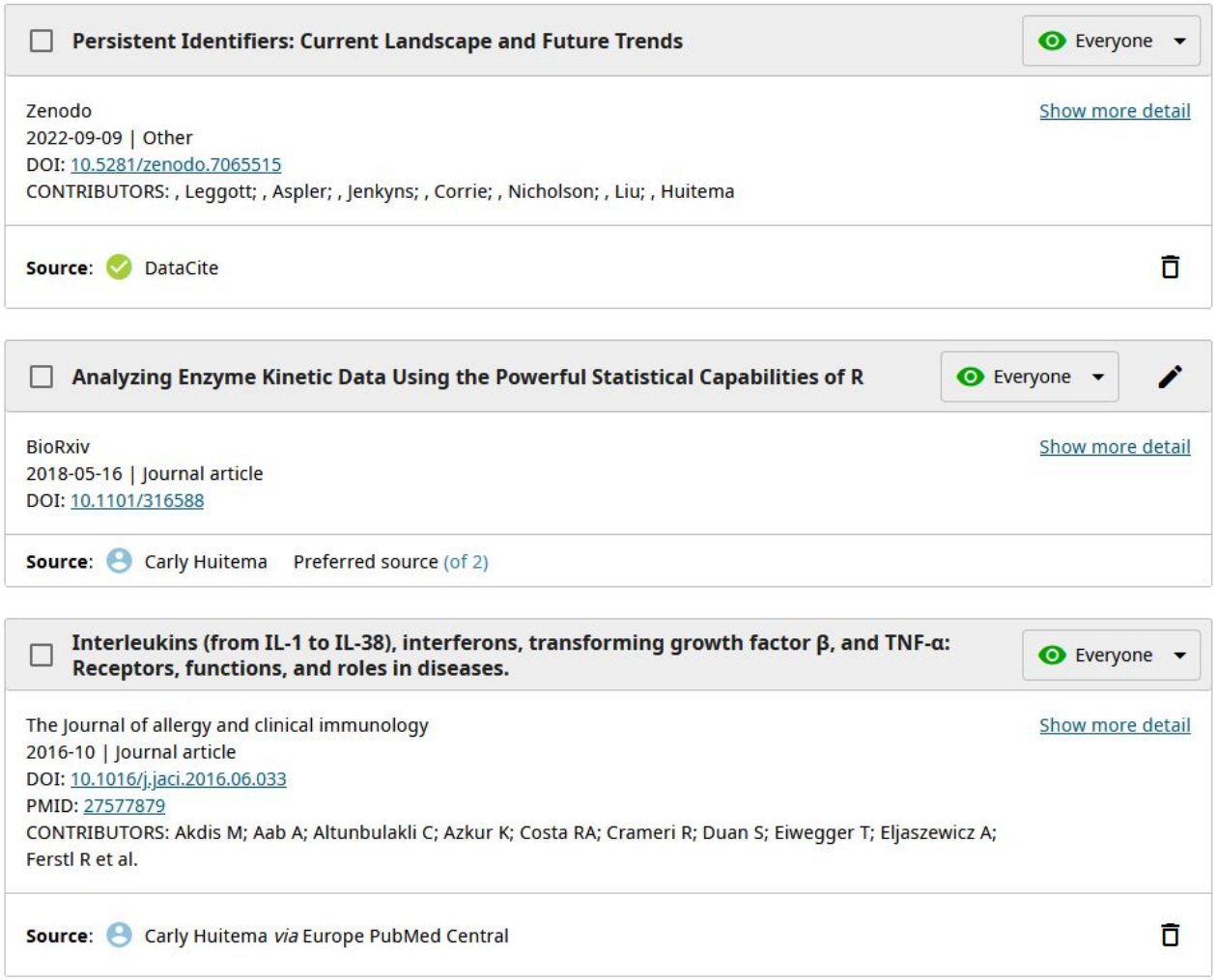
Abstract:

- Scientific self-evaluation practices are increasingly built on citation counts. Citation practices for the top journals in economics, psychology, and statistics illustrate article characteristics that

ORCID record example

- ORCID data is either self-attested or updated via trusted organizations (researcher approved)
- OAuth and audit trails for verification of data

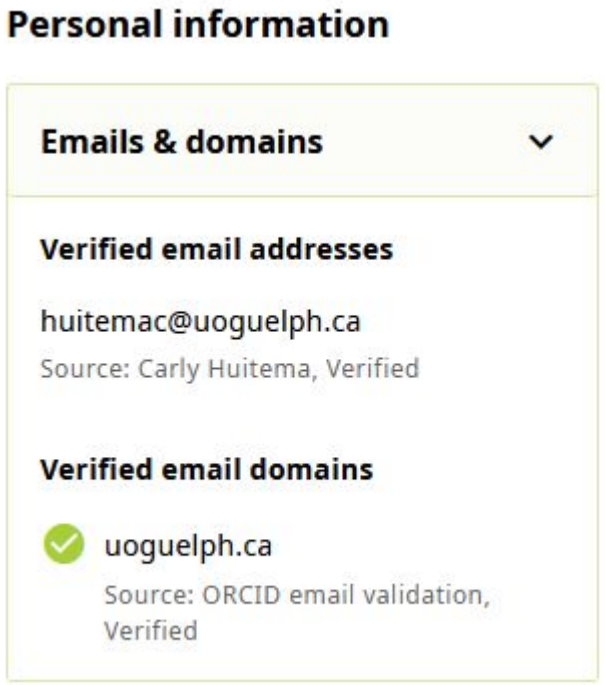


Decentralized Identifiers (DIDs)

- W3C standard Decentralized Identifiers (DID)
- The identifier (DID) resolves a DID Document
  - Resolution method depends on DID method (200+)
  - Storage and security of DID source data depends on DID method
    - Ledger, files, websites, history etc.
- DID document content contains:
  - Authentication keys – public keys for specified services
  - Assertion keys – public keys for signing statements
  - Key agreement keys – public keys for secure data channels
  - Endpoints – methods to contact DID subject

Proposal 1

- List researcher DIDs in ORCID record
- Could be used for:
  - Provenance tracking
    - Sign datasets and other outputs
  - Authentication
    - Key-based authentication
  - Secure data transfer
    - Key agreement keys and endpoints



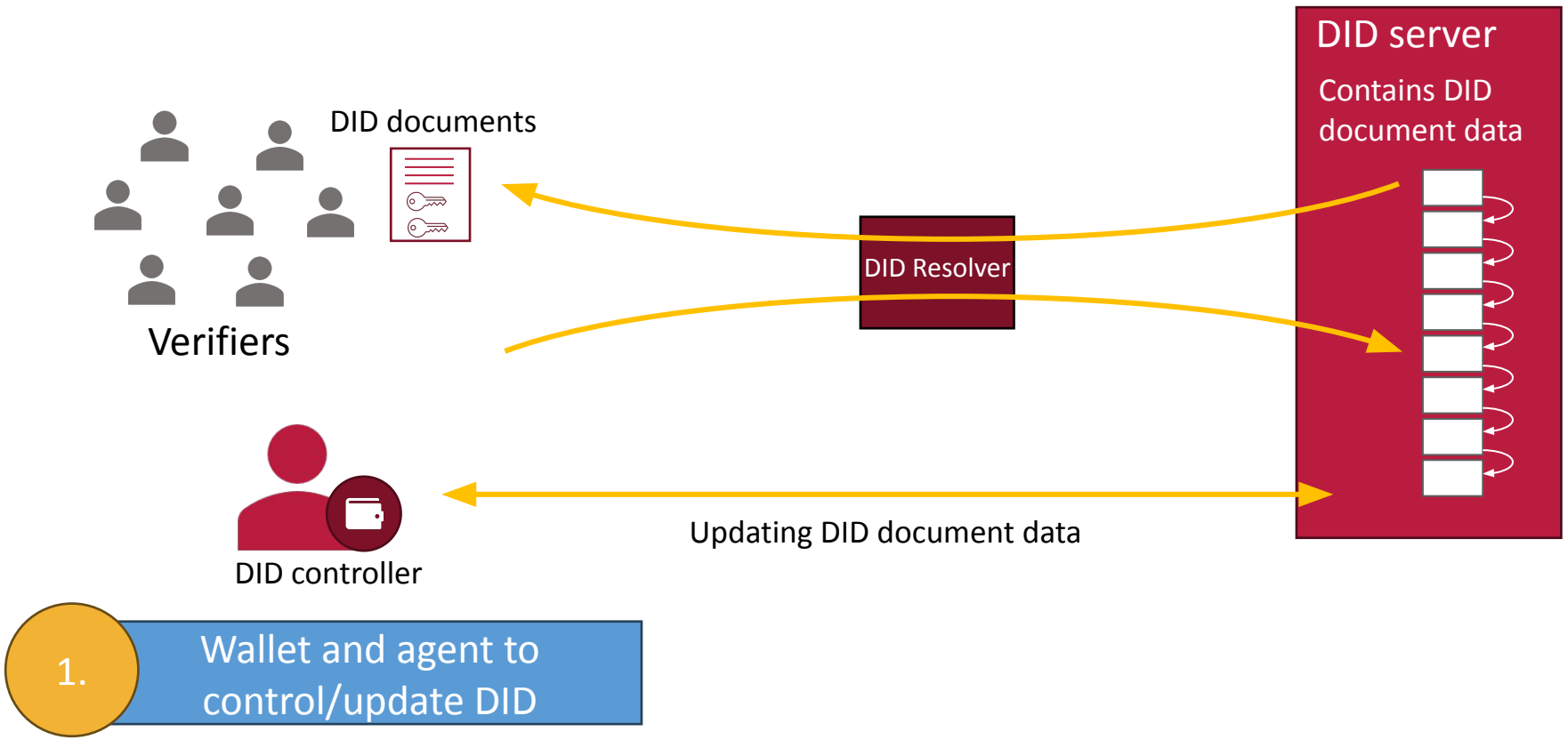
Verified DIDs

did:example:123456789abcdefghi

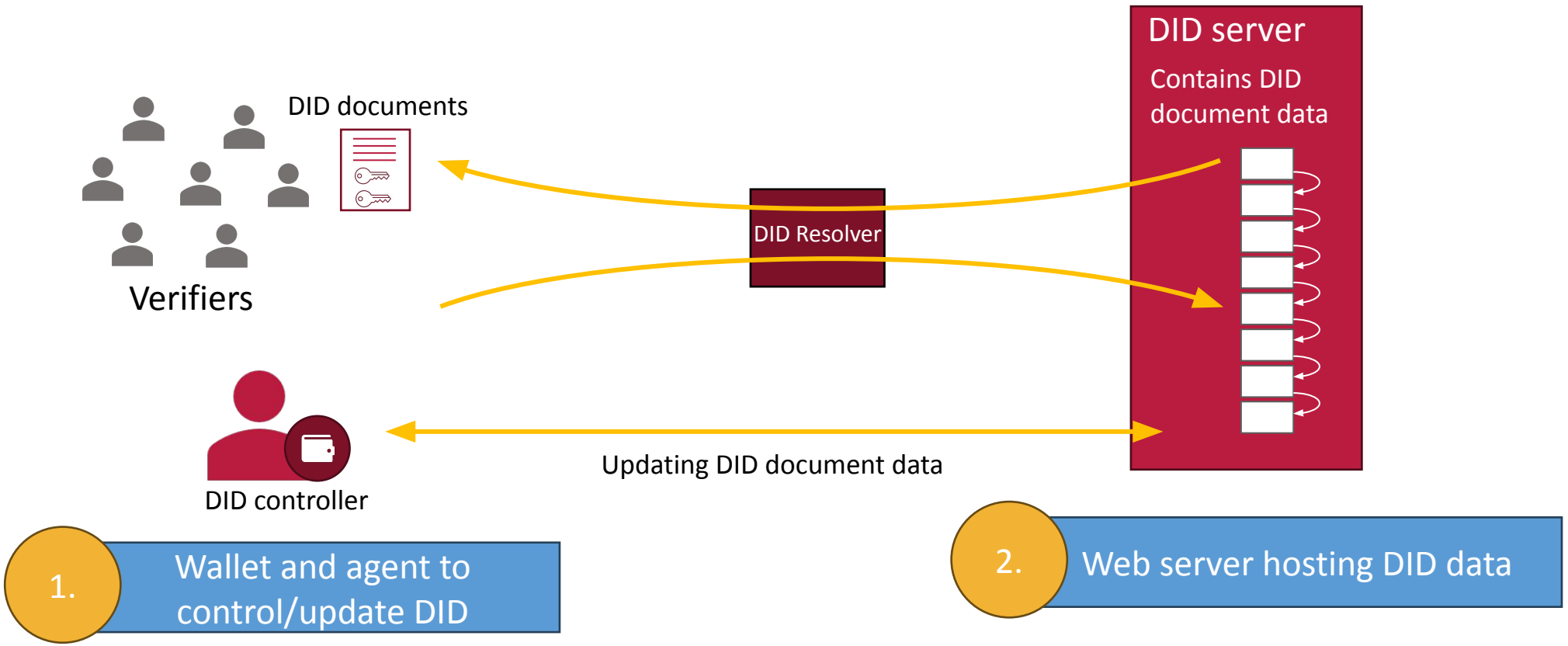
What can a DID do in a data ecosystem?

- Support authentication, assertions, secure communication/transfer
- DIDs available for building data spaces
  - Data Spaces can build on top of these available keys and endpoints
- ORCID with DIDs
  - Trust signals from ORCID record
  - Researcher PID integrated into existing workflows and infrastructure

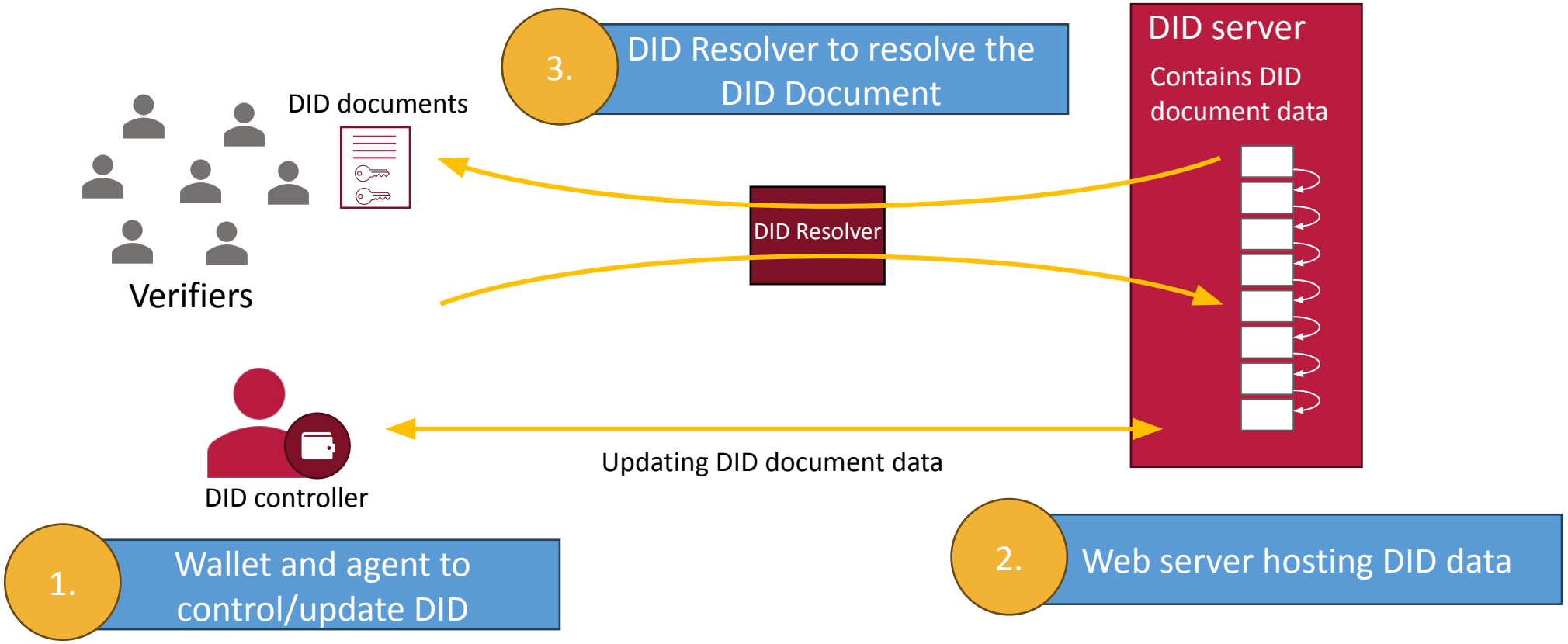
DID Ecosystem Architecture



DID Ecosystem Architecture



DID Ecosystem Architecture



Proposal 2

- ORCID host DID infrastructure
  - Let researchers create DIDs as well as list them
  - Bootstrap more secure research Data Spaces
  - Support others to build DID infrastructure

DID methods: did:webvh and did:webs

- Self-certifying identifiers
- Key pre-rotation
- Verifiable history, cryptographic evidence
- Witnesses and watchers supported
- Web-based publication
- Portable DIDs

https://didwebvh.info/

aca-py.org and Credo

Python implementation

https://trustoverip.github.io/tswg-did-method-webs-specification/

https://github.com/GLEIF-IT/did-webs-resolver

KERI-Py: https://github.com/WebOfTrust/keripy

How to follow this work

- **Agrifooddatacanada.ca**
- Trust over IP at Linux Foundation Decentralized Trust
- Educational content: Bite Size Trust on YouTube
  - https://www.youtube.com/playlist?list=PL0MZ85B_96CEoV-jvUbTovUAOA531bce_

THANK YOU

Agri-food Data Canada at the University of Guelph is an innovation platform for Canada's agriculture and food sectors.

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