Data Publishing while Preserving Data Privacy

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5R: Innovative Approaches to Promoting Transparency in Research

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Introduction to Dataverse

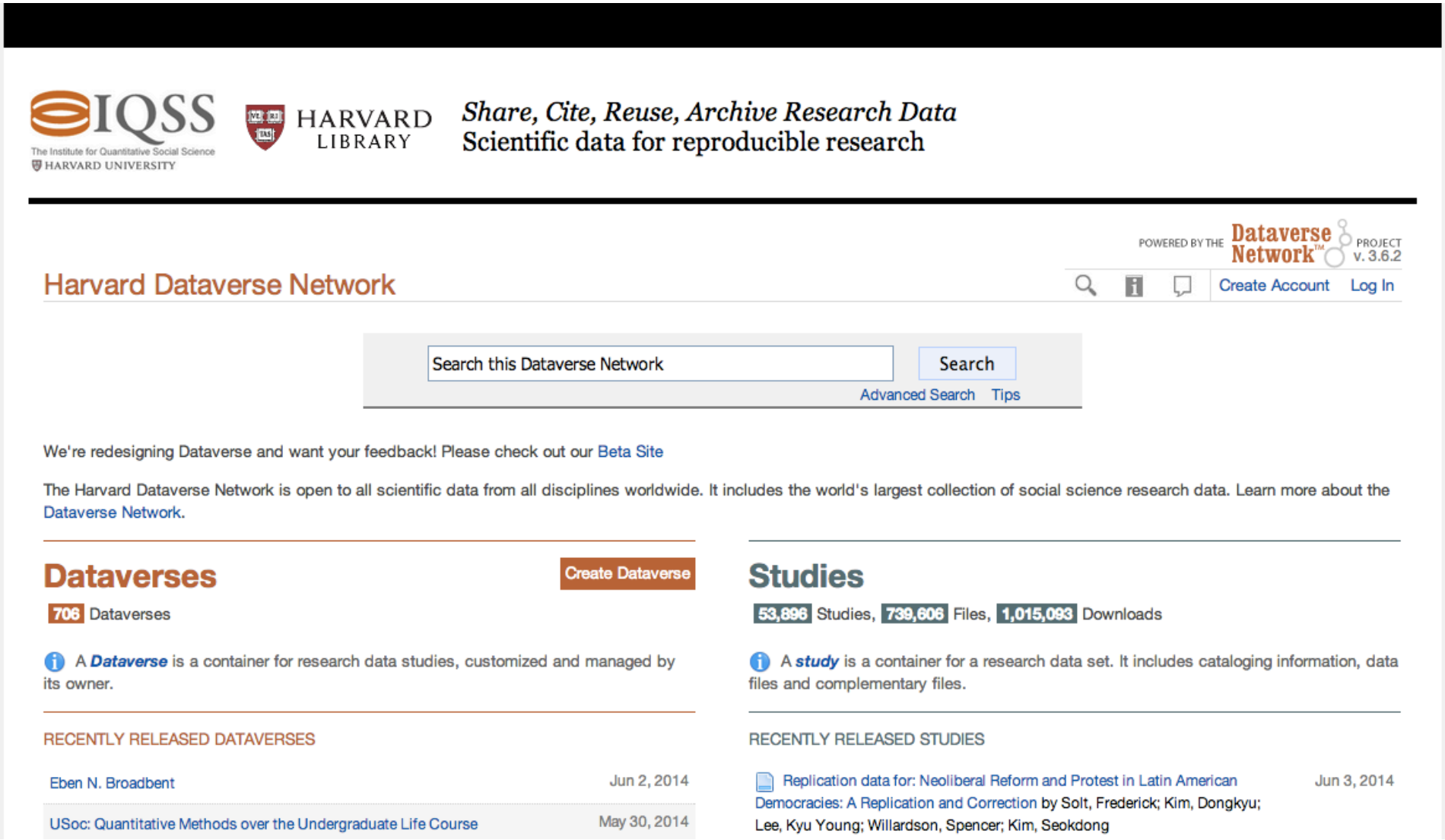
Dataverse Software

- A framework for publishing, citing and preserving research data
- Open-source, available at GitHub
- Started in 2006
- Several installations around the world, supporting all data types across multiple disciplines.

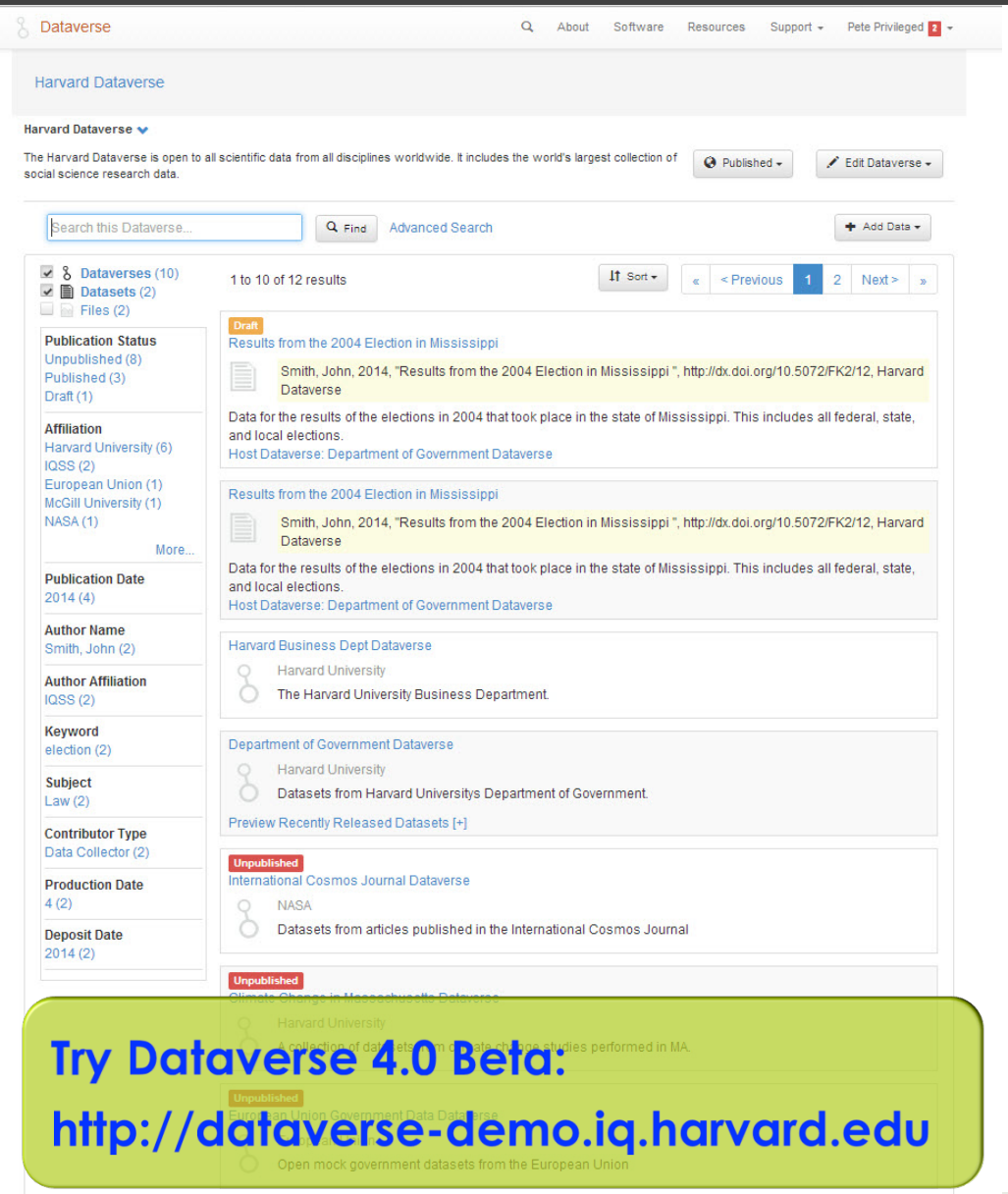
Dataverse Repository

- **Harvard** hosts a Dataverse instance **free and open** to all research data
- More than 53,000 datasets, with 735,000 files.
- Dataverses can be created for researchers, journals, organizations, educators, …
- It federates with the other Dataverse installations.

Find and publish data at: http://thedata.harvard.edu



Dataverse 4.0



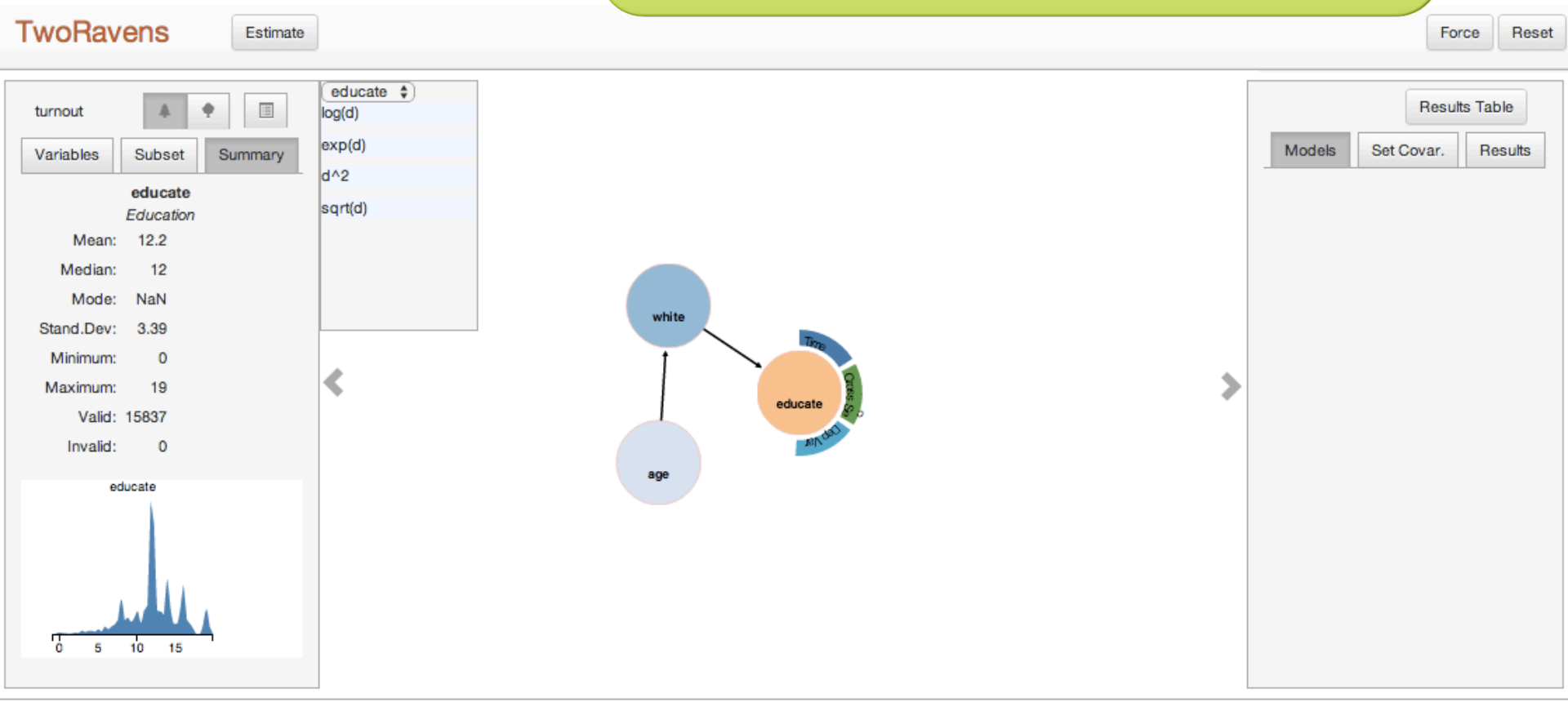
Try Dataverse 4.0 Beta:
http://dataverse-demo.iq.harvard.edu

This summer:

- New UI
- New rich, faceted search
- Reformatting and metadata extraction for more data types (excel, CSV, R data, Stata, SPSS, FITS)
- Metadata standards for social sciences, astronomy, biomedical sciences.
- Integration with a new data exploration and analysis tool: **TwoRavens**

TwoRavens

Dataverse 4.0 will include a new interactive data exploration and analysis tool, **TwoRavens,** which integrates with **Zelig statistical framework**



Citation Metadata

Title *
Replication Data for: Building a Bridge Betwe
Add 'Replication Data for' to Title

Author
Name* Castro, Eleni
Affiliation IQSS

Contact E-mail * ecastro@fas.harvard.edu

Description *
Research dataset for my publication on connecting journal articles and their underlying research data. Includes analysis of current data publication practices.

Keyword data publication

Subject *
- [ ] Mathematical Sciences
- [ ] Physics
- [x] Social Sciences
- [ ] Other

Citation Metadata:
Compliant with DataCite, Dublin Core, DDI study description. Applies to all datasets.

Social Science and Humanities Metadata

Topic Classification
Term | Vocabulary | URL

Software
Name | Version

Series
Name | Information

Time Period Covered
Start (YYYY-MM-DD) | End (YYYY-MM-DD)

Date of Collection
Start (YYYY-MM-DD) | End (YYYY-MM-DD)

Country/Nation

Geographic Coverage

Geographic Unit

Geographic Bounding Box
West Longitude | East Longitude
North Latitude | South Latitude

Social Sciences and Humanities Metadata:
Compliant with DDI

Astronomy and Astrophysics Metadata

Type

- Image
- Mosaic
- EventList
- Spectrum
- Cube

Facility

Instrument

Spatial Resolution

Spectral Resolution

Time Resolution

Bandpass

Central Wavelength (m)

Wavelength Range — **Minimum (m)** — **Maximum (m)**

Dataset Date Range — **Start** (YYYY-MM-DD) — **End** (YYYY-MM-DD)

Astronomy Metadata:
Compliant Virtual Observatory (VO) schema; extract metadata from FITS files

Design Type

- [ ] Case Control
- [ ] Cross Sectional
- [ ] Not Specified
- [ ] Parallel Group Design
- [ ] Perturbation Design

Factor Type

- [ ] Age
- [ ] Biomarkers
- [ ] Developmental Stage
- [ ] Cell Surface Markers
- [ ] Cell Type/Cell Line

Measurement Type

- [ ] DNA Methylation Profiling (Bisulfite-Seq)
- [ ] DNA Methylation Profiling (MeDIP-Seq)
- [ ] Histone Modification (ChIP-Seq)
- [ ] Protein-RNA Binding (RIP-Seq)
- [ ] Transcription Factor Binding

Organism

- [ ] Danio rerio
- [ ] Homo sapiens
- [ ] Mus musculus
- [ ] Rattus norvegicus

Cell Type

+

Bio Metadata:
Compliant with ISA-Tab schema, plus biomedical ontologies

Data Publishing Guidelines

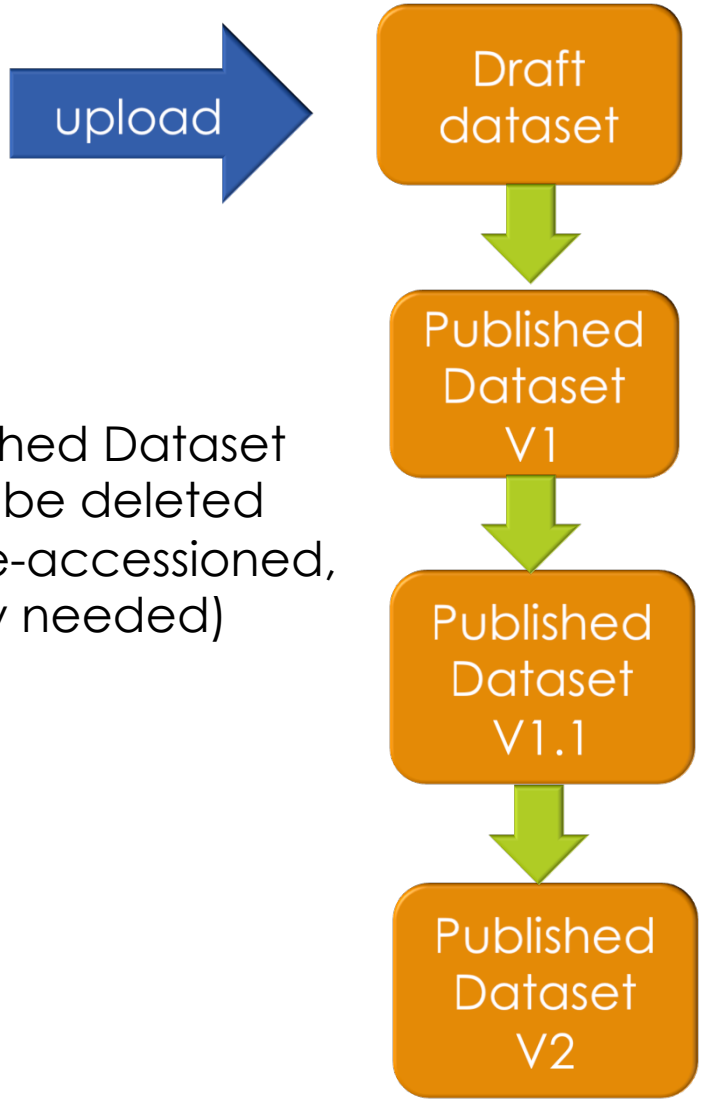
Three pillars to Data Publishing:

- A trusted data repository to guarantee long-term access
- A formal data citation*
- Sufficient information to understand and reuse the data (metadata, documentation, code)

By supporting these pillars, Dataverse provides a full solution to Data Publishing.

* Data Citation Principles: https://www.force11.org/datacitation

A Rigorous Data Publishing Workflow



A Published Dataset cannot be deleted (only de-accessioned, if legally needed)

Rublish Version 1: once published, **metadata** is always **public** (e.g., CC0), but data files might be restricted.

Authors, Title, Year, DOI Repository, UNF, V1

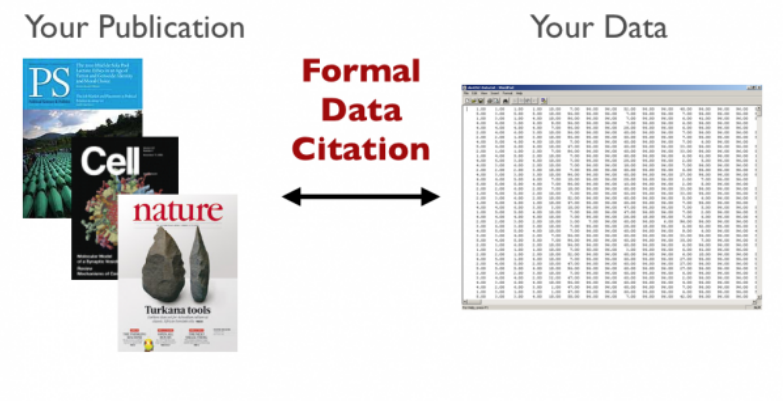
Publish Version 1.1: small metadata change; citation doesn't change

Authors, Title, Year, DOI Repository, UNF, V1

Publish Version 2: big metadata change, or file change; citation changes

Authors, Title, Year, DOI Repository, UNF, V2

Workflows that Integrate with Journals



Option A. Author publishes a dataset to his/her Dataverse, then provides the Data Citation to the journal.

Option B. Author contributes to a journal Dataverse:

1. Add dataset to Journal Dataverse as a draft.
2. Journal Editor reviews it, and approves it for release.
3. Dataset is published with Data Citation and link from journal article to the data.

Option C. Seamless Integration between journal system and Dataverse.

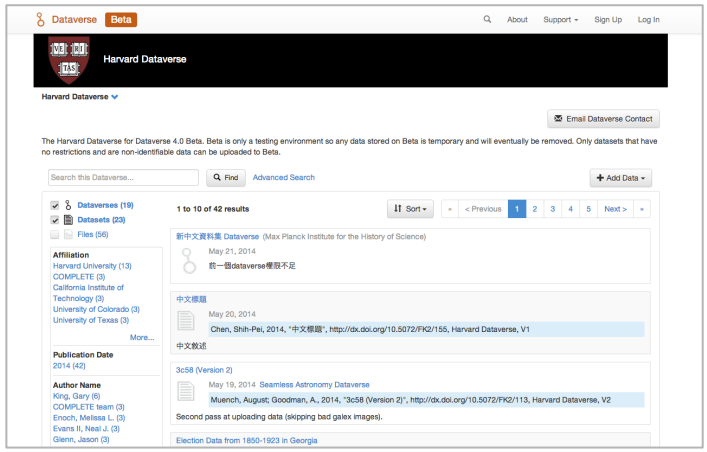
Example of Option C: OJS and Dataverse Integration

OJS Journal

Citation to Data

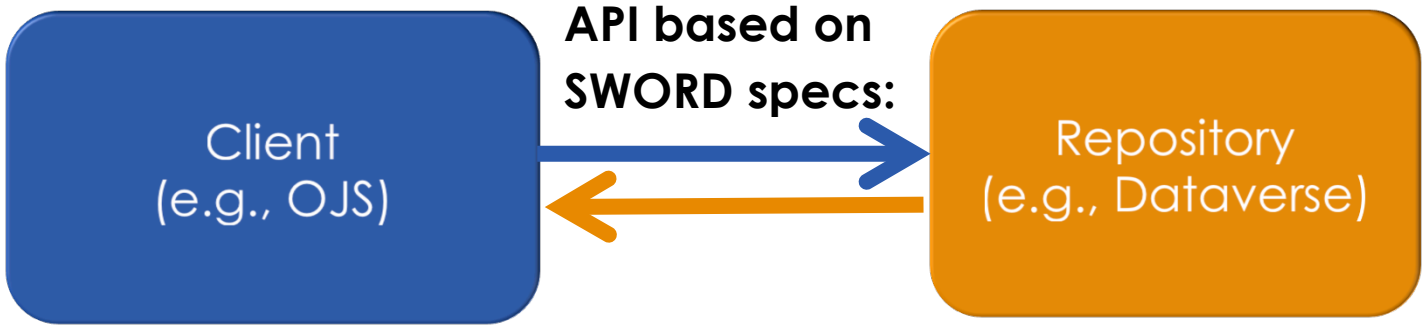
Citation to Article

Journal Dataverse



- Sloan funded project to integrate PKP's Open Journal System (OJS) with the Dataverse software.
- Pilot with ~ 50 journals
- OJS Dataverse plugin now available with latest OJS release
- http://projects.iq.harvard.edu/ojs-dvn

Toward a common API between journal systems and data repositories



Client sends:

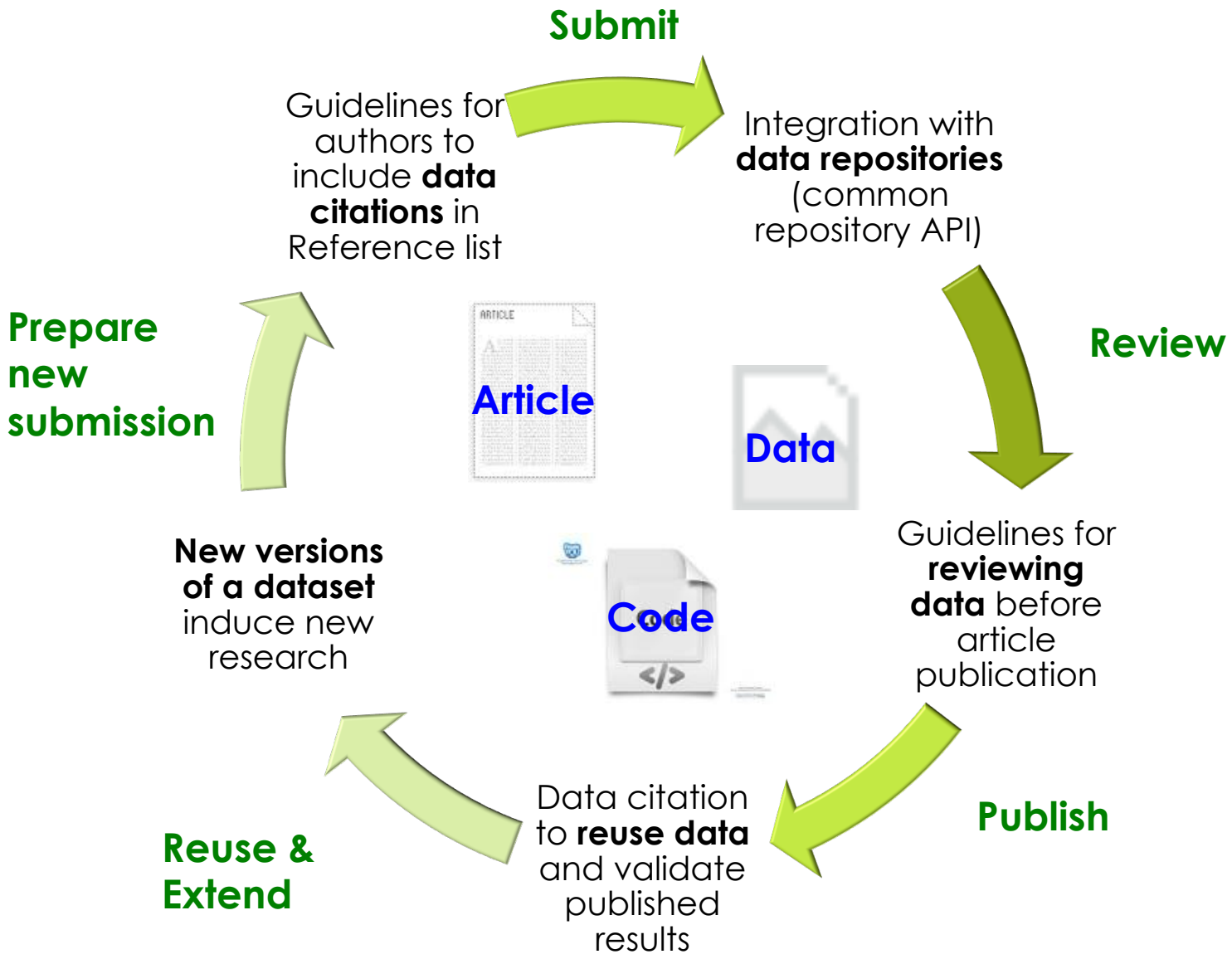
- ✓ XML file: AtomPub "entry" with Dublin Core Terms (e.g., title, creator)
- ✓ Zip file: All data files associated with that dataset.

Repository sends:

- ✓ XML file: "Deposit Receipt" → send **data citation** from repository to client

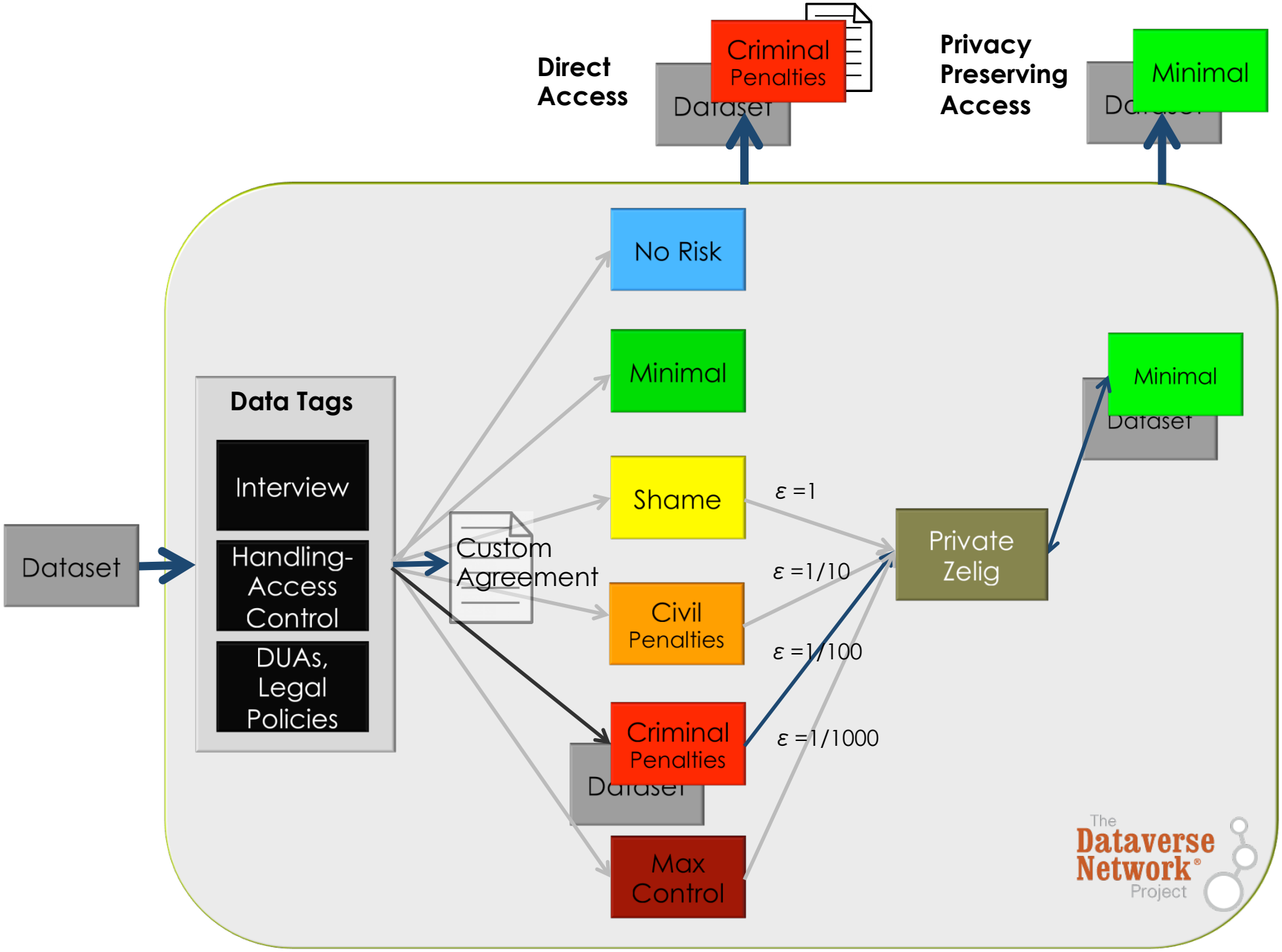
Plus updates from client to server during lifecycle:
In review, publish first version, new versions

Toward an integrated, living publishing workflow

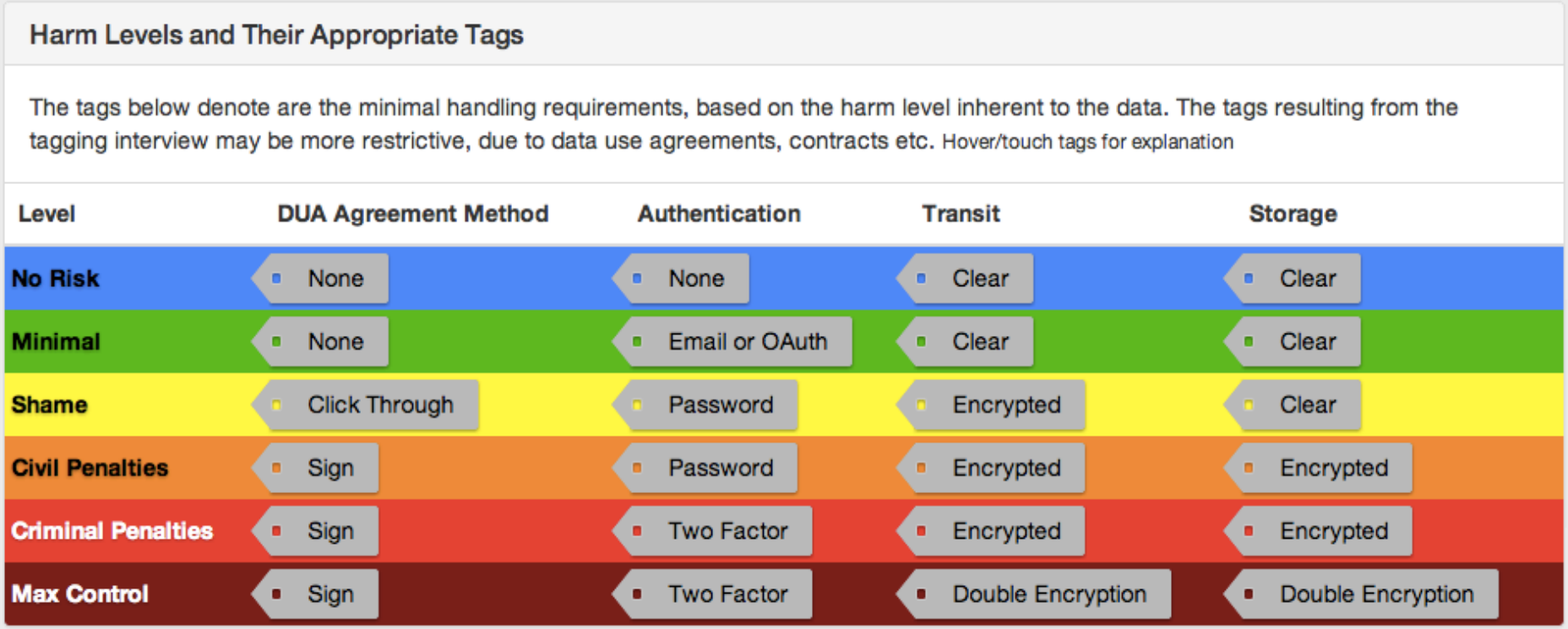


Publishing Sensitive Data

- Dataverse is part of a 4 years NSF funded project on **Privacy Tools for Sharing Sensitive Data** *(Harvard SEAS, Berkman Center, Data Privacy Lab, IQSS)*.
- This project includes:
  - **DataTags:** A framework that provides data handling prescriptions to comply with numerous privacy regulations and data user agreements
  - **Private Zelig:** A differential privacy version of the Zelig statistical framework


Direct Access
Criminal Penalties
Dataset
Privacy Preserving Access
Minimal
Data Tags
Interview
Handling-Access Control
DUAs, Legal Policies
Dataset
Custom Agreement
No Risk
Minimal
Shame
Civil Penalties
Criminal Penalties
Max Control
ε =1
ε =1/10
ε =1/100
ε =1/1000
Private Zelig
Minimal
The Dataverse Network® Project

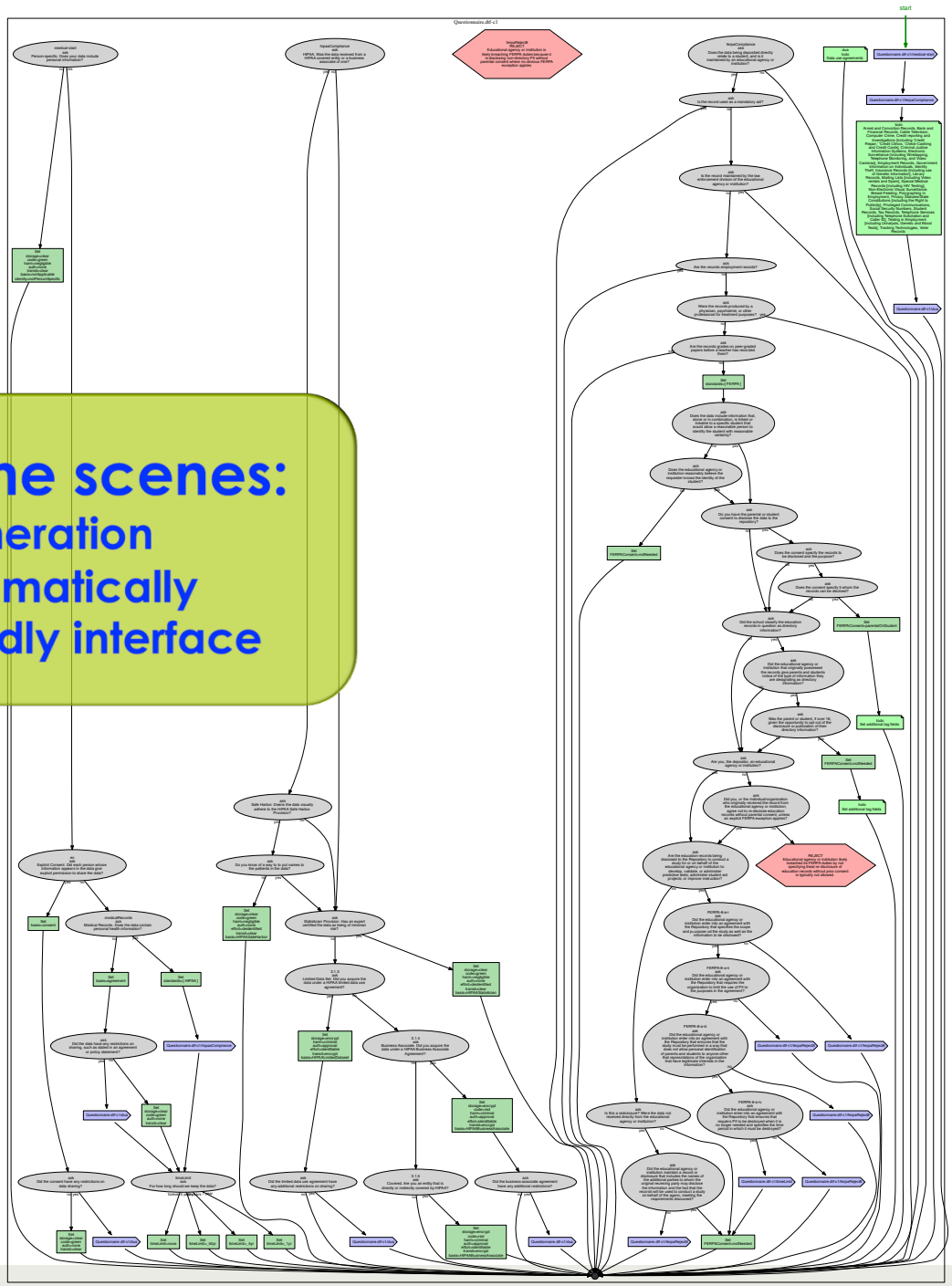
Try our new Beta version: http://datatags.org



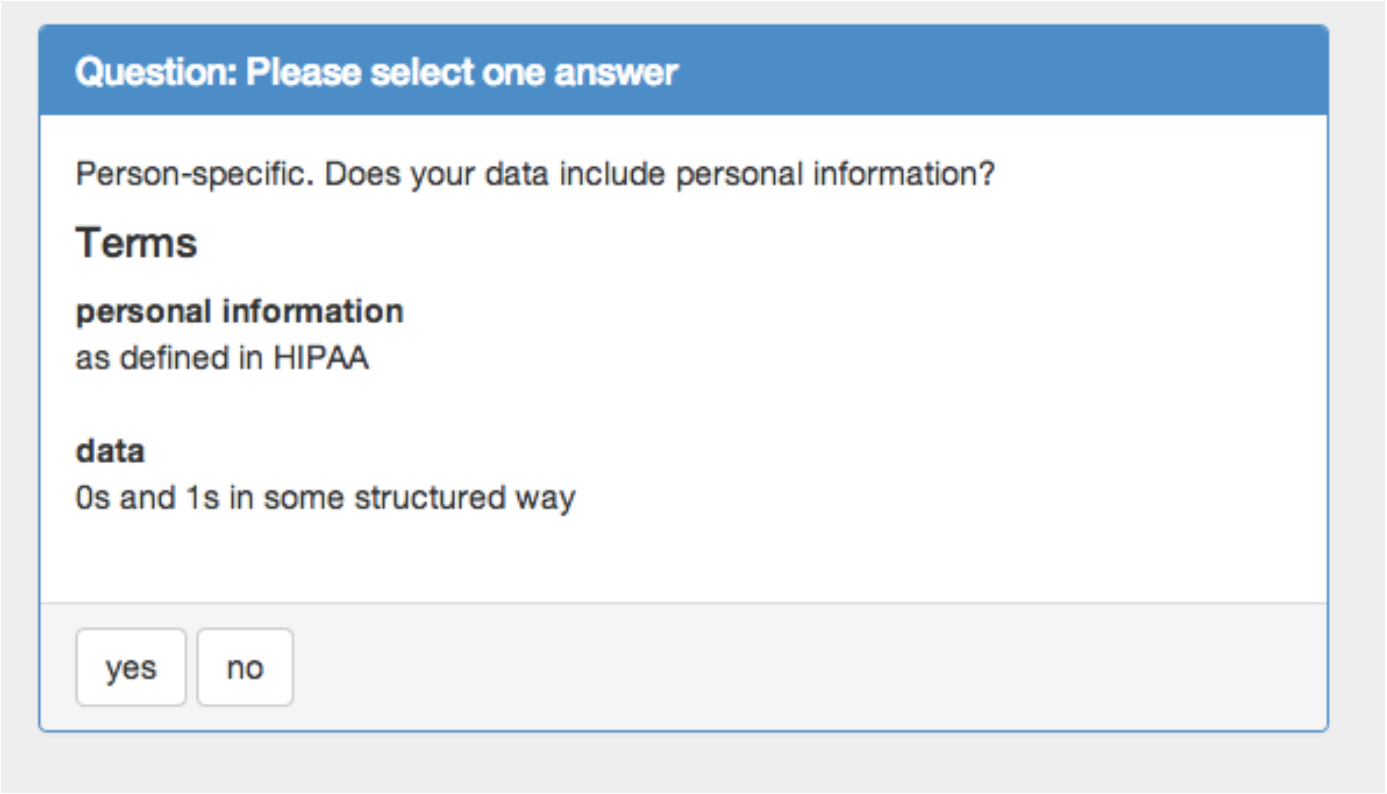
Currently supporting HIPAA and FERPA (and DUAs)

DataTags behind the scenes:

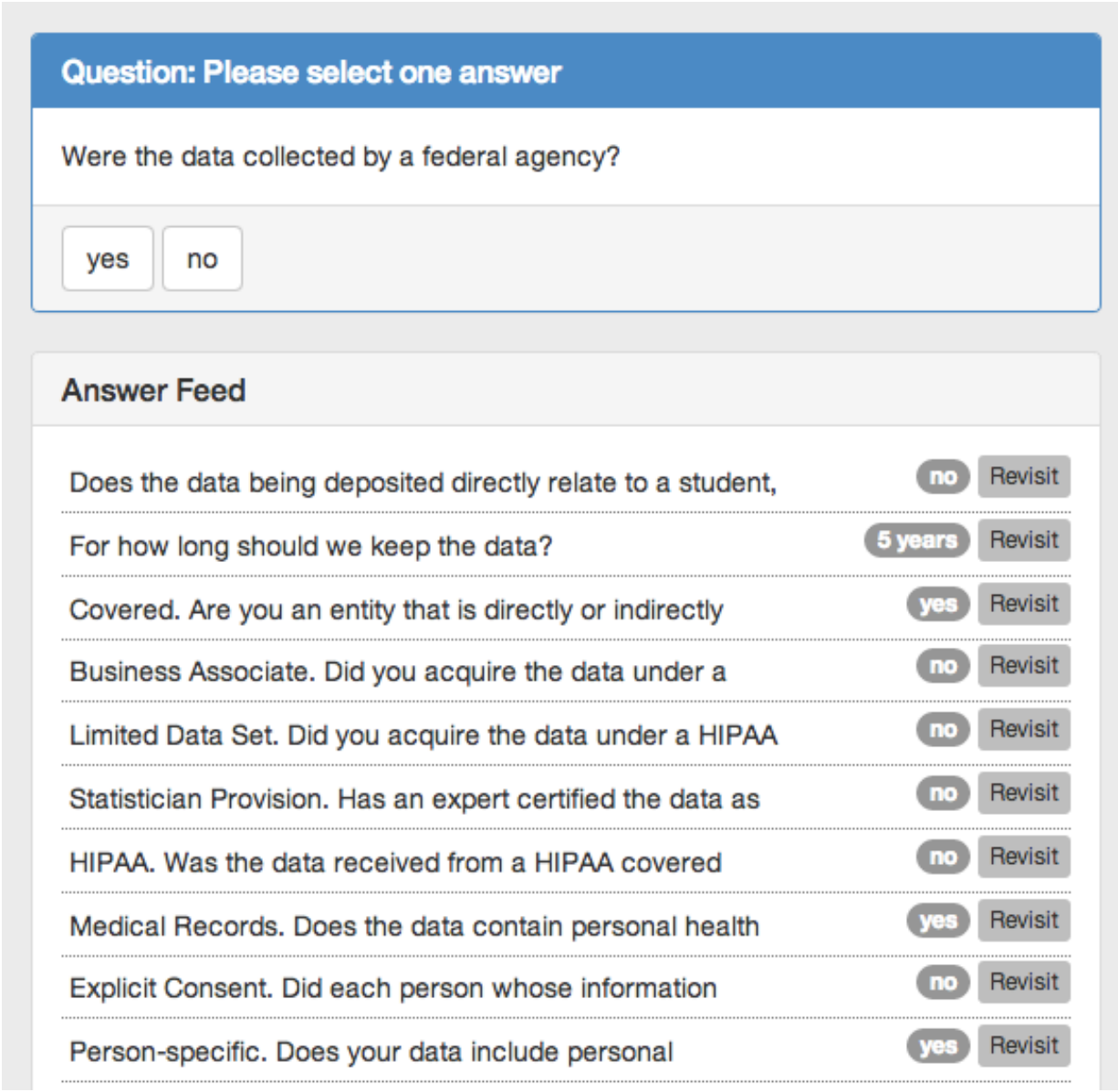
A complex interview generation framework, which is automatically converted to a user-friendly interface



Interview Example: First question …



Interview Example: After several questions …



Interview Example: … and a Final Tag

Your dataset is tagged as

red — *Very sensitive identifiable personal information, shared with strong verification of approved recipients under signed agreement.*

Full Tags

- DataTags
  - code: red
  - DataType
    - harm: criminal
    - effort: identifiable
    - standards: HIPAA
  - Handling
    - storage: encrypt
    - auth: approval
    - transit: encrypt
  - basis: HIPAABusinessAssociate
  - DUA
    - timeLimit: _5yr

Learn more at: http://datascience.iq.harvard.edu

Data Science

Research Frameworks for Data-Intensive Science, Analytical Tools and Data Stewardship

IQSS
The Institute for Quantiative Social Science
HARVARD UNIVERSITY

Zelig Dataverse TwoRavens DataTags Consilience RBuild

THANKS @mercecrosas