# Implementing a Data Publishing Service via DSpace

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# Outline

- IUScholarWorks
- Massive Data Storage Service
- Example of the data publishing need
- What is the data publishing service
- Conceptual overview of DSpace implementation

# IUScholarWorks

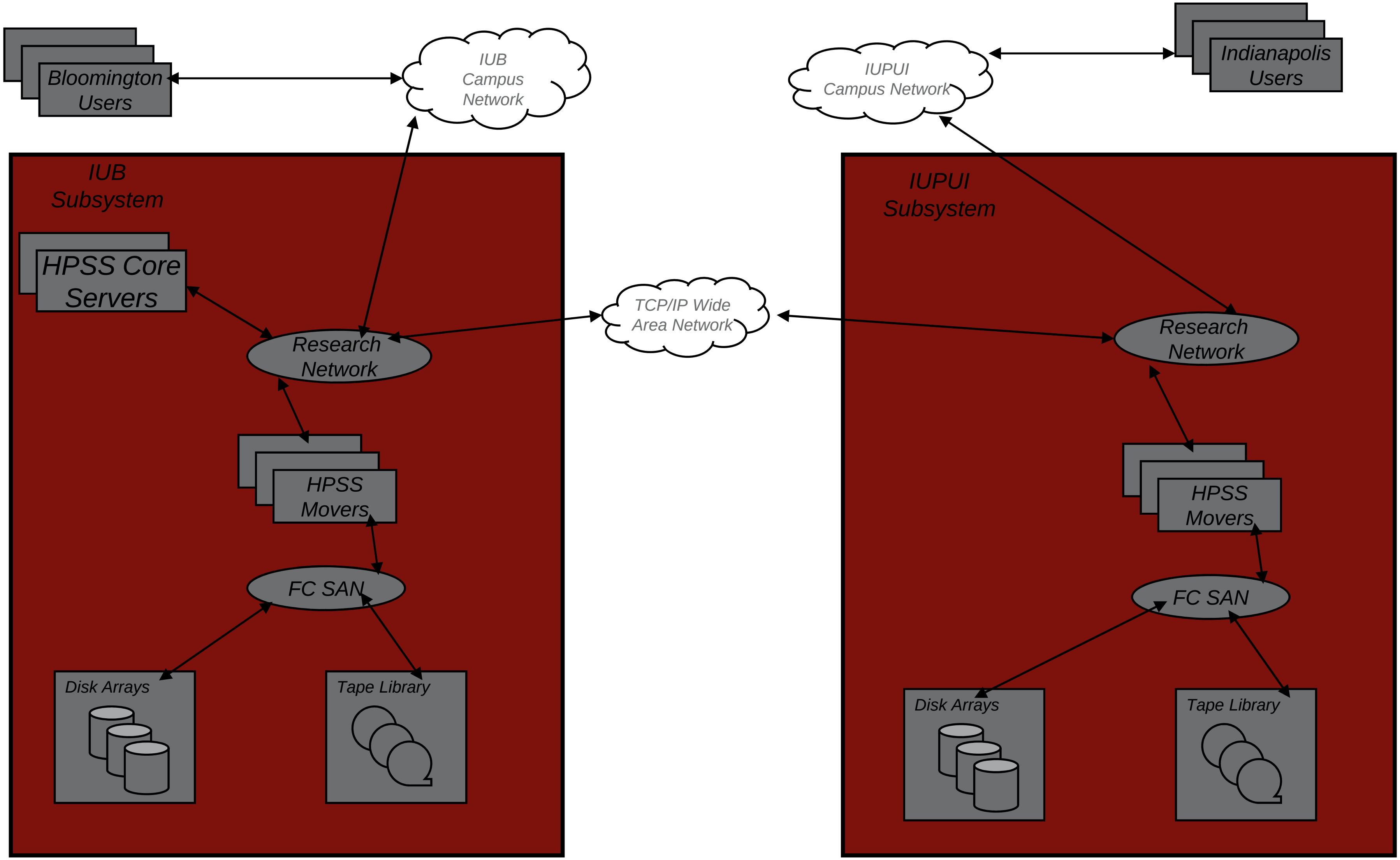
- IUScholarWorks – Indiana University's (IU's) scholarly communication services
- IUScholarWorks Team – members from IU Libraries and the Digital Library Program

- Current services:
  - A DSpace-based IR - articles, papers, technical reports, etc
  - An Open Journal System-based scholarly journal hosting service

# Overview of MDSS

- Massive Data Storage System (MDSS)
- Current system for research data storage
- Installed in 1998
- Based on IBM developed High Performance Storage System (HPSS) software
- It offers over 2.8 petabytes of disk- and tape-based storage. Distributed between Indianapolis and Bloomington campuses

# Distributed between IUB and IUPUI

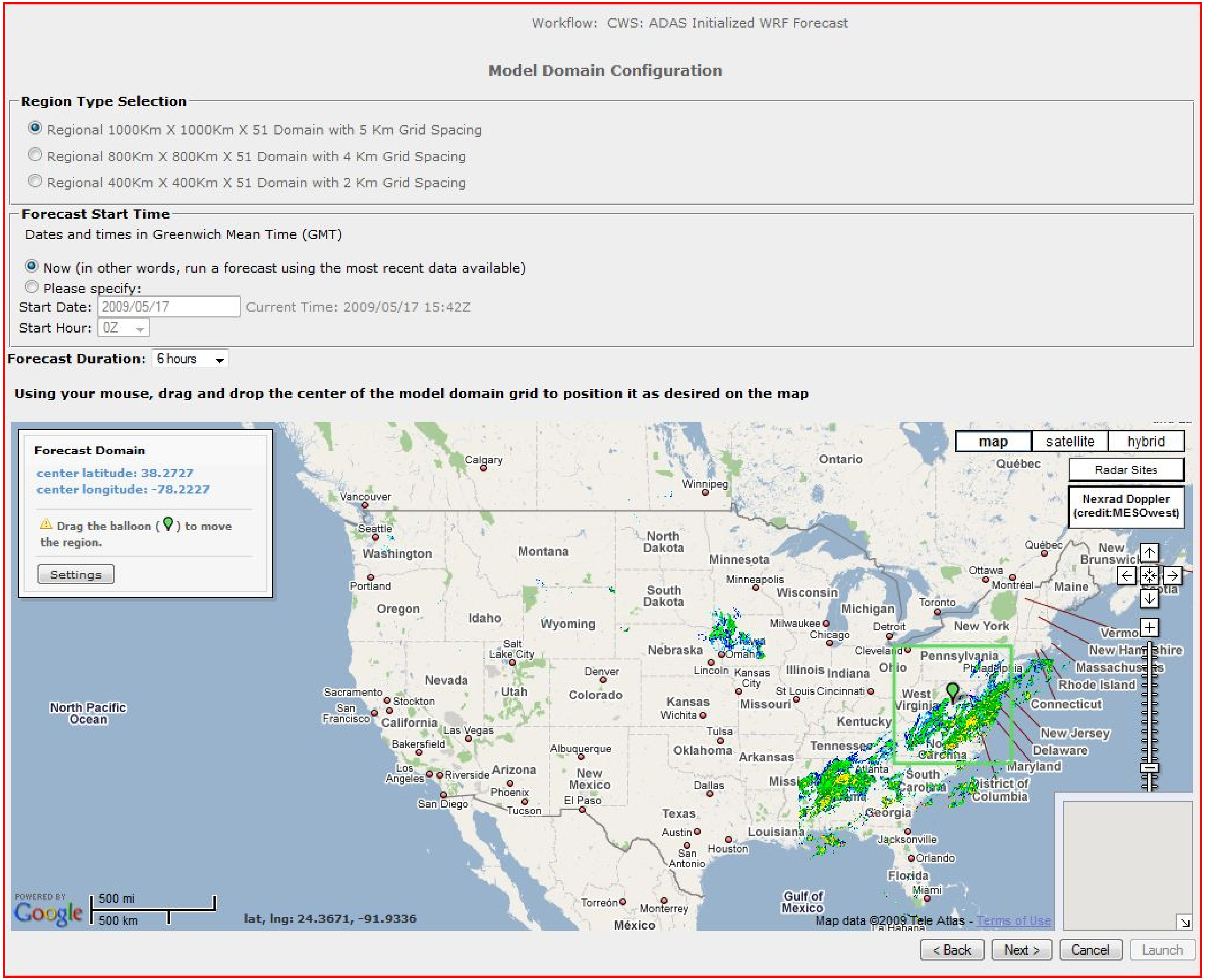


# Transferring Files in MDSS

- Fastest Methods
  - hsi
  - Gridftp
  - pftp_client
  - kerberized ftp
- Convenient Methods
  - Sftp
  - https
  - Samba
  - Hpssfs

# Example of Data Publishing Need

- Linked Environments for Atmospheric Discovery (LEAD)
  - Weather forecasting experiments
  - Want to capture the entire workflow from an experiment
  - Each workflow ~10GB
  - They are looking for a mechanism to preserve the workflows and make them available to others



Workflow: CWS: ADAS Initialized WRF Forecast

Model Domain Configuration

**Region Type Selection**

● Regional 1000Km X 1000Km X 51 Domain with 5 Km Grid Spacing
○ Regional 800Km X 800Km X 51 Domain with 4 Km Grid Spacing
○ Regional 400Km X 400Km X 51 Domain with 2 Km Grid Spacing

**Forecast Start Time**

Dates and times in Greenwich Mean Time (GMT)

● Now (in other words, run a forecast using the most recent data available)
○ Please specify:
Start Date: 2009/05/17 Current Time: 2009/05/17 15:42Z
Start Hour: 0Z

**Forecast Duration:** 6 hours

**Using your mouse, drag and drop the center of the model domain grid to position it as desired on the map**

**Forecast Domain**
center latitude: 38.2727
center longitude: -78.2227

⚠ Drag the balloon ( ) to move the region.

lat, lng: 24.3671, -91.9336

# IUScholarWorks Data

- A new service of the IUScholarWorks repository
- Allow for the publishing of datasets
- Data will have a persistent URL so it can be linked to publications
- The service will combine our DSpace repository with IU’s Massive Data Storage system (MDSS), a system that researchers are already uses
- If a file is over a certain size, it will be stored in MDSS
- Allows discovery over the Web
- Preservation – bit level

# Collaborative effort

- IU Libraries
- Research Technologies division - IU’s central IT organization, University Information Technology Services (UITS)
- Digital Library Program (a collaboration between the Libraries and UITS)
- IU's Office of the Vice-Provost for Research

# Current Activities

- Two phased implementation
  - Phase one – more manual on the part of the DSpace administrator, user
  - Phase two- more automated system
- Convene focus groups
- Metadata requirements
- DSpace/MDSS integration

# Two scenarios

- Researcher already uses MDSS to store their data
- Researcher does not use MDSS to store their data

# Classes of Files

1. **Small Data Files –** would go directly into DSpace in the underlying asset store as bitstreams
2. **Large Data File**
    1. Preexisting datasets in MDSS account directory
    2. User needs to upload new datasets to MDSS

# Conceptual overview of DSpace implementation

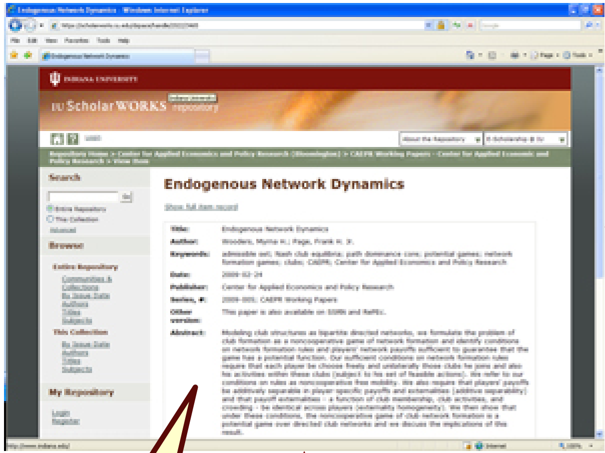
# IUScholarWorks Data in DSpace

- Recap of the primary goals of the service:
  - Discovery and access of datasets and related publications through the IUScholarWorks Repository service
  - Facilitating the submission process for both the researcher and collection manager

# IUScholarWorks Data in DSpace

- Discovery and access of datasets and related publications through the IUScholarWorks Repository service
  - DSpace records that are searchable, indexed, and harvested and available at stable URL's
  - DSpace records that contain DSpace bitstreams for small datasets
  - DSpace records that link to large datasets in IU MDSS

# IUScholarWorks Data: Linking to MDSS and delivery via HTTP

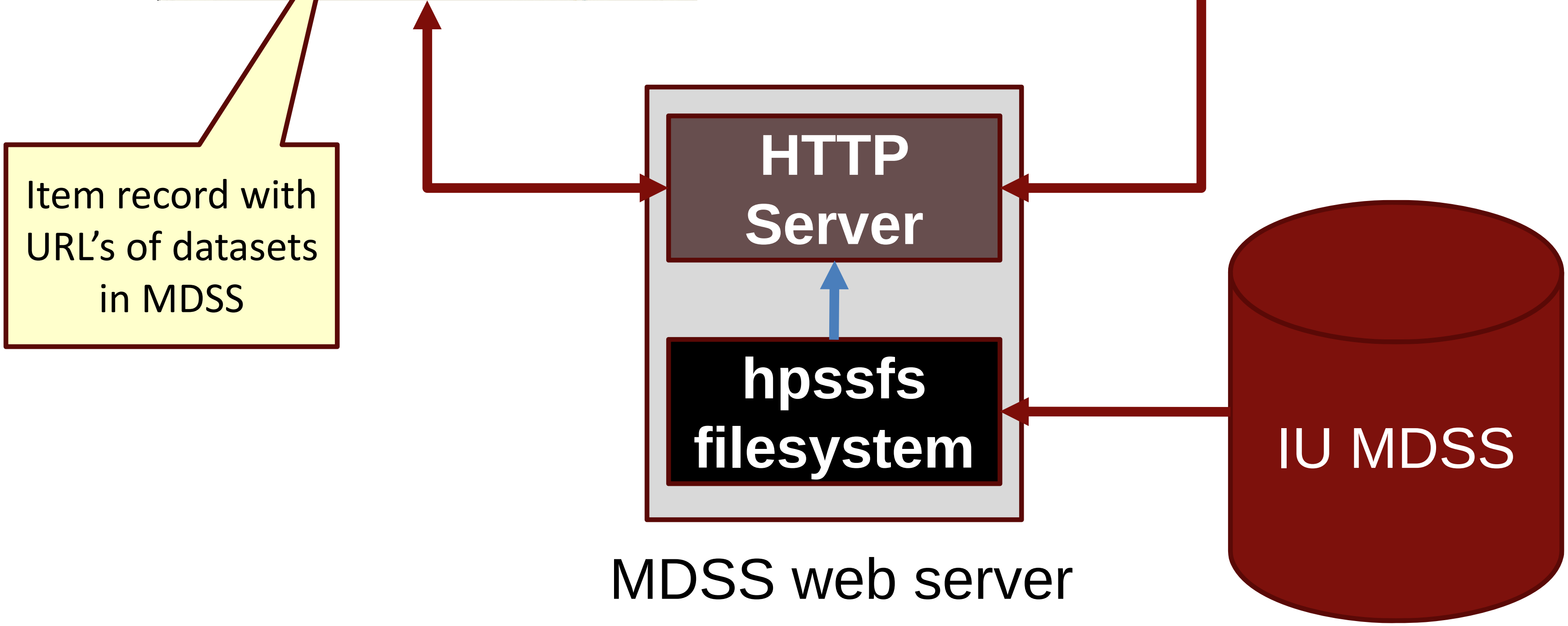


Repository Home > Center for Applied Economics and Policy Research (Bloomington) > CAEPR Working Papers - Center for Applied Economic and Policy Research > View Item

## Endogenous Network Dynamics

Show full item record

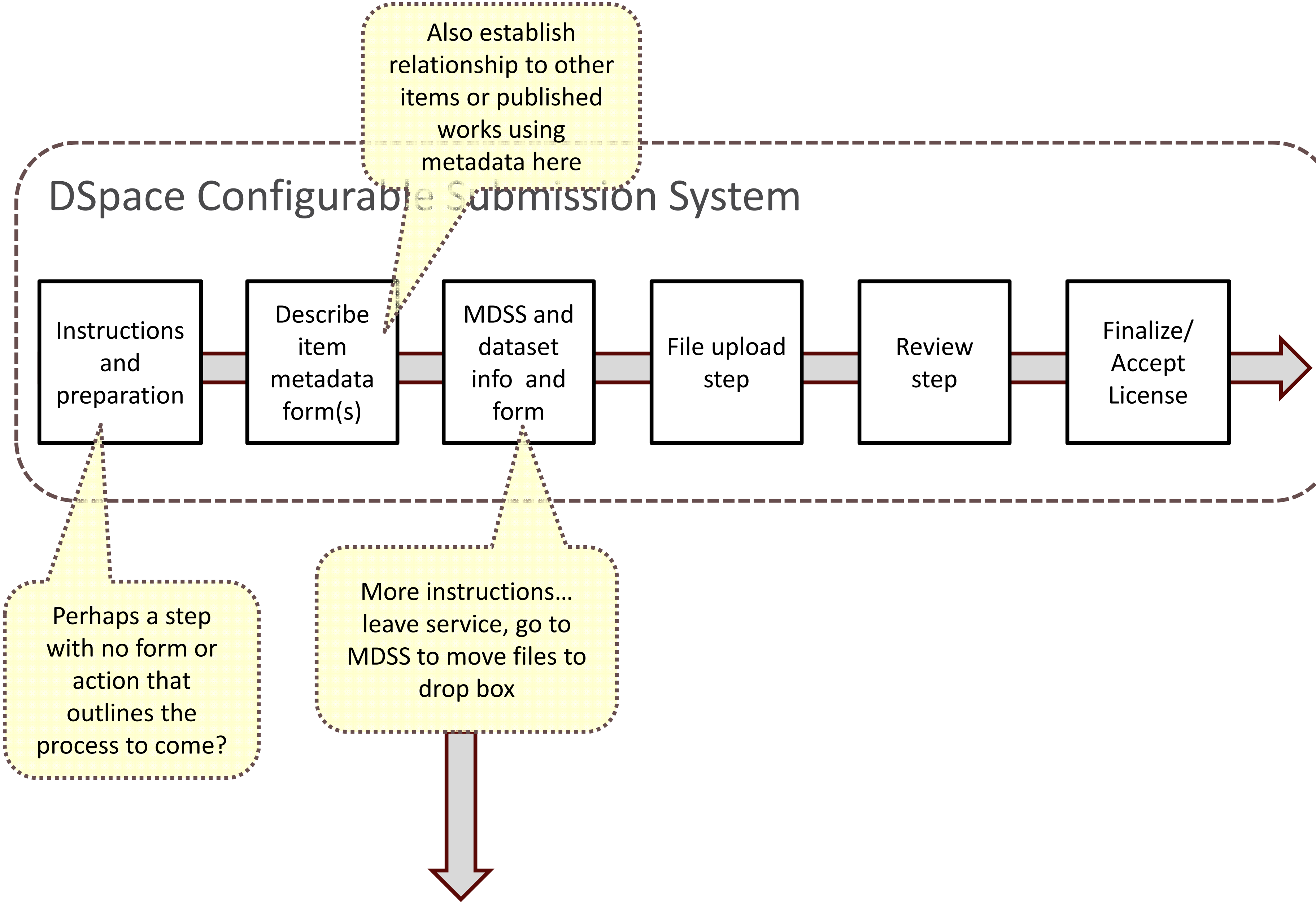
| | |
|---|---|
| Title: | Endogenous Network Dynamics |
| Author: | Wooders, Myrna H.; Page, Frank H. Jr. |
| Keywords: | admissible sell; Nash club equilibria; path dominance core; potential games; network formation games; clubs; CAEPR; Center for Applied Economics and Policy Research |
| Date: | 2009-02-24 |
| Publisher: | Center for Applied Economics and Policy Research |
| Series, #: | 2009-005; CAEPR Working Papers |
| Other version: | This paper is also available on SSRN and RePEc. |
| Abstract: | Modeling club structures as bipartite directed networks, we formulate the problem of club formation as a noncooperative game of network formation and identify conditions on network formation rules and players' network payoffs sufficient to guarantee that the game has a potential function. Our sufficient conditions on network formation rules require that each player be choose freely and unilaterally those clubs he joins and also his activities within these clubs (subject to his set of feasible actions). We refer to our conditions on rules as noncooperative free mobility. We also require that players' payoffs be additively separable in player specific payoffs and externalities (additive separability) and that payoff externalities - a function of club membership, club activities, and crowding - be identical across players (externality homogeneity). We then show that under these conditions, the noncooperative game of club network formation is a potential game over directed club networks and we discuss the implications of this result. |



# IUScholarWorks Data in DSpace

- Facilitating the submission process for both the researcher and collection manager
  - Because some datasets are external in MDSS, this is inherently an asynchronous process for both
  - We will facilitate the process for submitters via the DSpace Configurable Submission system
  - We will facilitate the data collection manager's process via steps in the DSpace workflow system

# IUScholarWorks Data: Item submission user interface



DSpace Configurable Submission System

Instructions and preparation

Describe item metadata form(s)

MDSS and dataset info and form

File upload step

Review step

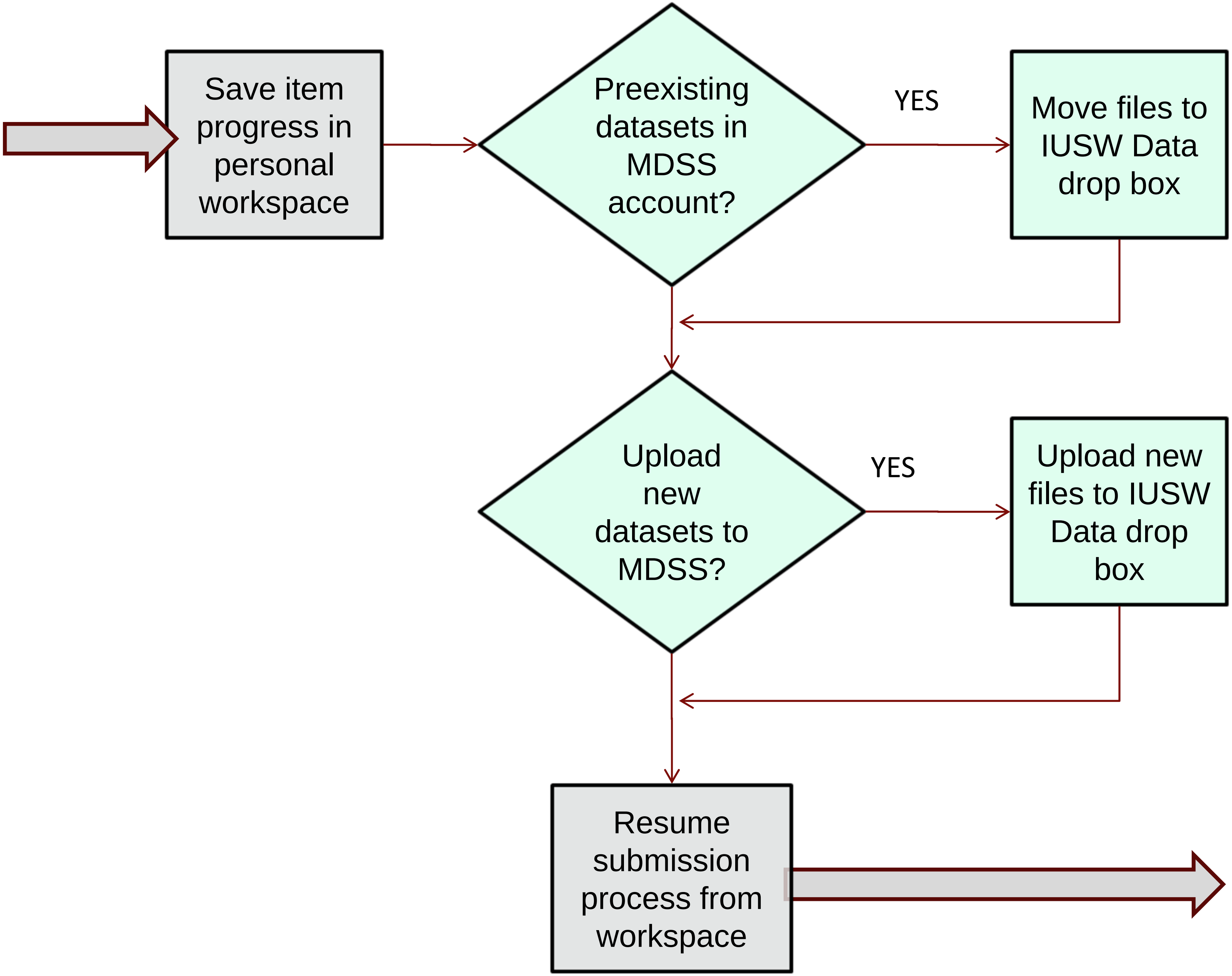
Finalize/ Accept License

Also establish relationship to other items or published works using metadata here

Perhaps a step with no form or action that outlines the process to come?

More instructions… leave service, go to MDSS to move files to drop box

# IUScholarWorks Data: File management in IU MDSS



Save item progress in personal workspace

Preexisting datasets in MDSS account?

YES

Move files to IUSW Data drop box

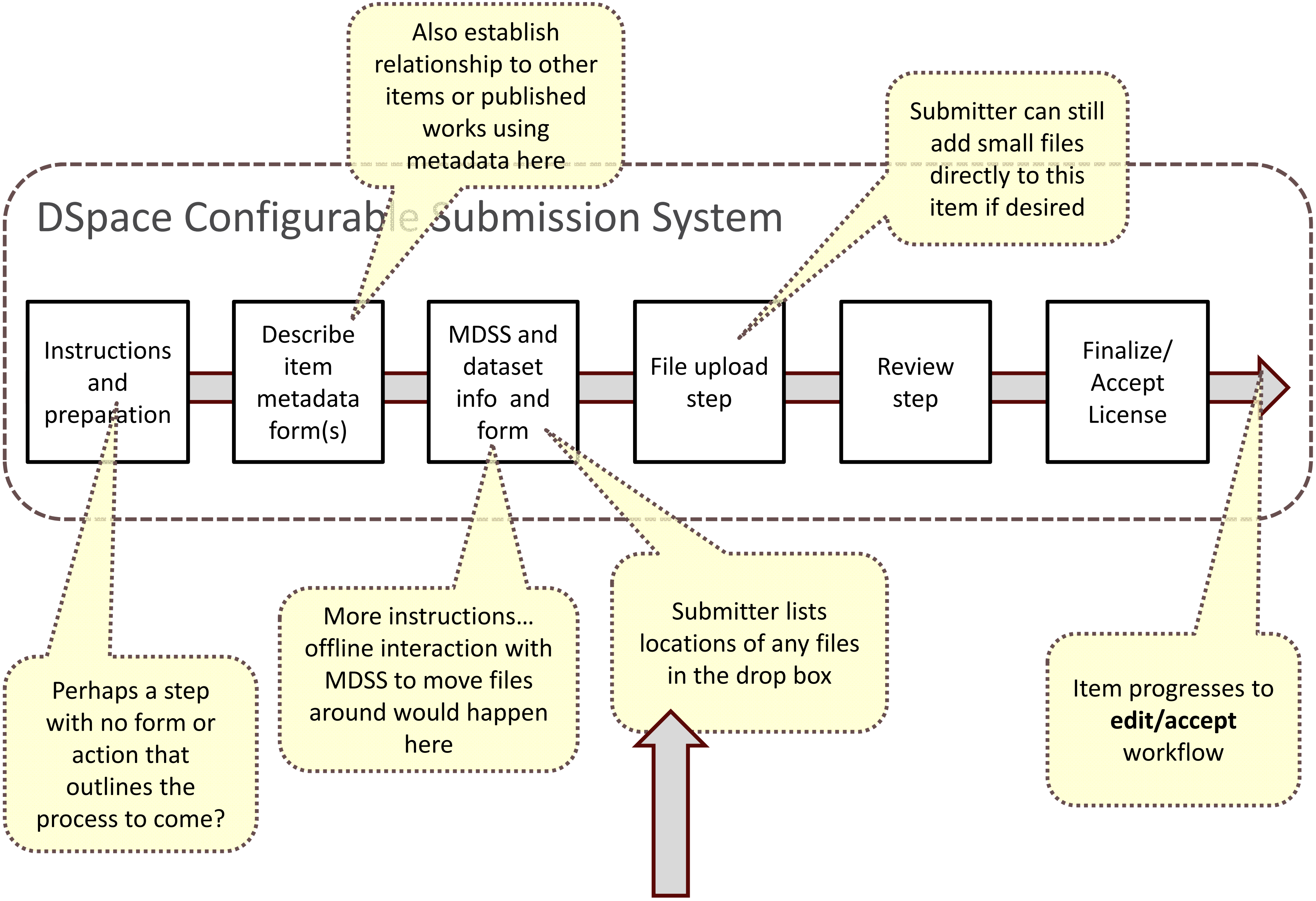
Upload new datasets to MDSS?

YES

Upload new files to IUSW Data drop box

Resume submission process from workspace

# IUScholarWorks Data: Item submission user interface



DSpace Configurable Submission System

Instructions and preparation

Describe item metadata form(s)

MDSS and dataset info and form

File upload step

Review step

Finalize/ Accept License

Also establish relationship to other items or published works using metadata here

Submitter can still add small files directly to this item if desired

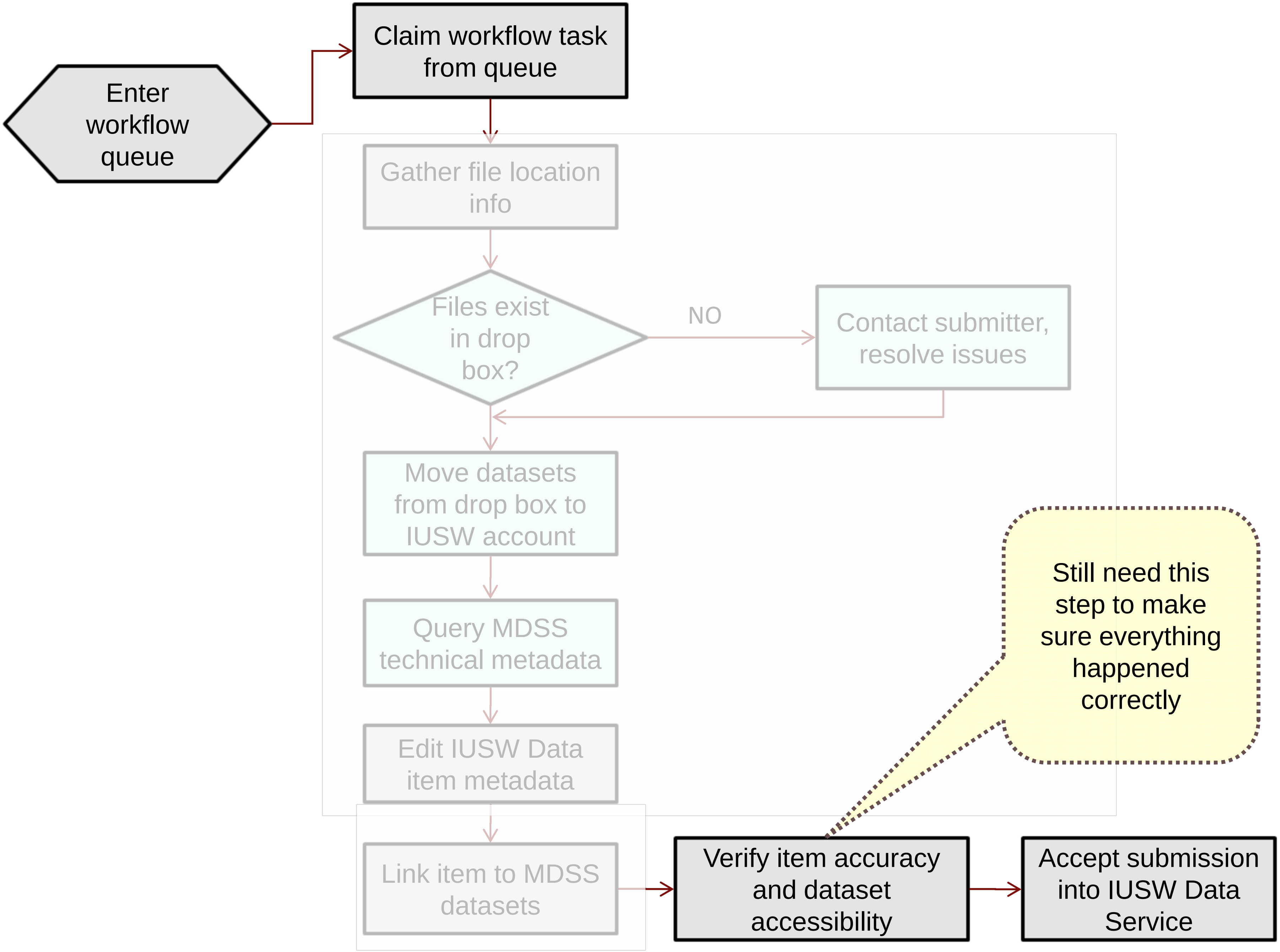
Perhaps a step with no form or action that outlines the process to come?

More instructions… offline interaction with MDSS to move files around would happen here

Submitter lists locations of any files in the drop box

Item progresses to **edit/accept** workflow

# IUScholarWorks Data: Collection Manager Workflow

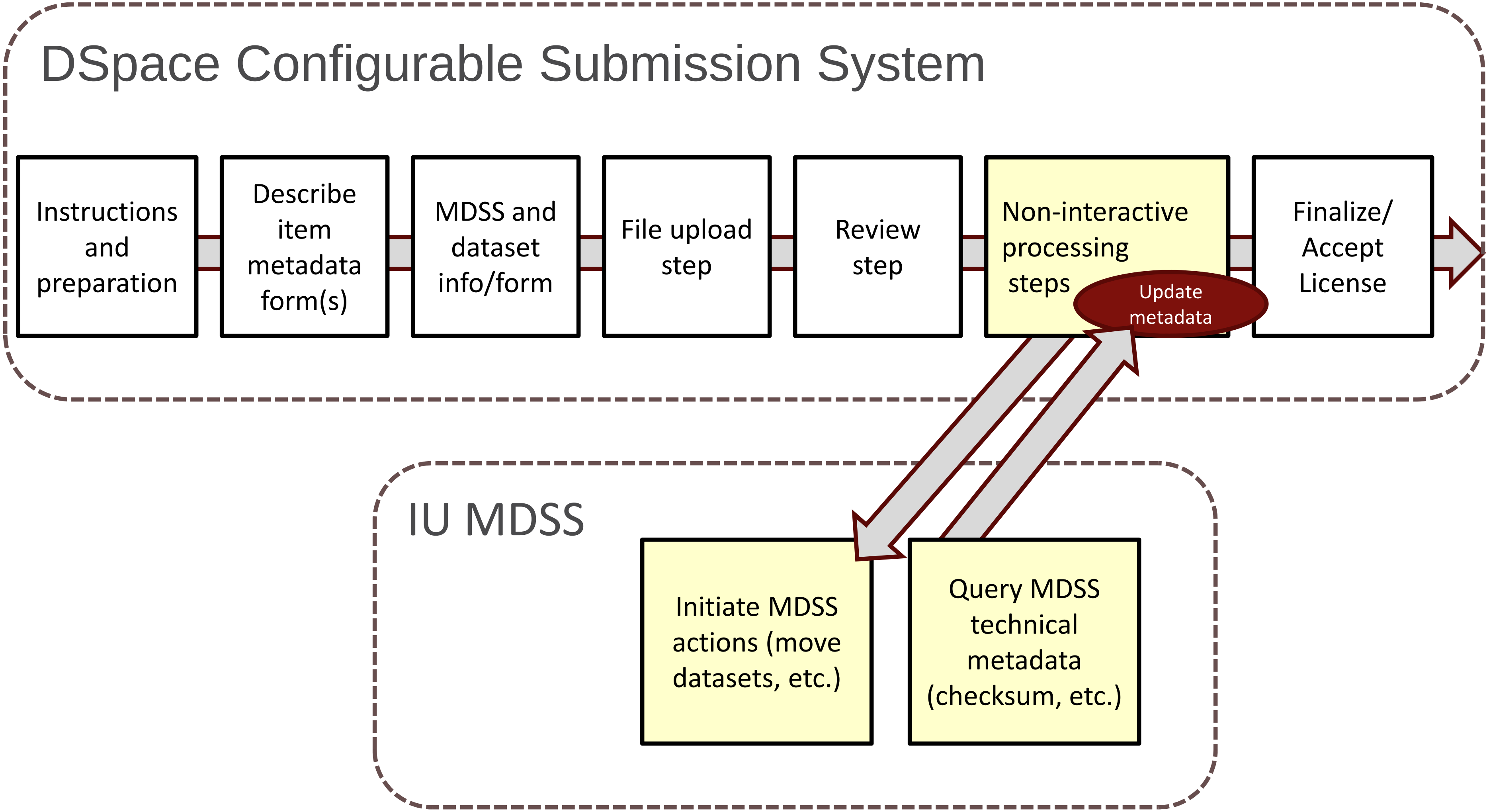


Enter workflow queue
Claim workflow task from queue
Gather file location info
Files exist in drop box?
NO
Contact submitter, resolve issues
Move datasets from drop box to IUSW account
Query MDSS technical metadata
Edit IUSW Data item metadata
Link item to MDSS datasets
Verify item accuracy and dataset accessibility
Accept submission into IUSW Data Service

Still need this step to make sure everything happened correctly

# IUScholarWorks Data: Item submission user interface

Phase 2, automated workflow


DSpace Configurable Submission System
Instructions and preparation
Describe item metadata form(s)
MDSS and dataset info/form
File upload step
Review step
Non-interactive processing steps
Update metadata
Finalize/ Accept License
IU MDSS
Initiate MDSS actions (move datasets, etc.)
Query MDSS technical metadata (checksum, etc.)

# End result…

- End result is a published data item that contains:
  - Descriptive metadata
  - Links to related publications
  - Actual DSpace Bitstreams for small datasets
  - URL links to large datasets in IU MDSS
  - Technical metadata about both classes of datasets

# Beyond linking via URL…

- Storage abstraction layers to get to IU MDSS
  - DSpace support for Storage Resource Broker (SRB)
  - Akubra, a low-level storage API from Topaz and Fedora Commons
- Direct mounting of MDSS directories on the DSpace server
  - Configure a separate DSpace asset store using a network mounted filesystem from MDSS

# Beyond linking via URL…

- These solutions would all imply the same thing: configuring additional DSpace asset stores and performing ***item registration***
  - We don’t want to use one of those methods for the default asset store and upload very large files through the DSpace web interface

# Beyond linking via URL…

- But… item registration of existing files is a batch oriented command-line process
  - assumes ready to go packages with descriptive metadata, just like importing items

# Beyond linking via URL…

- We lose the convenience of the submission interface to facilitate the service

- The ideal solution would be to connect to IU MDSS as an alternative asset store and be able to register files to items through the submission interface, versus just being able to register files as new items

# Questions, opinions, or comments?