Workflow Exchange and Archival: The KSW File and the Kepler Object Manager

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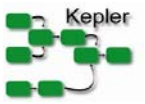


Outline

1. The Kepler Object Manager
2. Archival and Exchange via KSW Files
3. Local Object Cache
4. Work in Progress (literally)

Motivation

In SEEK (and generally, Kepler) we:

Envision a large number of science-specific actors
- E.g., ecology, biodiversity, geoscience, bioinformatics, chemistry

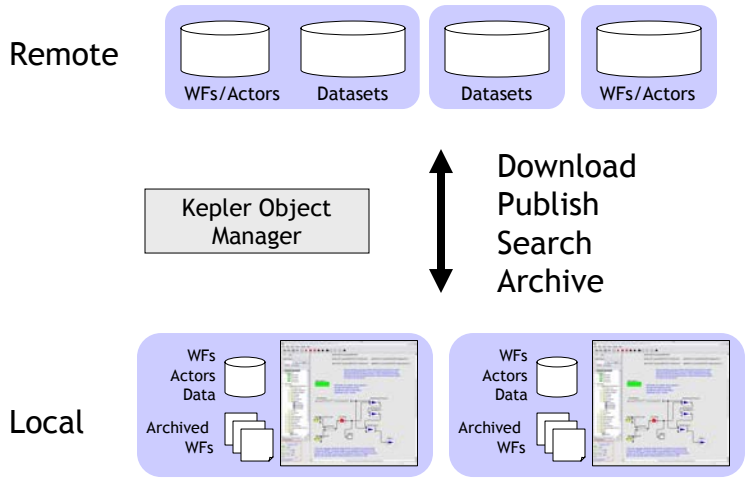
Envision a large number of available data sets
- Some may be fairly large; already various "collections" (e.g., LTER, GEON)

Want to enable search / discovery of actors, datasets, and workflows

Want to enable wide-scale sharing and re-use of data and workflows (and their components) across disciplines

… and have desired more than CVS to accomplish these goals

Managing distributed collections of workflow "objects"



Main Issues and Goals

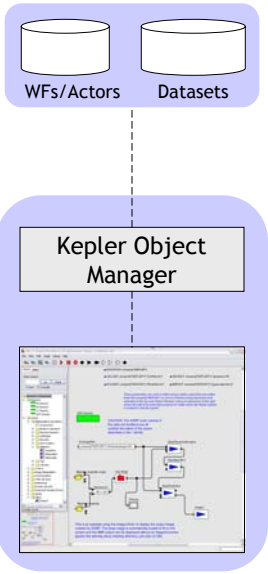
Handle various kinds of objects
- Workflows, Actors, Datasets, Libraries, Applications, Ontologies, Metadata, …

Transport objects
- Publish to and download from remote repositories
- Recognize local versus remote objects

Search for objects
- Both local and remote repositories w/in Kepler

Version objects
- E.g., managing conflicts in dependency chains

Enable "functional" groups
- Core group plus packages, e.g., biodiversity, geospatial, R, etc.



Overall Architecture

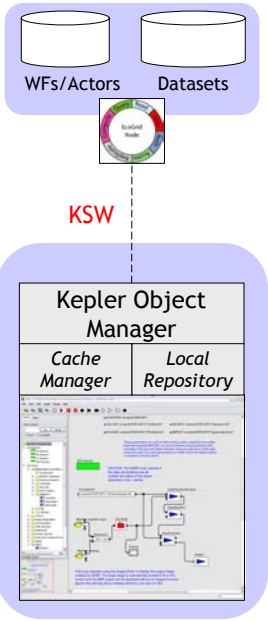
Life-Science Identifiers (LSIDs)
- Similar to DOIs (urn's, etc.)
- Includes (some) versversioning support
- Well-defined APIs

Kepler Scientific Workflow (KSW) Files
- An archive/jar file of objects
- KSW Metadata (a la MoML)
- For publish/download/archive/groups

EcoGrid
- Remote Access/Query
- A "thin" client / protocol

Local Object Repository
- Object retrieval, indexing, etc.

Local Object Cache
- Managing local vs. remote objects
- Dynamic class loader



KSW Files

An archive/jar file of objects

- Actor code and metadata, libraries; Dataset, metadata, etc.
- A manifest (what's in the file)

All objects in KSW files have associated LSID identifiers

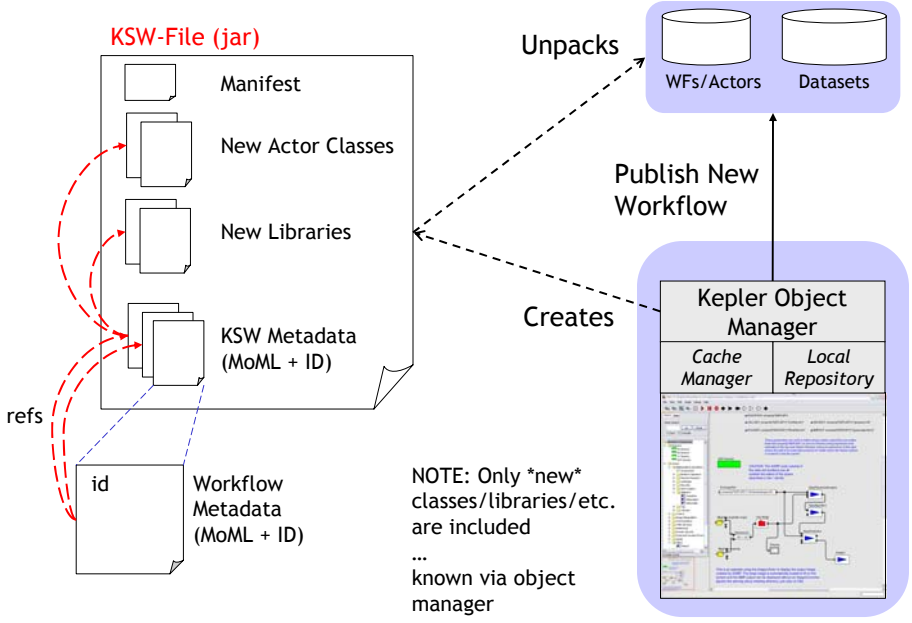
- An LSID is a urn, e.g., urn:lsid:kepler.org:actor:1000:2

Authority Namespace OID Version (opt.)

Objects have associated metadata files (basically MoML)

- Distinguish between "object definitions" and "object references"
  - Objects within a KSW file have corresponding definitions
  - Dependent objects not included are denoted via references
- Semantic types, dependency information, ports and types, etc.

KSW Metadata example (notional)



Local Object Cache

- Helps manage LSIDs
  - Creates them locally (for local actors, datasets, etc.)
  - Resolves LSIDs (both local and remote)
  - Handles publication (local id -> repository id, etc.)
- Support for packing/unpacking KSW files
- Provides simple database-like capabilities
  - "Persistent" storage / file indexing
  - Result caching (e.g., for remote queries)
  - Temporary files
  - Object indexing (e.g., dependency graphs, etc.)
- Handles multiple formats (within Kepler)
  - Stream versus File access
  - Representation conversion (e.g., binary interleaved, ascii grid)

Work In Progress

Still much to do …

- Still finalizing Object-Manager interfaces / APIs
- The object cache is partly implemented
- Simple KSW files can be packed / unpacked
- The KSW metadata format still being finalized
  - Working on MoML parsing, handling ids, etc.
  - Defining properties, like semtypes, dependencies, refs, etc.
  - We have a simple implementation of lsids for actor lib.

Our goal is to leverage Ptolemy's strengths …

- Most of what we have added / plan to add is layered on top of Ptolemy
- We want well-defined, generic interfaces
- We are soliciting volunteers !