HydroShare: Advancing Hydrology through Collaborative Data and Model Sharing

David Tarboton, Ray Idaszak, Jeffery Horsburgh, Dan Ames, Jon Goodall, Larry Band, Venkatesh Merwade, Alva Couch, Rick Hooper, David Valentine, David Maidment, Pabitra Dash, Michael Stealey, Hong Yi, Tian Gan, Tony Castronova, Brian Miles, Shaun Livingston, Cuyler Frisby

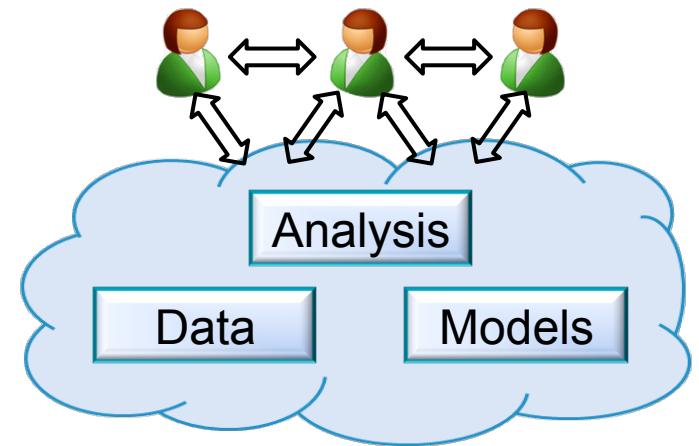USU, RENCI, BYU, UNC, UVA, CUAHSI, Tufts, Texas, Purdue, SDSC

http://www.hydroshare.org

Motivation

- Advancing Hydrologic Understanding

  - requires integration of information from multiple sources

  - is data and computationally intensive

 - requires collaboration and working as a team/community

Grand challenge (NRC 2001): Better hydrologic forecasting that quantifies effects and consequences of land surface change on hydrologic processes and conditions

Floods and Droughts

Data intensive models to understand and examine consequences, impacts and effects of land surface and climate changes
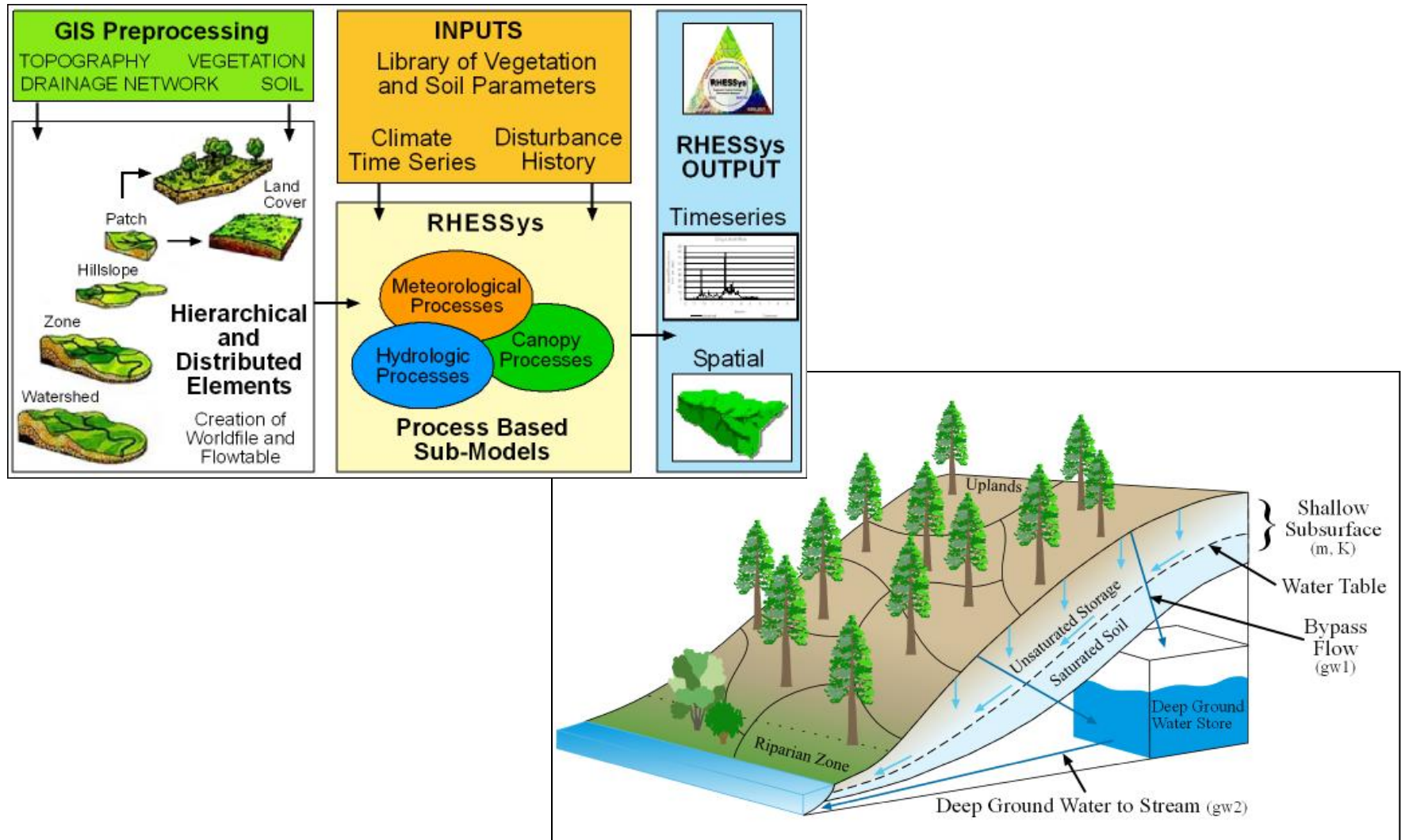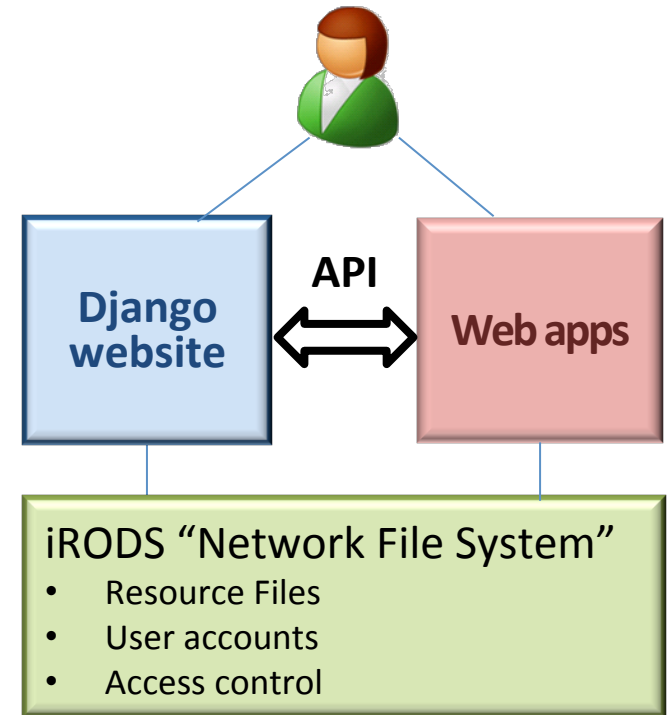

From Larry Band

HydroShare Goals

- To provide a cyberinfrastructure platform for hydrologic research to solve problems of size and scope not otherwise solvable using desktop computing through
  - Software as a service
  - Data as a service
  - Models as a service
  - Visualization and analysis services
- To enable more rapid advances in hydrologic understanding through collaborative data sharing, analysis and modeling
- To address community cyberinfrastructure needs

HydroShare is a collaborative environment (being developed) for data sharing, analysis and modeling

- Share your data and models with colleagues

- Manage who has access to the content that you share

- Share, access, visualize and manipulate a broad set of hydrologic data types

- Sharing and execution of models

- Web services API to facilitate automated and client access to almost all functionality

- Access to and use of high performance computing

- Publication of data and models with a DOI

API

Django website ⬌ **Web apps**

iRODS "Network File System"
- Resource Files
- User accounts
- Access control

Our goal is to make sharing of hydrologic data and models as easy as sharing videos on YouTube or shopping on Amazon.

Collaborative data analysis and publication use case
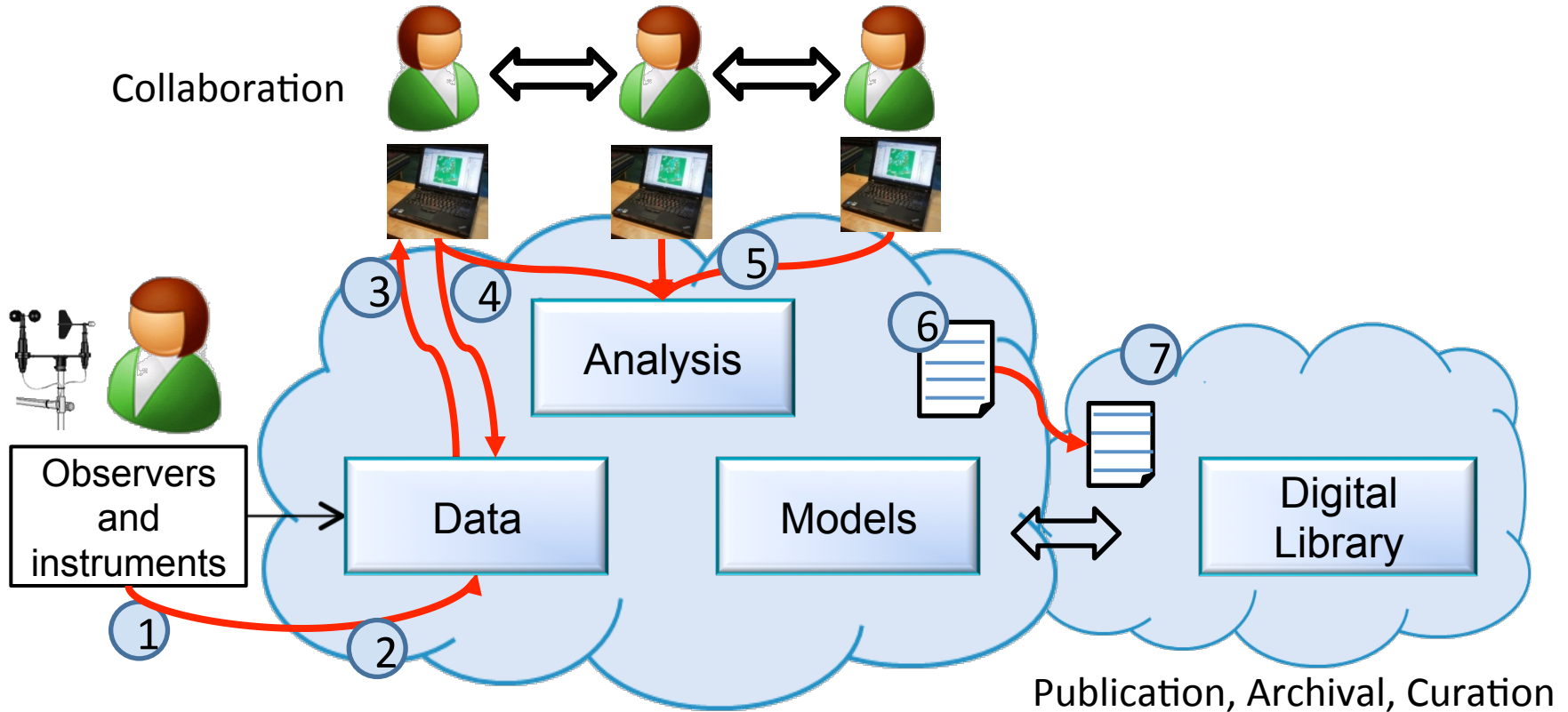
1. Observe
2. Store
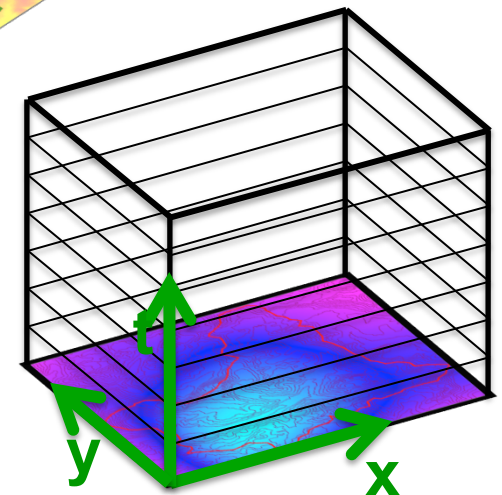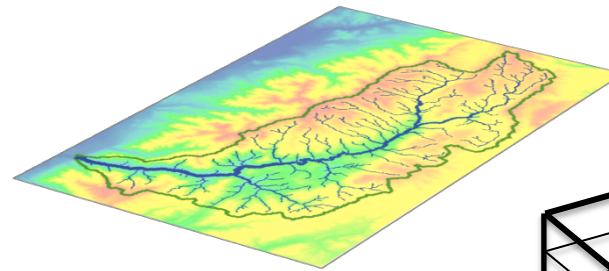3. Discover and access
4. Analyze
5. Model
6. Collaborate
7. Publish (DOI)

At its heart, HydroShare is a system for sharing Resources and Collaborating

- Files and sets of files structured to represent a hydrologic process, model, or element in the hydrologic environment

- Standard data models enhance interoperability and support functionality "hydro value added"

- Tools that act on resources to visualize, modify and create new resources
  - Encode standard/best practices

- Access control and sharing model

Types of data to support as resources

Resource Types

- Generic ✓
- Geographic Raster ✓
- Time Series ✓
- Multidimensional Space Time dataset ✓
- Referenced Time Series (CUAHSI HIS web service link) ⚠
- Model program ⚠
- Model instance ⚠
- Application ⚠
- Geographic Feature set
- River Geometry
- Sample based observations (ODM2 and CZO)
- Model component
- Composite resources

USGS 10109000 LOGAN RIVER ABOVE STATE DAM, NEAR LOGAN, UT

— Discharge   — Period of approved data
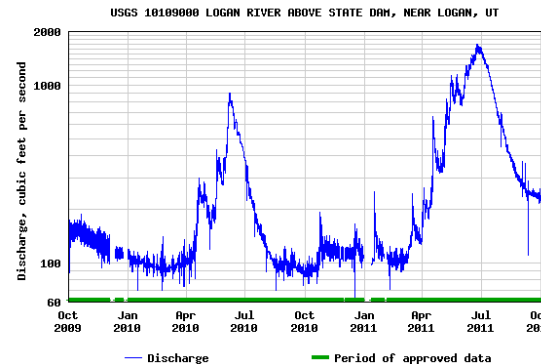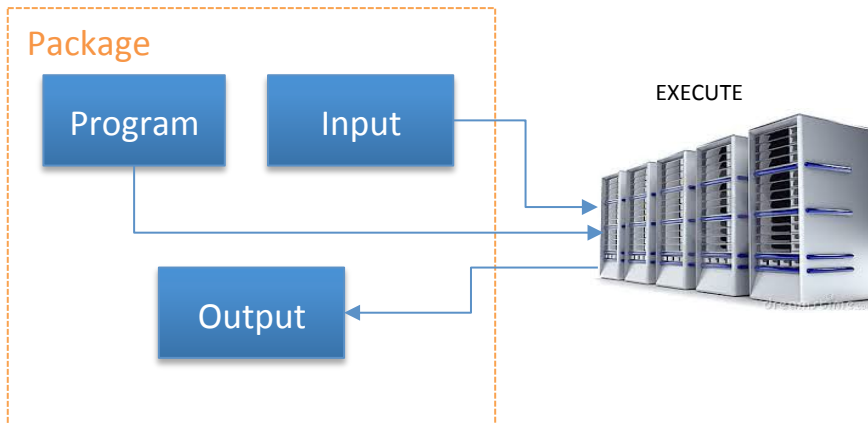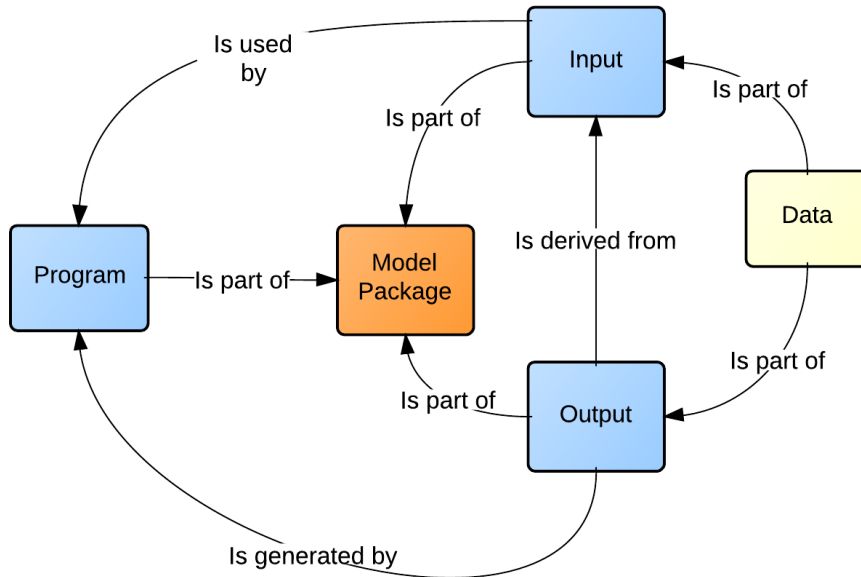
Models

- Model package
  - Bundled components
  - references existing resources

- Model program
  - executable entity
  - may consist of submodules and other complex relationships

- Model input
  - input required by a program
  - files, parameters, etc...

- Model output
  - outputs produced by a program
  - files, plots, etc...

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www.hydroshare.org

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HYDROSHARE   RESOURCES   SUPPORT   SIGN IN

First name

Last name

Email address

Username

HYDROSHARE   RESOURCES   **Demo**   DAVID TARBOTON

Great Salt Lake Level and Volume

Authors:	David Tarboton, Ibrahim Mohammed
Owners:	David Tarboton
Resource type:	Generic
Created:	June 7, 2015, 7:57 p.m.
Last updated:	June 11, 2015, 4:28 a.m. by David Tarboton

start collaborating.

Abstract

These comma separated variable files give the level and volume of the Great Sa
1847 to 2014-05-03. Level in feet is as recorded by the USGS. Level in m was c
were computed from the bathymetry.

How to cite

Tarboton, D., I.Mohammed (2015). Great Salt Lake Level and Volume, HydroSh
/resource/7875d551e40a43b8848f74c63f5481ae

Content

data/contents/GSLN2013.txt
608.4 KB

data/contents/GSLS2013.txt
681.9 KB

Download All Content as Zipped BagIt Archive   + Add file...   + Sign in iRODS...
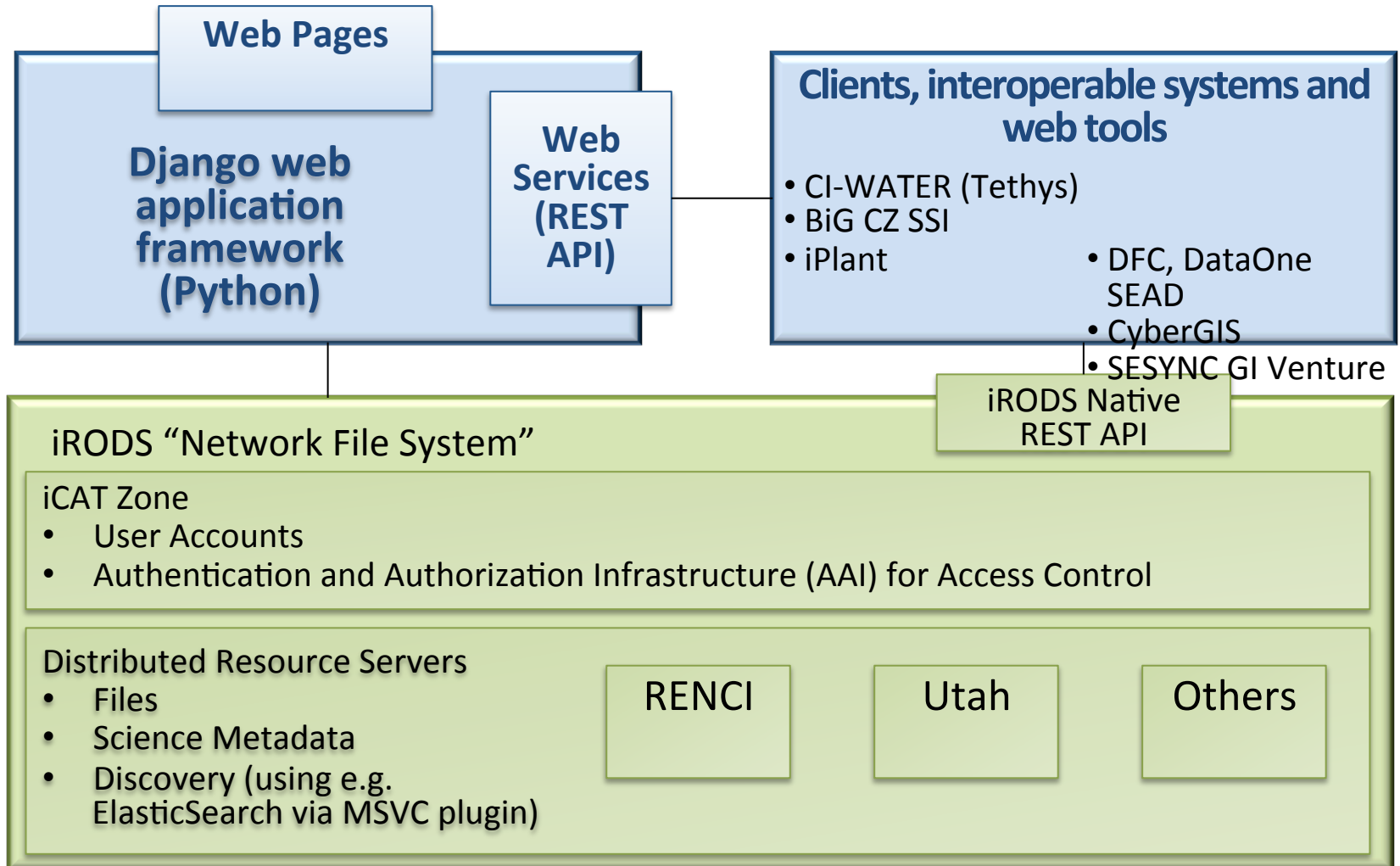
Learn more about the BagIt archive format

Architecture

www.hydroshare.org

apps.hydroshare.org

Web Pages

Django web application framework (Python)

Web Services (REST API)

Clients, interoperable systems and web tools
- CI-WATER (Tethys)
- BiG CZ SSI
- iPlant
- DFC, DataOne SEAD
- CyberGIS
- SESYNC GI Venture

iRODS Native REST API

iRODS "Network File System"

iCAT Zone
- User Accounts
- Authentication and Authorization Infrastructure (AAI) for Access Control

Distributed Resource Servers
- Files
- Science Metadata
- Discovery (using e.g. ElasticSearch via MSVC plugin)

RENCI

Utah

Others

Summary

1. A new, web-based system for advancing model and data sharing

2. Access multiple types of hydrologic data using standards compliant data formats and interfaces

3. Flexible discovery functionality

4. Model sharing and execution

5. Facilitate and ease access to use of high performance computing

6. Social media and collaboration functionality

7. Links to other data and modeling systems

Thanks to the HydroShare team!

- USU
- RENCI/UNC
- CUAHSI
- BYU
- Tufts
- UVA
- Texas
- Purdue
- SDSC

HYDROSHARE

http://hydroshare.cuahsi.org