HydroShare

An online, collaborative environment for the sharing of hydrologic data and models

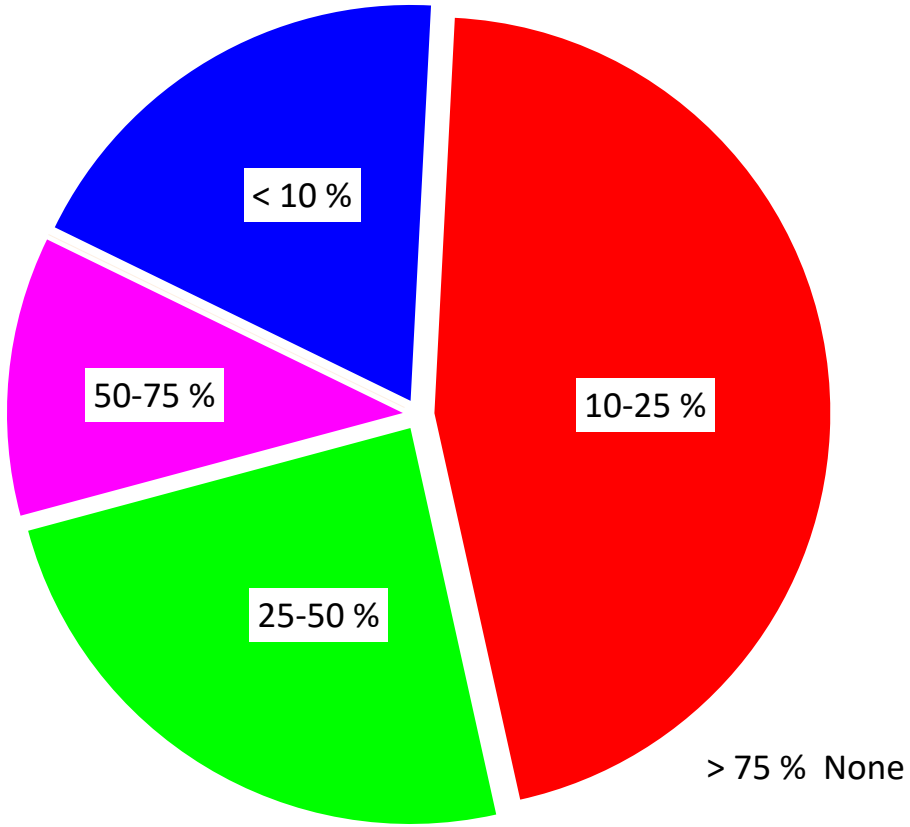
David Tarboton, Ray Idaszak, Dan Ames, Jeff Horsburgh, Jon Goodall, Larry Band, Venkatesh Merwade, Carol Song, Alva Couch, David Valentine, Rick Hooper, Jennifer Arrigo, David Maidment, Tim Whiteaker

dtarb@usu.edu
http://his.cuahsi.org

CUAHSI
HIS
Sharing hydrologic data

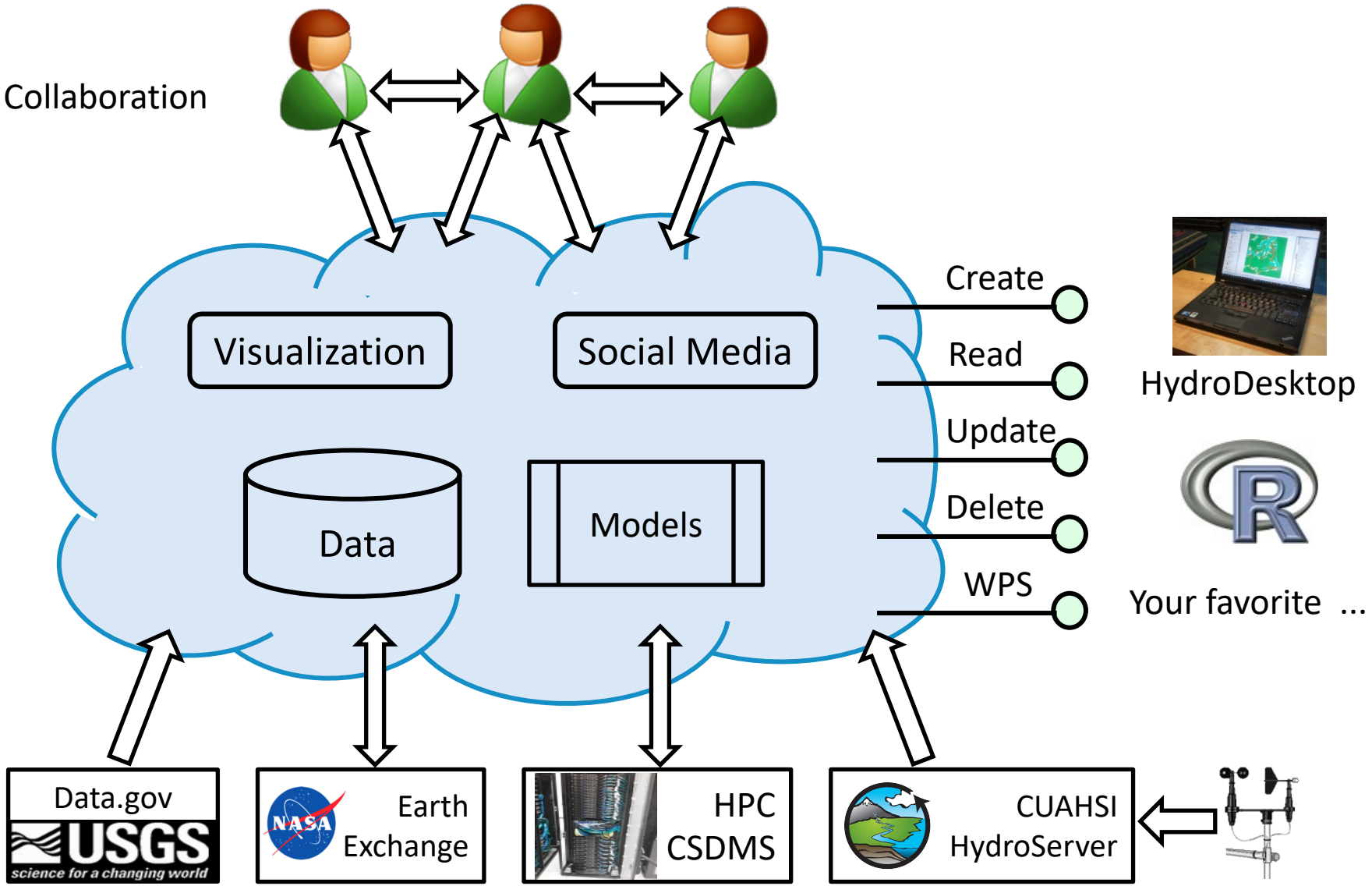
OCI-1148453
OCI-1148090
2012-2017

What proportion of your research time do you spend on preparing or preprocessing data into appropriate forms needed for research purposes?



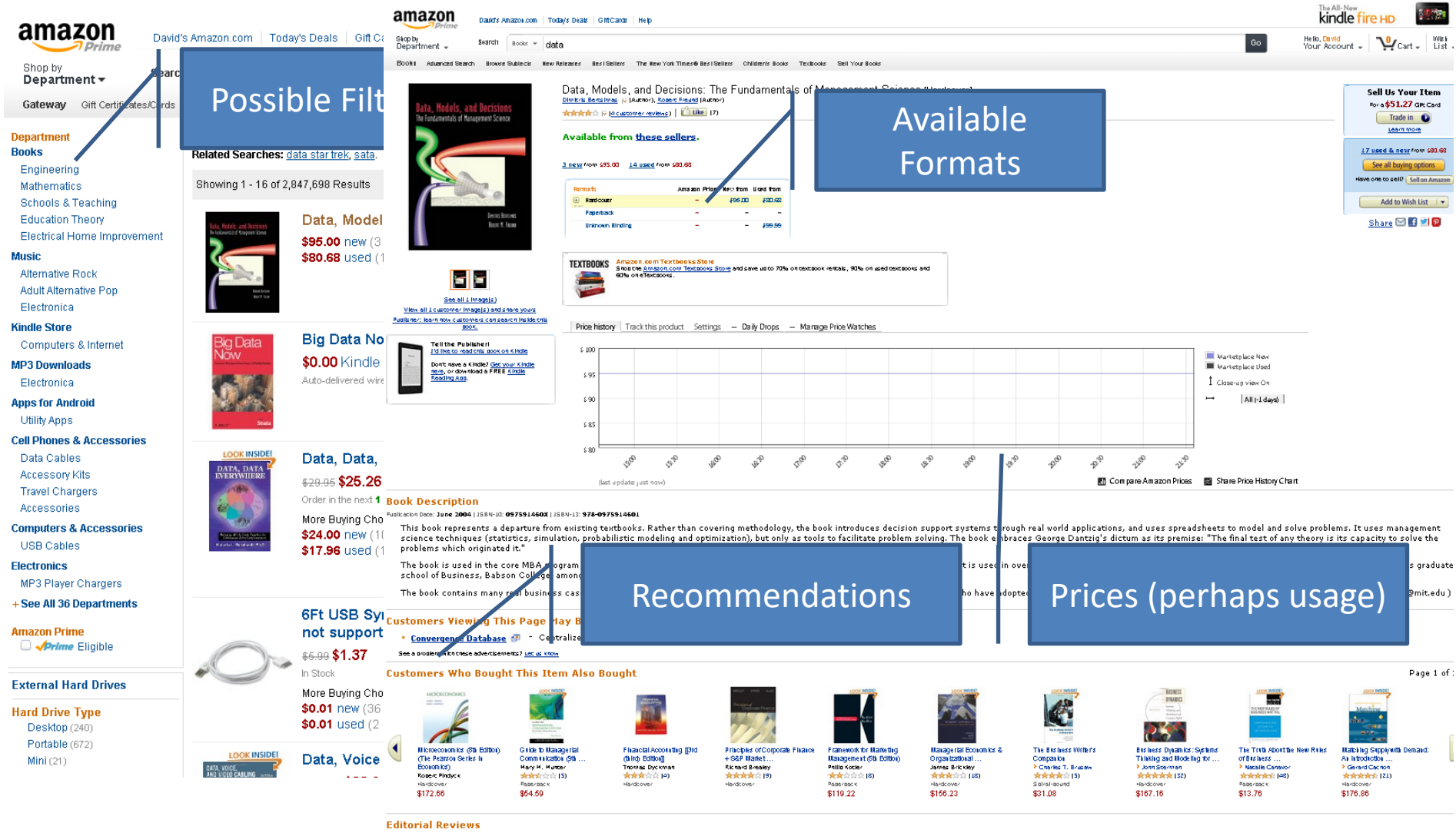
http://his.cuahsi.org/documents/HISStatusSept15.pdf

HydroShare


Collaboration
Visualization
Social Media
Data
Models
Create
Read
Update
Delete
WPS
HydroDesktop
Your favorite ...
Data.gov
USGS
science for a changing world
Earth
Exchange
HPC
CSDMS
CUAHSI
HydroServer

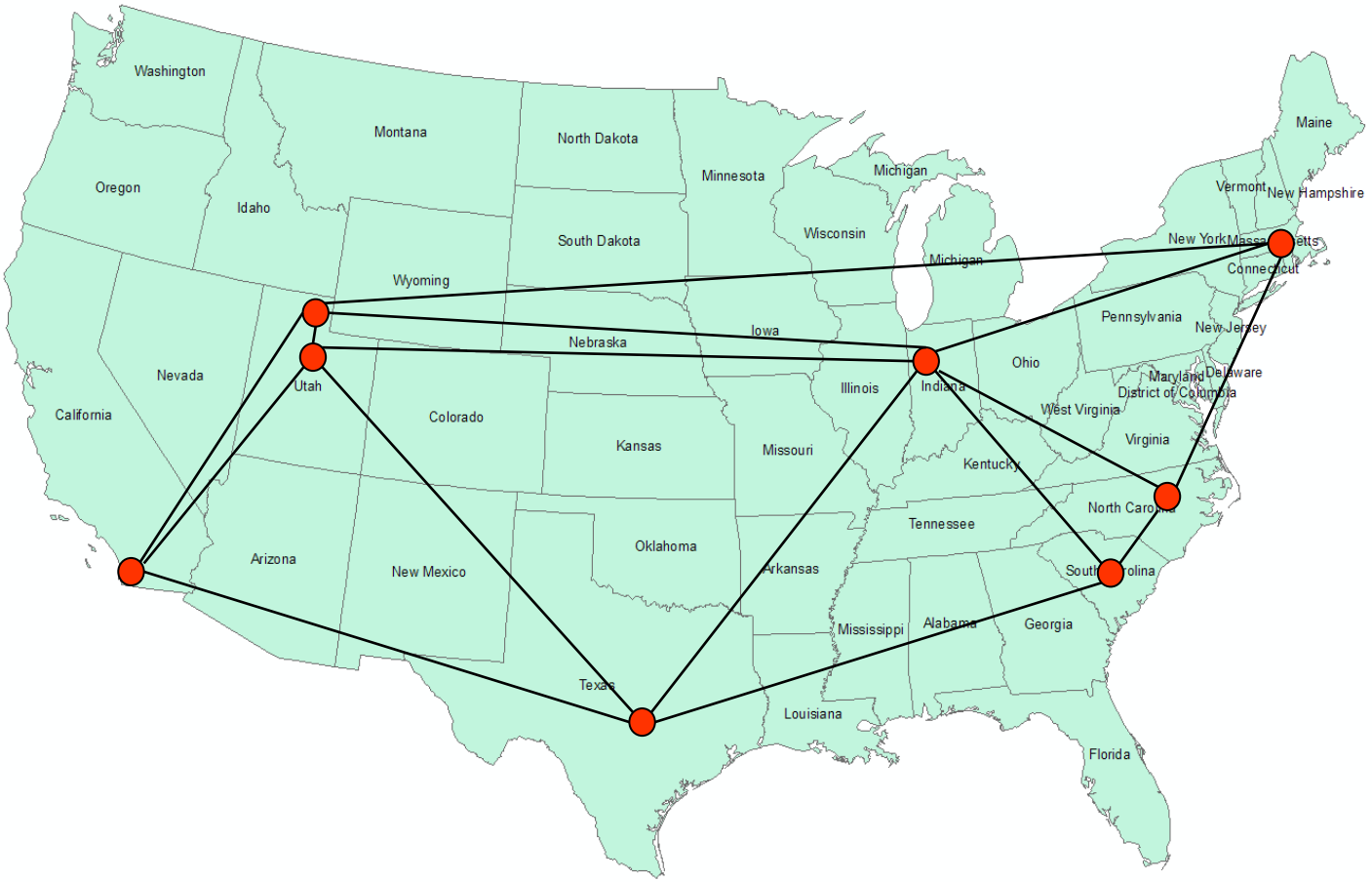
Can sharing data and models be as easy as sharing photos on Facebook or videos on YouTube?

Can finding data and models be as easy as shopping on Amazon?



HydroShare project team

- USU
- RENCI/UNC
- CUAHSI
- ISU (BYU)
- Tufts
- USC
- Texas
- Purdue
- SDSC



CUAHSI HIS

Sharing hydrologic data

OCI-1148453
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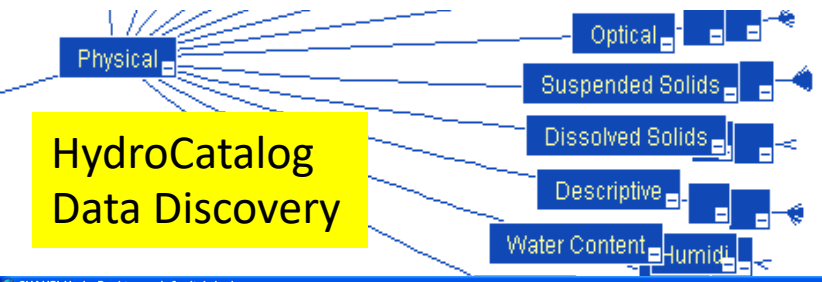
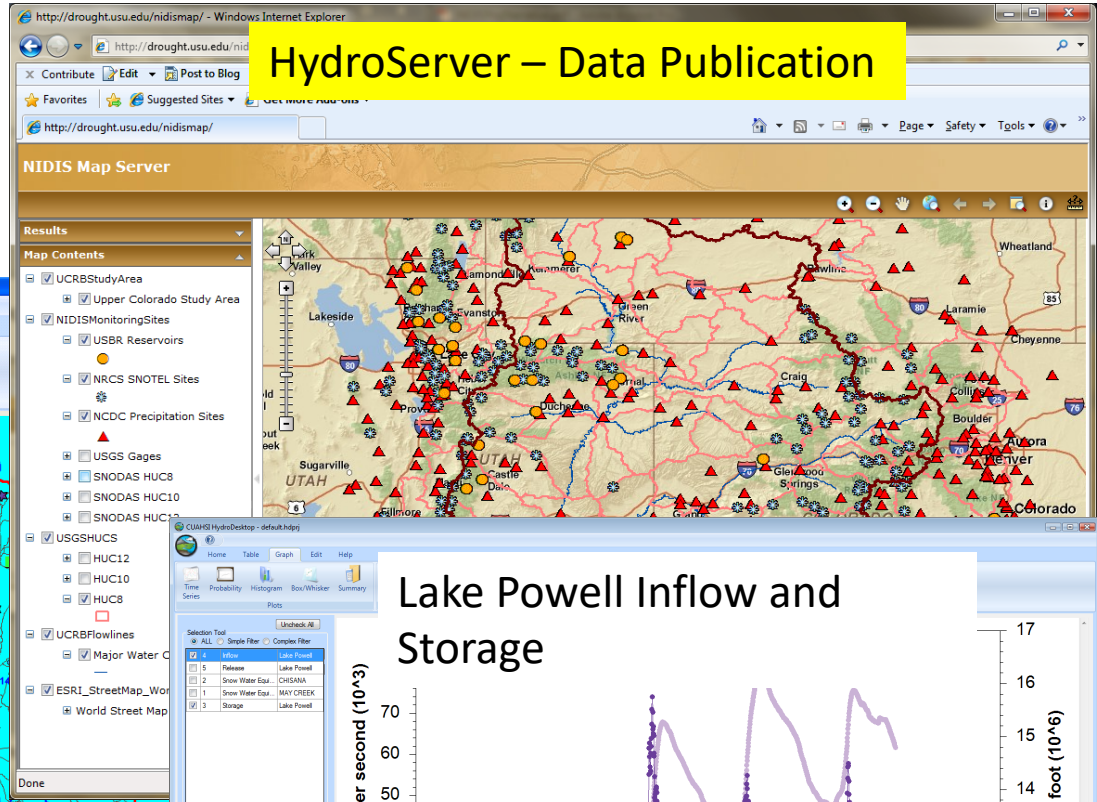
2012-2017

CUAHSI Hydrologic Information System

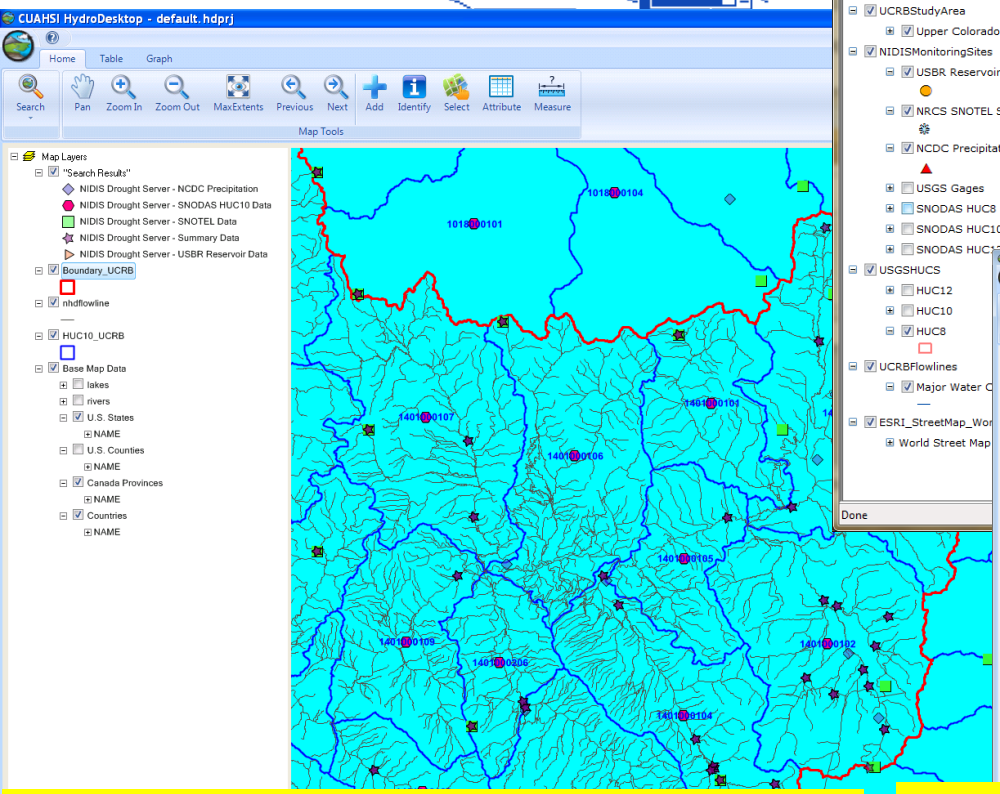
The CUAHSI Hydrologic Information System (HIS) is an internet based system to support the sharing of hydrologic data. It is comprised of hydrologic databases and servers connected through web services as well as software for data publication, discovery and access.



HydroCatalog
Data Discovery



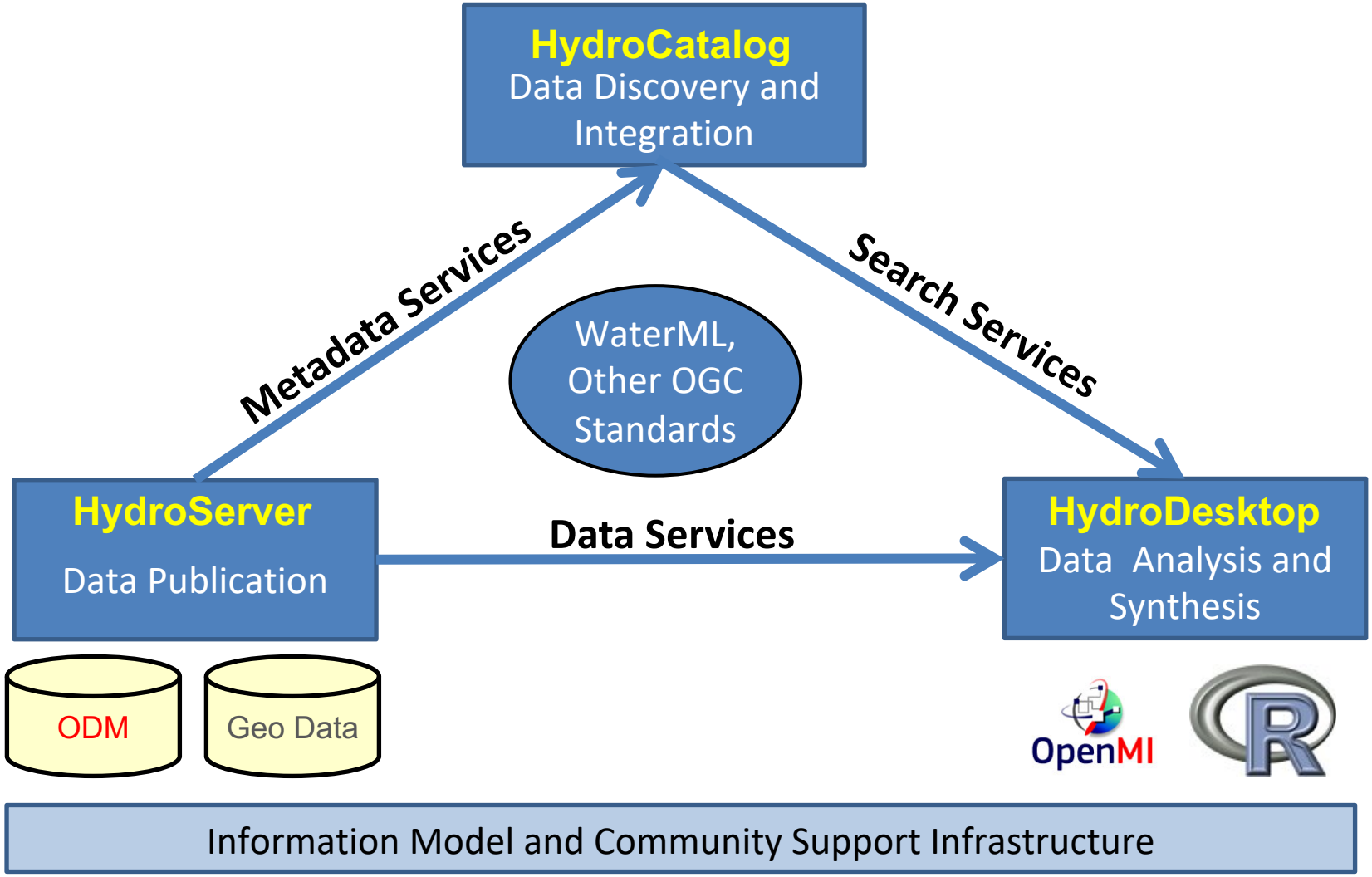
HydroServer – Data Publication



HydroDesktop – Data Access and Analysis

HydroDesktop – Combining multiple data sources

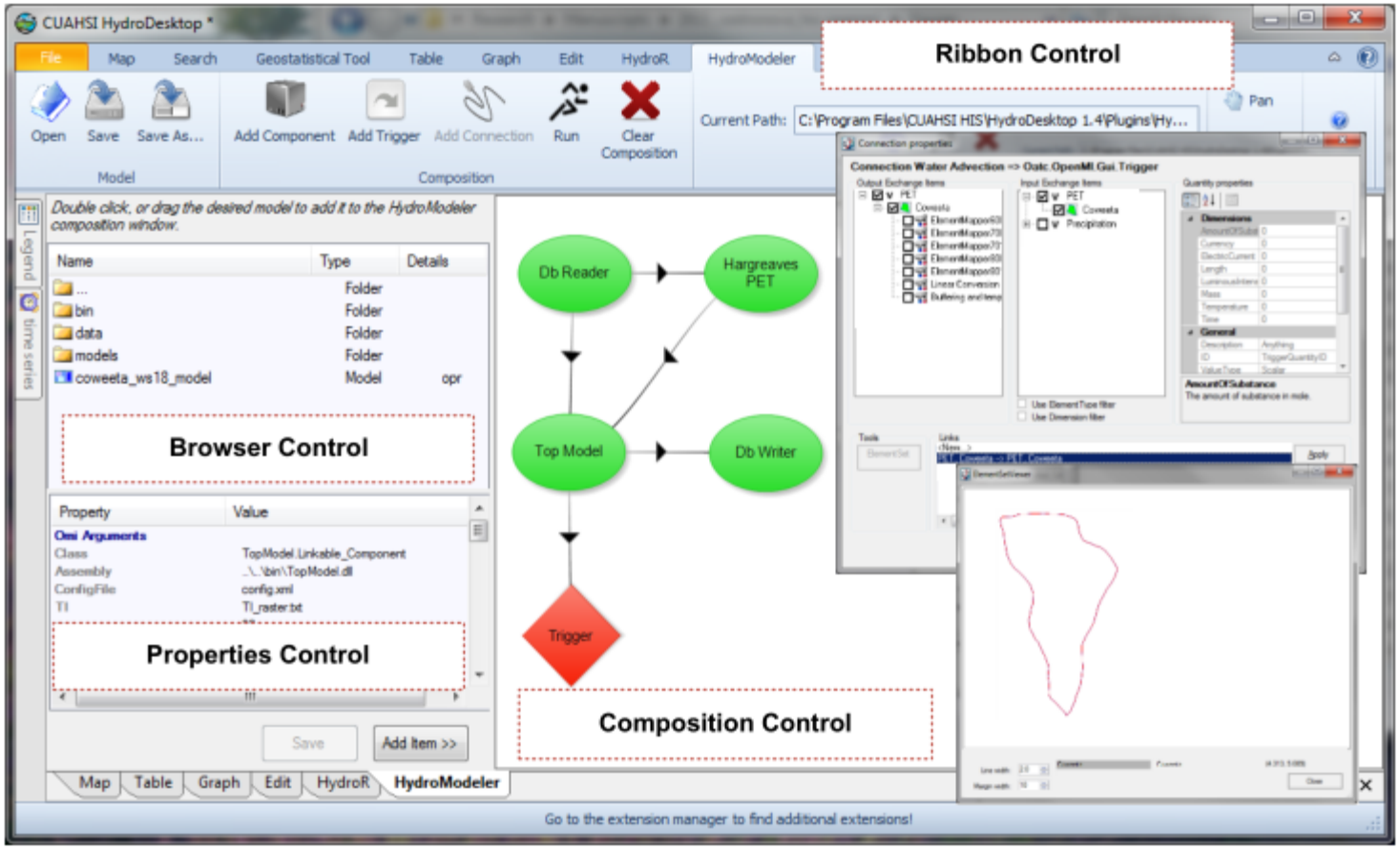
CUAHSI HIS
Services-Oriented Architecture



2004-2012, David Maidment PI, http://his.cuahsi.org

HydroDesktop and Modeling

An integrated modeling environment based on the Open Modeling Interface (OpenMI) standard and embedded within HydroDesktop



Integrated modeling within a Hydrologic Information System: An OpenMI based approach, Castronova, A.M., Goodall, J.L., Ercan, M,B. Environmental Modelling & Software, In Press. 10.1016/j.envsoft.2012.02.011.

CUAHSI HIS Key Aspects

- Storage in a community data model
- Publication from a server (92 registered to date)
- Data access through internet-based services using consistent language and format
- Tools for access and analysis
- Discovery through thematic and geographic search functionality
- Integrated modeling and analysis combining information from multiple sources
- WaterML evolved into Open Geospatial Consortium Standard, being considered by WMO and used by USGS and EPA among others

Open Development Model

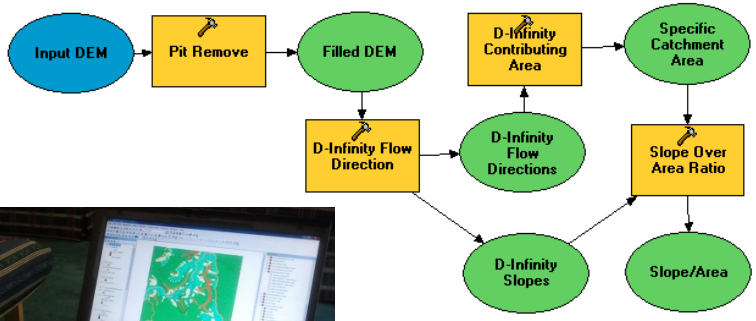
- http://his.cuahsi.org

- http://hydrodesktop.codeplex.com
- http://hydroserver.codeplex.com
- http://hydrocatalog.codeplex.com

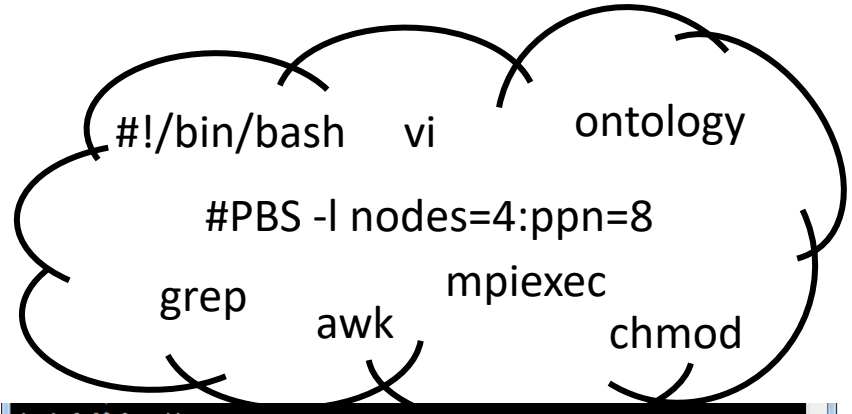
A Digital Divide

Researchers

- Experimentalists
- Modelers



Big Data and HPC

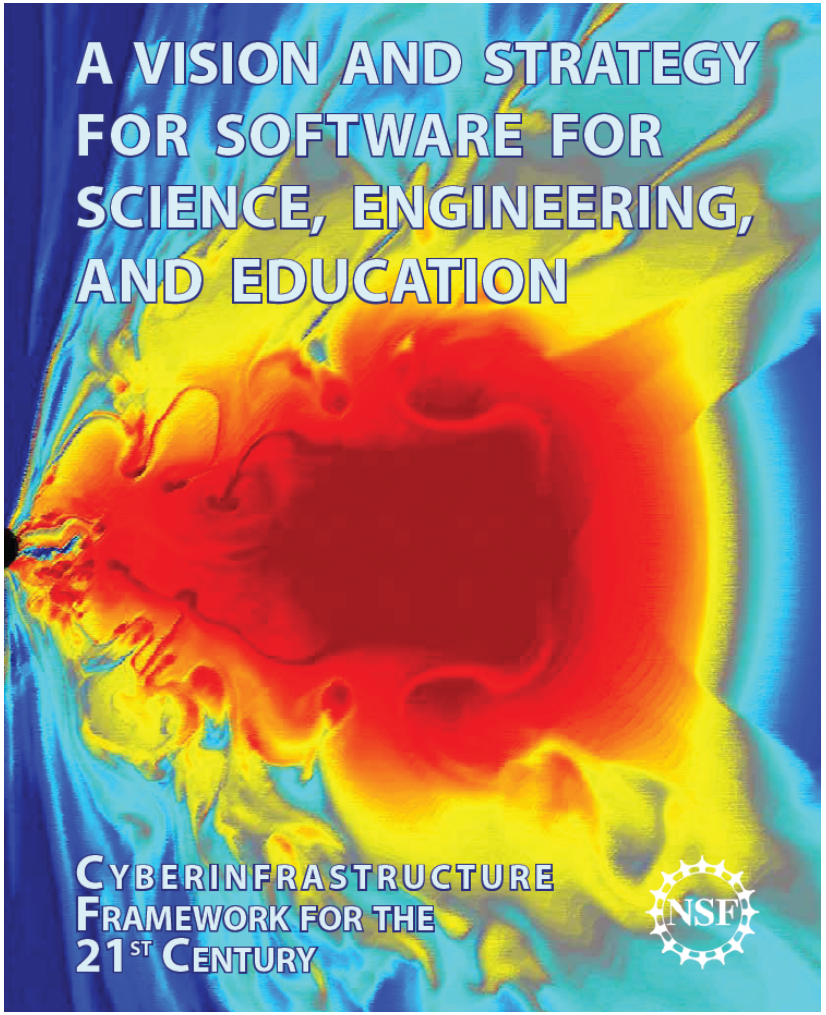



```
-bash-3.2$ ls tddata
logan           LoganOutlet.sbn  LoganOutlet.shp      LoganOutlet.shx
LoganOutlet.dbf  LoganOutlet.sbx  LoganOutlet.shp.xml
-bash-3.2$ ls tddata/logan
logan.tif
-bash-3.2$ ls
eric    logMPfel        run.bash        taudem.bash     taudem_submit.sh
logMPI  run_all.bash    run_taudem.sh   taudem.o41959   tddata
-bash-3.2$ run_taudem.sh pitremove -z logan -fel loganfel
43058.ib-net
-bash-3.2$
```

NSF vision

"enabling software systems are needed to create an environment in which the barrier to access is low for innovation and new discovery"

- Data Management and Preservation
- Software Sustainability



http://www.nsf.gov/pubs/2012/nsf12113/nsf12113.pdf

Overlying Concepts

- HydroShare must change the way we do science
- HydroShare is a collaboration environment and social media site
- HydroShare must appeal to the community
- HydroShare is designed and governed to be responsive to community input

- ***HydroShare has to be dead simple to use***

Functionality to be developed

1. A new, web-based system for advancing model and data sharing
2. Sharing features to HydroDesktop
3. Access more types of hydrologic data using standards compliant data formats and interfaces
4. Enhance catalog functionality that broadens discovery functionality to different data types and models
5. New model sharing and discovery functionality
6. Facilitate and ease access to use of high performance computing
7. New social media and collaboration functionality

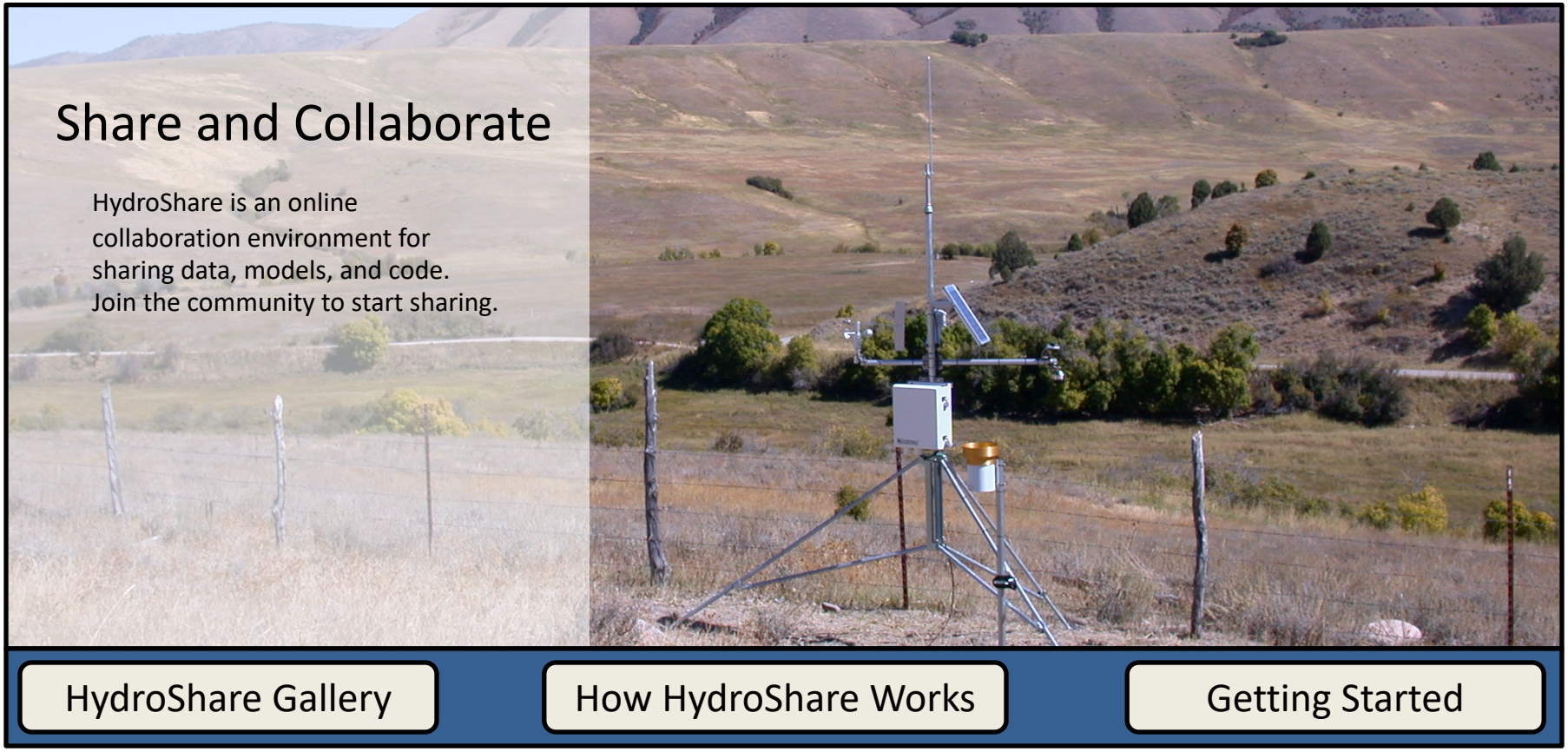
Extend HIS Data Formats

- Point Observations (Time Series in ODM/WaterML)
- Feature data set (Shapefile of points, lines or polygons and attribute tables)
- Raster data set (GeoTIFF file)
- Multidimensional space/time data set (NetCDF file)
- Geochemistry (ODM2)

- Generalize catalog to include these formats
- Adopt or develop appropriate web services or data delivery mechanisms

HydroShare

Share your work with others



HydroShare

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Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NSF.

HydroShare

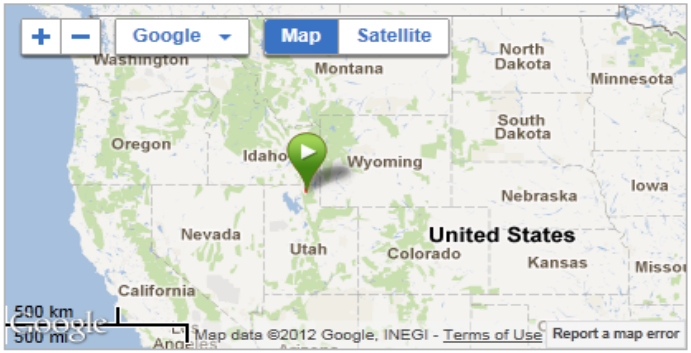
Share your work with others

Recent Activity

All activity | Only my activity

- Little Bear River ODM Database 6/6/2012
- Little Bear River Sites 6/6/2012
- Little Bear River Excel File 6/6/2012
- Watershed delineation Workflow 6/6/2012

More



Abstract: Time series of water quality sensor data in the Little Bear River, Utah, USA

Keywords: Temperature, Dissolved Oxygen, pH, Specific Conductance, Turbidity

View Details

Announcements

What's New at HydroShare: Click here to visit the HydroShare blog to learn more about recent updates and new HydroShare features.

Profile

Jeff Horsburgh
Utah State University
jeff.horsburgh@usu.edu

Resources You May Like

- Little Bear River SWAT Model
  Shared by: David Tarboton
- Little Bear River DEM
  Shared by: David Tarboton

You Should Follow

People | Groups

- Jeff Horsburgh
  Utah State University
- David Tarboton
  Utah State University

HydroShare

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My Resources | All your resources in one place

Keyword: Little Bear River Search Advanced

+ Upload X Delete Share Export

	Type ▲	Title ▲	Date ▲	Abstract ▲
☐		Little Bear River ODM Database	6/6/2012	Utah State University is conducting continuous monitoring within the Little Bear River watershed of northern Utah, USA to investigate the use of surrogate ...
☐		Little Bear River Sites	6/6/2012	Shapefile of monitoirng sites in the Little Bear River watershed.
☐		Watershed Delineation Workflow	6/6/2012	TauDEM workflow to delineate watershed from DEM. Stream threshold is determined automatically to obtain objective drainage density estimate.
☐		Little Bear River SWAT Model	6/6/2012	This is a Soil and Water Assessment Tool model package that is ready to execute. All inputs and outputs are included in the model package.
☐		Little Bear River DEM	6/6/2012	2 m resolution Digital Eleva6tion Model derived from LIDAR.
☐		Stream Metabolism R Script	6/6/2012	This R script contains a set of functions that implement a one-station stream metabolism model
☐				

Results 1 – 10 of 100 << 1 2 3 4 5 6 7 8 9 10 >>

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Little Bear River SWAT Model | Resource Details

Open | Execute | Share | Export | Edit | Delete

Resource Type: Model Package
Created by: Jeff Horsburgh
Created: 6/10/2012
Keywords: Little Bear River, Nutrients, Phosphorus, Water Quality, Model
Size: 100 MB

(76)

Resource Description

Abstract: This is a Soil and Water Assessment Tool model package that is ready to execute. All inputs and outputs are included in the model package.
Required Inputs: High frequency (sub-daily) measurements of water temperature, dissolved oxygen, solar radiation, barometric pressure,
Outputs: Daily estimates of streamflow and water quality for subwatersheds in the Little Bear River.
Citation: Horsburgh, J. S. (2012), Little Bear River SWAT Model, Utah State University, Logan, UT.

Comments

Add Comment

Jeff Horsburgh: This model package is ready to execute.

Shared With

Jon Goodall
University of South Carolina

Similar Resources

Neuse River SWAT Model
Shared by: Jon Goodall

Neuse River Rhessys Model
Shared by: Larry Band

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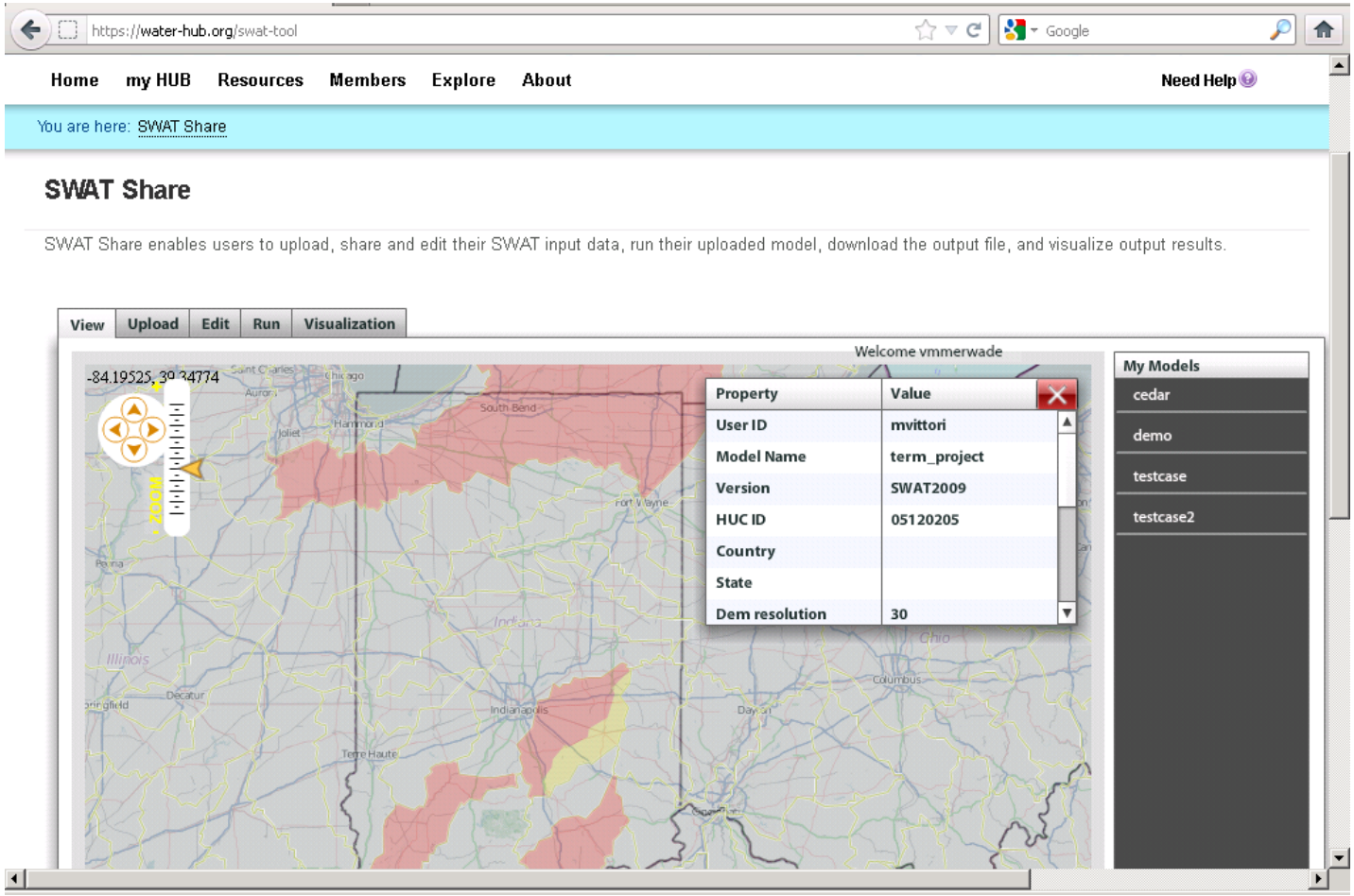
E.g. SWATShare

- A HUBZero based tool for publishing, sharing, and accessing Soil Water Assessment Tool (SWAT)



www.water-hub.org/swat-tool

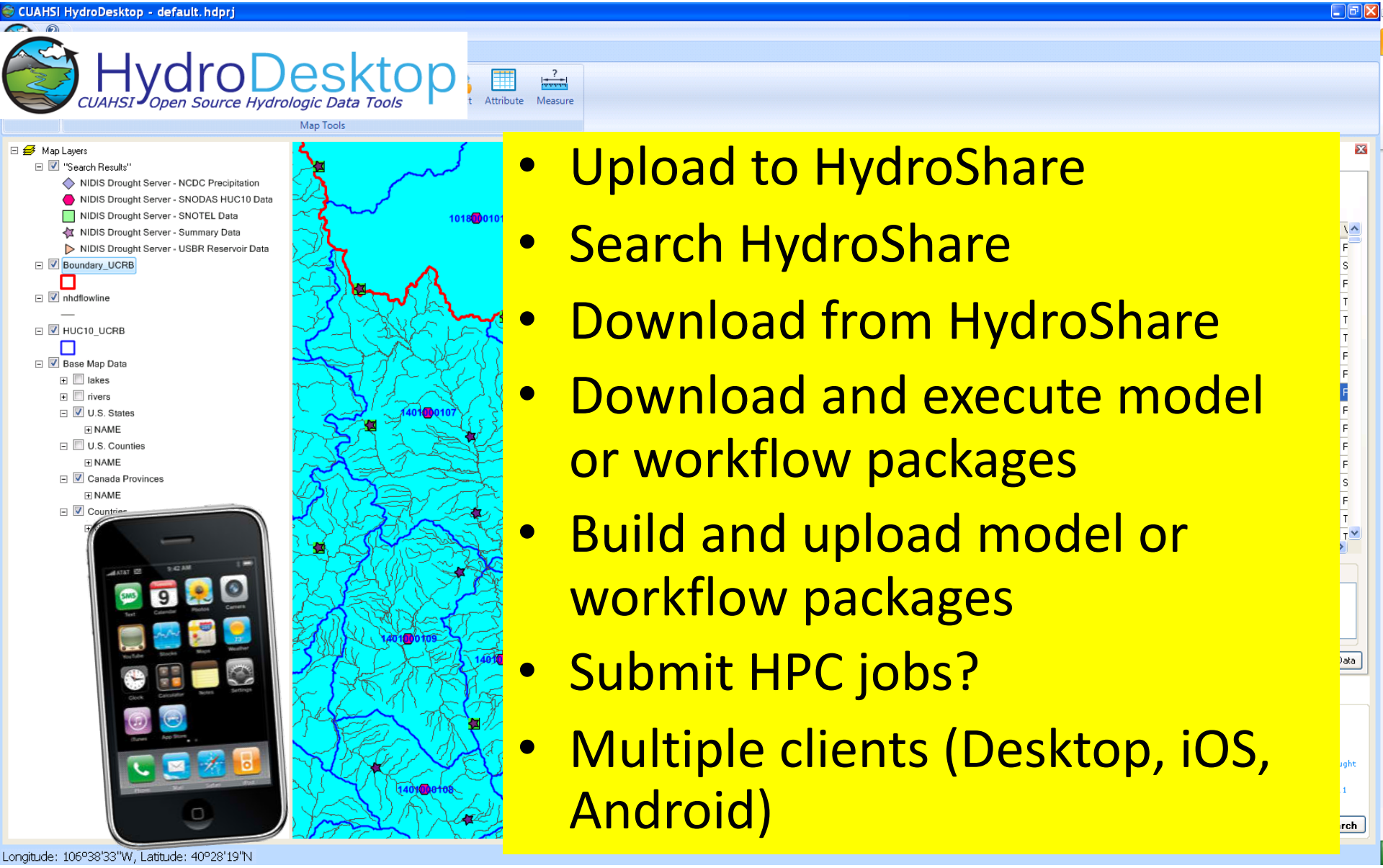
Interoperable data sharing

- Tim Berners-Lee contends that the danger of social networking sites is that most are silos and do not allow users to port data from one site to another. He also cautions against social networks that grow too big and become a monopoly as this tends to limit innovation.

  (http://www.scientificamerican.com/article.cfm?id=long-live-the-web)

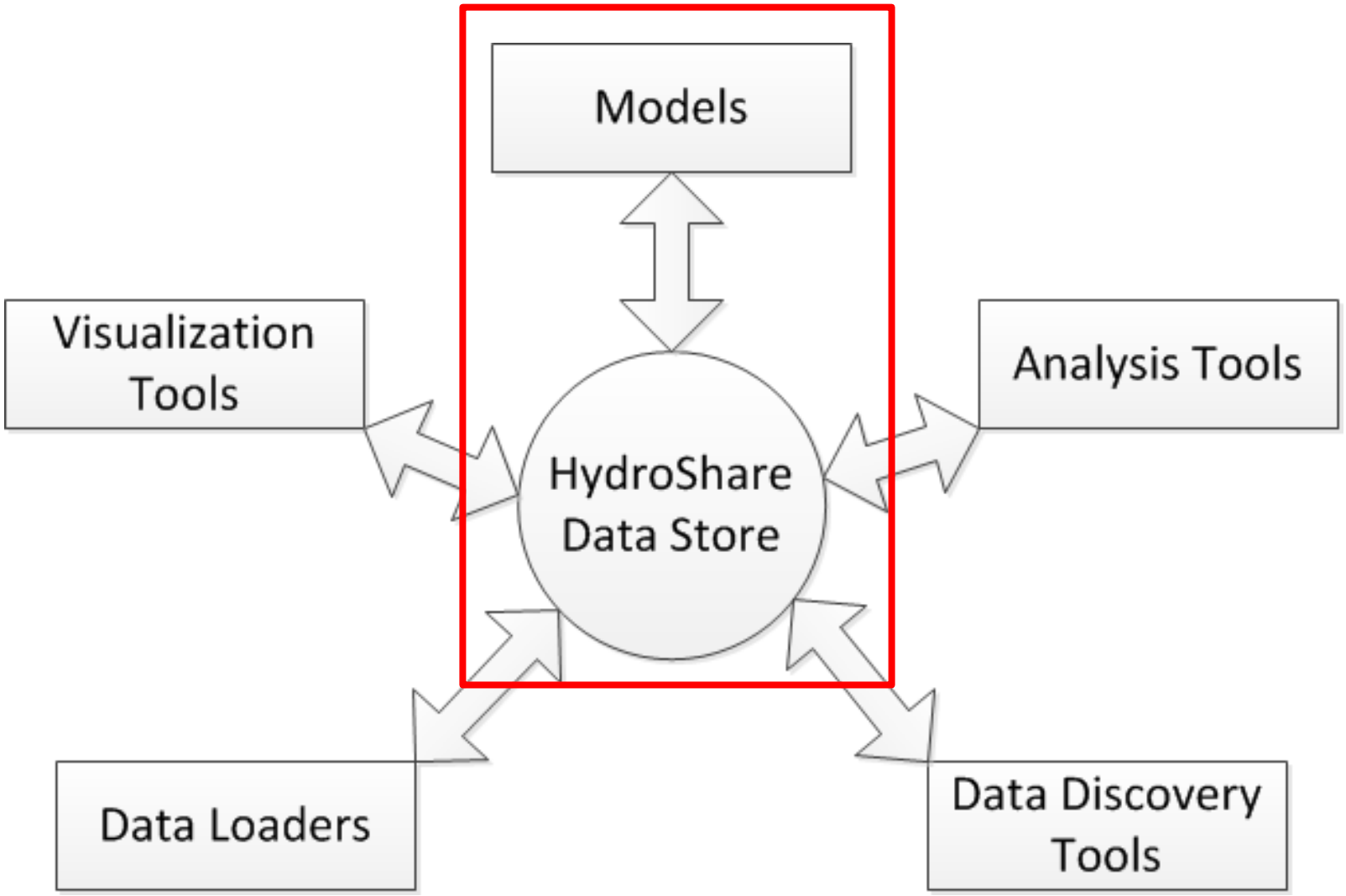
- ***We need:***
  - ***Well defined APIs for client application developers***
  - ***Well defined data encoding and transfer formats to ensure that all data is portable***
  - ***Standard CRUD interfaces***

Support Client/App Functionality

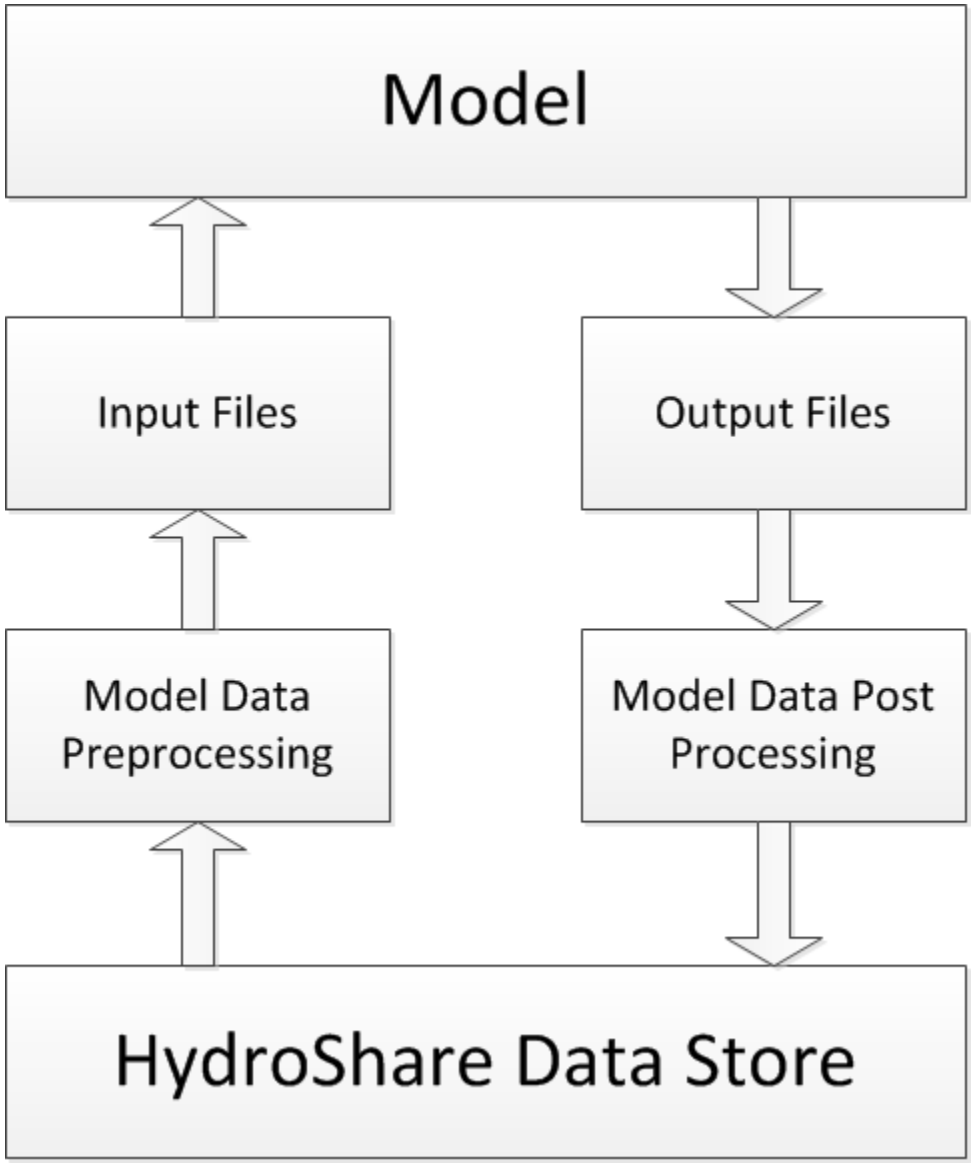


- Upload to HydroShare
- Search HydroShare
- Download from HydroShare
- Download and execute model or workflow packages
- Build and upload model or workflow packages
- Submit HPC jobs?
- Multiple clients (Desktop, iOS, Android)

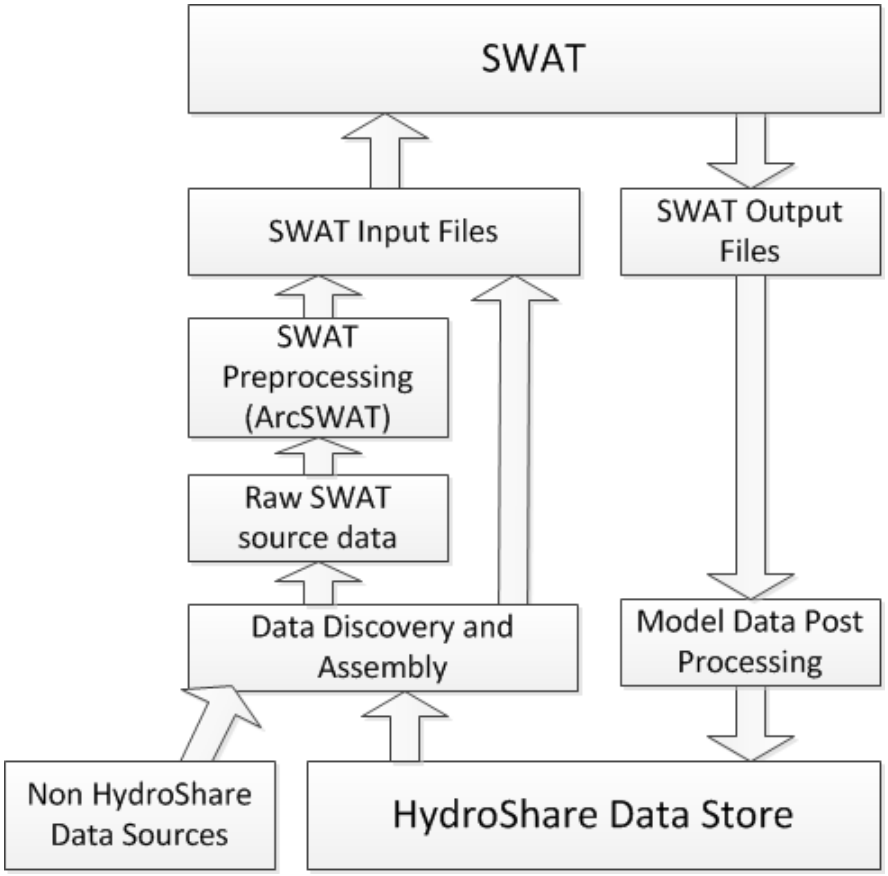
Using HydroShare for Modeling and Analysis

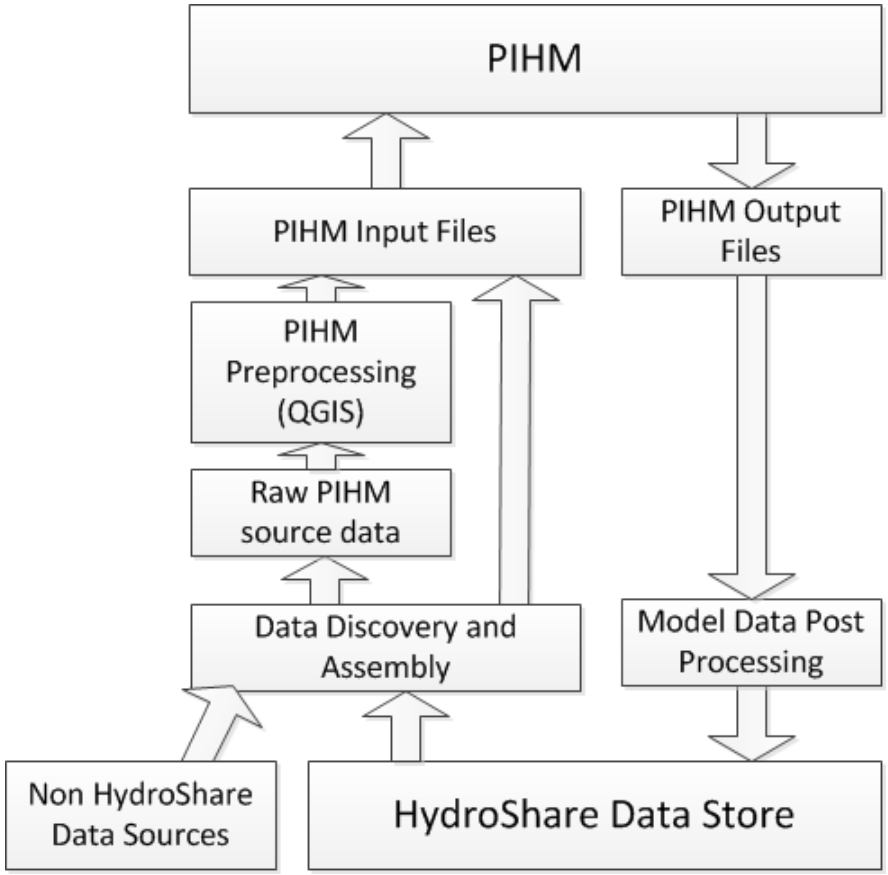


General Model Execution Paradigm



Examples

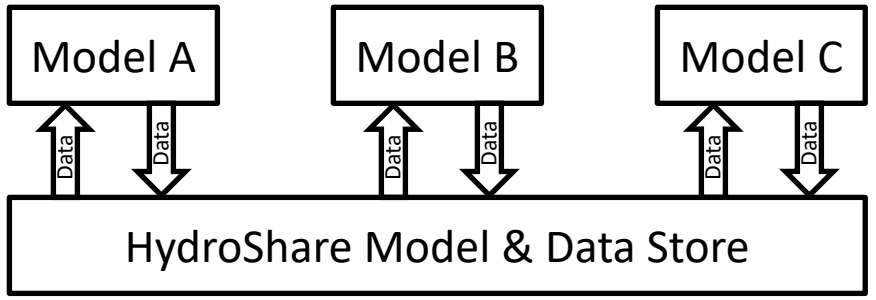




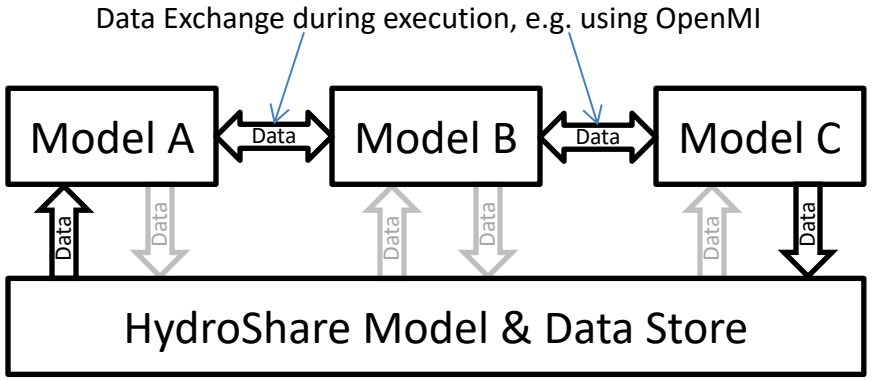
VIC, HSPF, Others ... You contribute your model

Levels of Model Integration

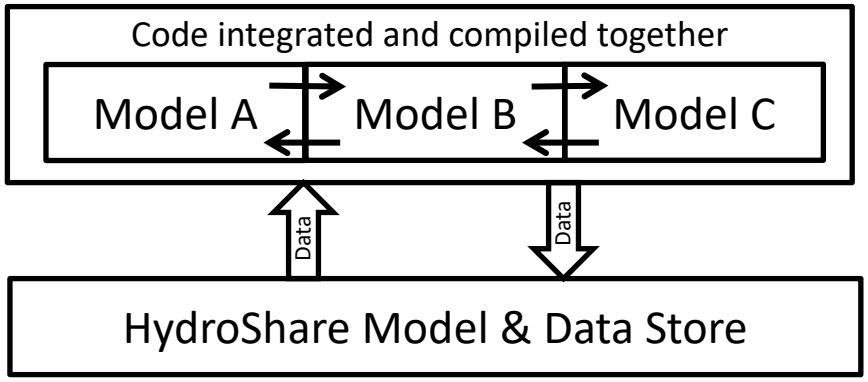
Data centric workflow



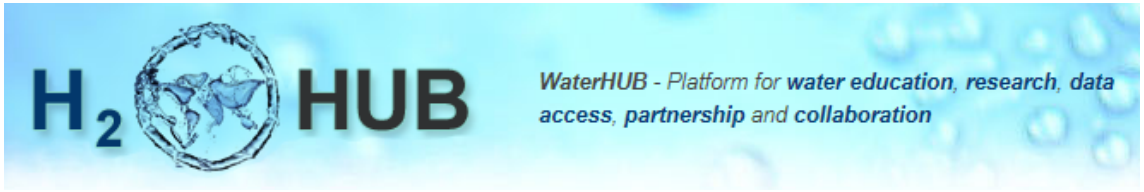
Loose coupling



Tight coupling



HUBzero Based Community Portal

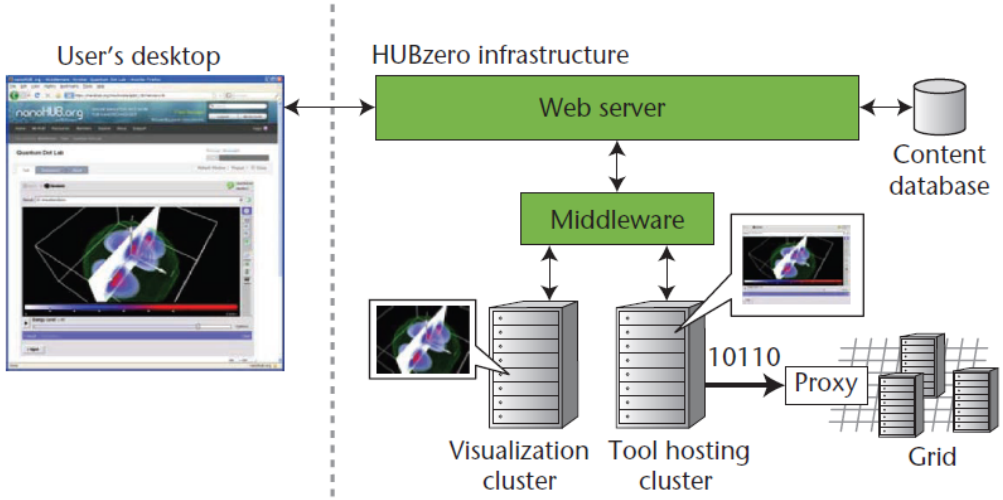


Data & Model Resources

- Discovery & access
- Development
- Execution on local VM
- Execution on remote HPC
- Publishing
- Collaboration

Web Portal

- Social networking
- Community collaboration
- Resource rating
- Documents & videos
- Learning modules

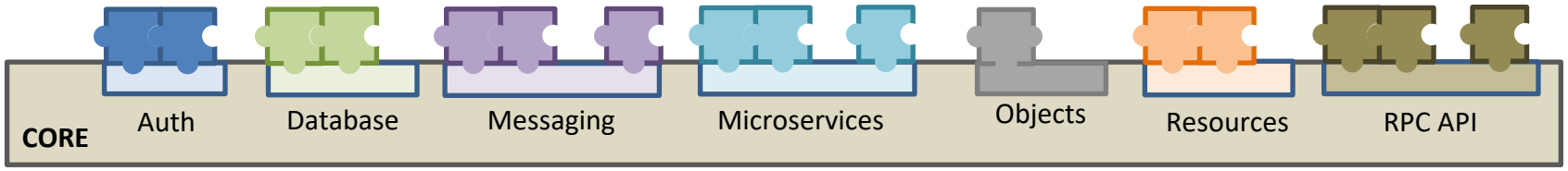


Architecture of HUBzero platform used to create dynamic web sites for scientific research and educational activities
http://dx.doi.org/10.1109/MCSE.2010.41

http://hubzero.org http://water-hub.org

Enterprise Integrated Rule-Oriented Data System

- Open source middleware with pluggable architecture produced by UNC Chapel Hill (i.e. production quality iRODS)
- Via microservices:
  - iRODS rules can automatically register available data
  - Programmatic capability to process data on upload/registration
    - Can automatically convert file formats (e.g. to create resources for visualization)
    - Can automatically assign unique and persistent identifiers
    - Can automatically parse metadata for semantic content and tag with additional semantic content
    - Can make metadata discoverable by other users/tools
- Access control is enforced at the file level
- Rules can be scheduled and run periodically

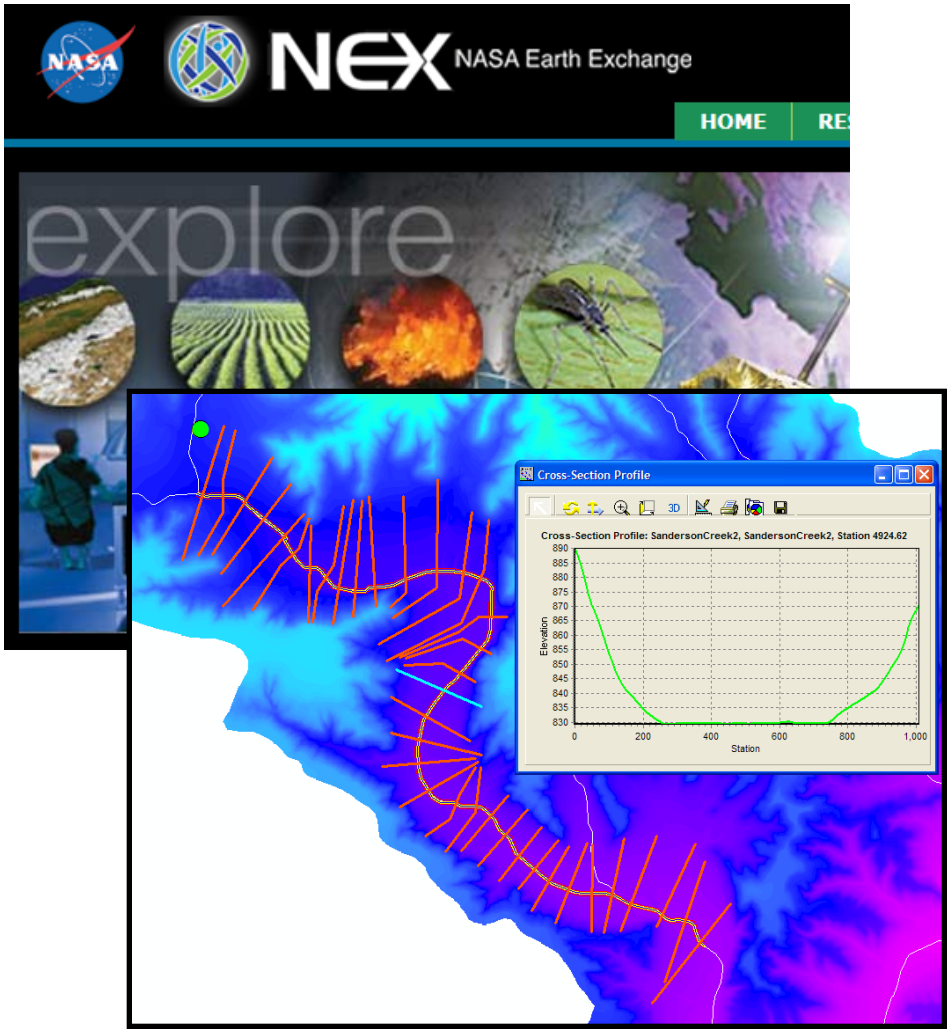


http://www.e-irods.org/

Facilitating Access to Critical National Datasets

- NASA Earth Exchange
- National River Morphology Dataset
- Baltimore and Coweeta LTER

- Already part of HIS
  - USGS Streamflow
  - EPA
  - Others



HydroShare

Share your work with others

Share
Your Resources

Explore
Discover Resources

Collaborate
Interact with colleagues

Summary

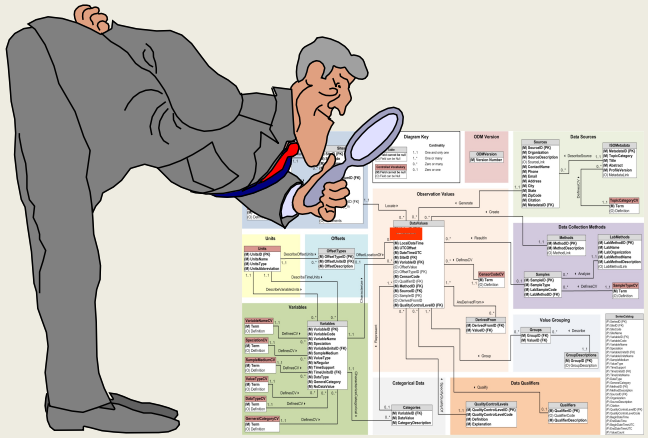
- Simple and easy to use
- Data and model sharing enabled by open standards based metadata
- Find, create, share, connect, interact, work together online
- Archive data collections accompanying research publications in easily accessible way
- Integration and synthesis across data collections

irods
enterprise data management

HUBzero.org
HUB

To participate

- See http://his.cuahsi.org
- Join his@sdsc.edu
- Write dtarb@usu.edu



Questions ?

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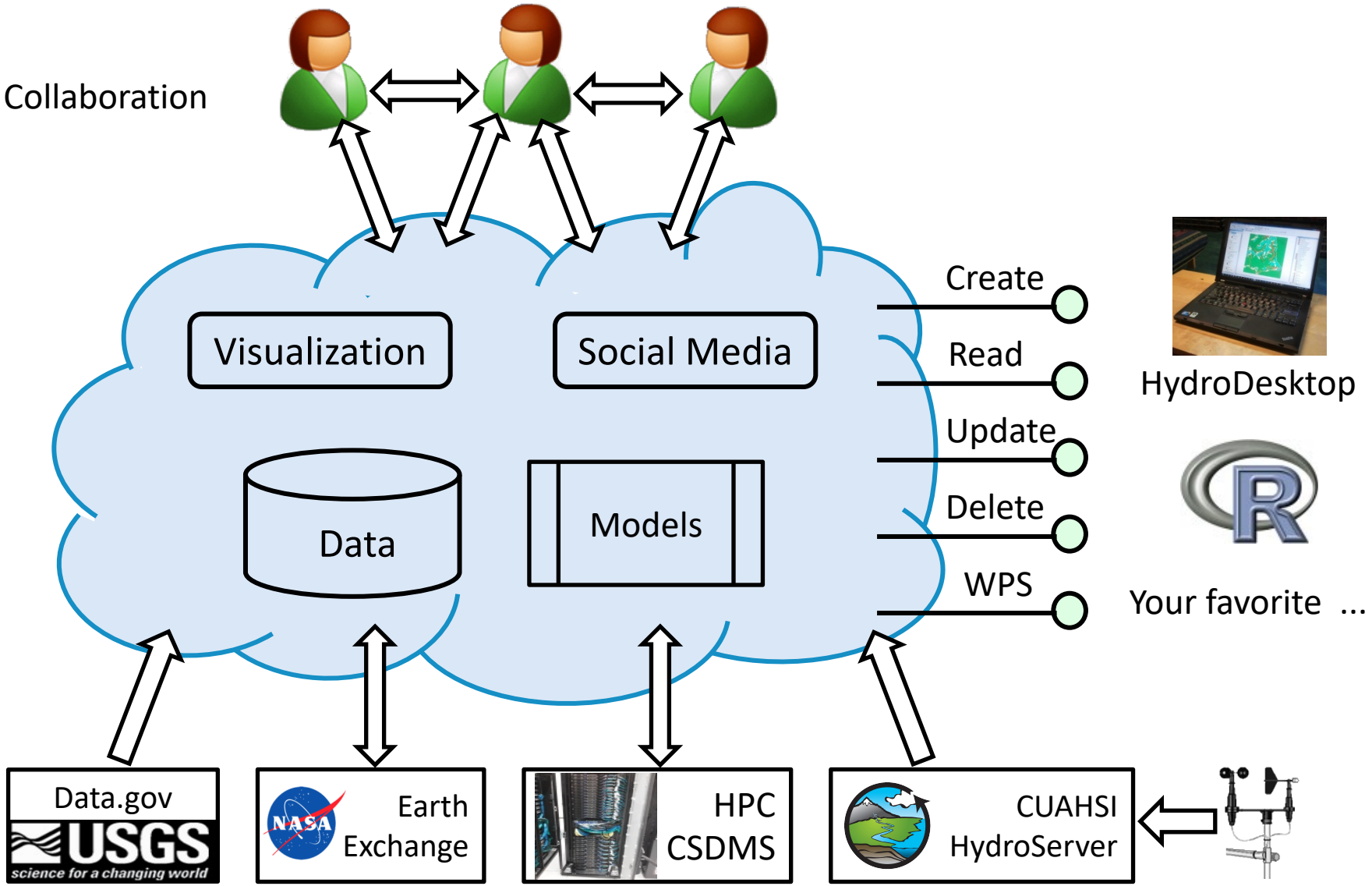
Collaboration
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Data
Models
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Update
Delete
WPS
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Data.gov
USGS
science for a changing world
Earth
Exchange
HPC
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