RECLAMATION
Managing Water in the West

U.S. Department of the Interior
Bureau of Reclamation

Research Update

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Bottom Line

This research project created a web service that will be available in 2017 at water.usbr.gov and will provide time-series data in computer-friendly formats for software programs, including analysis tools, web browsers, and web applications.

Better, Faster, Cheaper

Reclamation has several disparate water measurement systems that contain publically accessible data but are hard to find. Providing access to Reclamation data via web services will improve efficiency for external users, the public, and, specifically, for university-type researchers.

Principal Investigator

Karl Tarbet
Hydraulic Engineer
Pacific Northwest Region
208-378-5272
ktarbet@usbr.gov

Research Office Contact

Levi Brekke
Chief of Research
303-445-2494
lbrekke@usbr.gov

Easing Public Access to Reclamation's Reservoir Water Budget Data

Using open source software to bring Reclamation's water-related databases together

Problem

Managing data is central to Reclamation's core missions of delivering water and power. Time series data that tracks key factors such as flows, operations, and power deliveries will drive Reclamation's future planning and operations. State, regional, and local partners need Reclamation's data to support their water planning and forecasting. More and more requests are coming in for information about Reclamation's water operations, giving rise to data enhancement efforts such as Reclamation's Open Water Data Initiative.

Currently, Reclamation's bureau-wide water measurement data are locally managed and made available to local constituents, but not centrally consolidated or easily located by the general public. Regions have varying databases and software for managing water. In addition, field offices, area offices, regional offices, and corporate levels within Reclamation have different approaches to managing water-related databases. The corporate level manages the public web server separately from water-related databases. It is vital that a creative way be found to share data across organizational levels and from various types of databases.

Solution

This Reclamation Science and Technology Program research project created a Reclamation-wide team and a prototype to:

- Automatically pull data each day from internal databases in the Pacific Northwest, Great Plains, Upper Colorado, and Lower Colorado Regions
- Make various sets of water operations data readable to both humans and machines, and make them available in multiple formats
- Connect to the Tessel web application on the monitoring stations' layer
- Develop a Common Gateway Interface (CGI) web data feed for Reclamation's hydrologic databases (HDB).

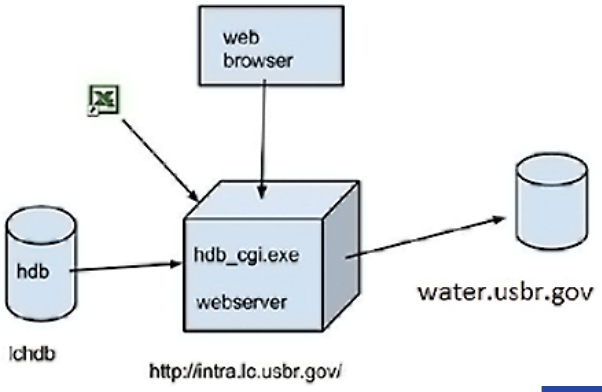
Issues such as security, synchronization, interfaces, data consistency, and Reclamation's IT constraints were identified, along with ways to resolve them. This research project developed a data-sharing community that is contributing to a Reclamation-wide effort involving reservoir operators, water data administrators, information technology groups, and web service providers.

Application and Results

This research project created a web service for sharing data that:

- Integrates with Tessel, Reclamation's overall geographic information system (GIS), to provide location-specific, time-series data.
- Provides time-series data in computer-friendly (machine and human readable) formats to support software programs access, including analysis tools, web browsers, and web applications
- Uses a standard web communication channel to share information between computers
- Provides programmable data feeds (i.e., processes that can be used by web browsers or set up by a programmer to obtain data automatically)

The Pisces software (Pisces) pulls or pushes data daily to the water.usbr.gov central database with HydrometServer.exe, the command line version of Pisces that runs on Linux or Windows computers. When Pisces is run from Reclamation's Denver Information Technology (Denver IT), data are pulled from the HDB and Hydromet servers from the regional servers daily via a CGI program. A CGI program is installed on each regional database. Pulling data is preferred for:



How CGI works with HDB.

- **Security.** Pulling is secure because data are retrieved using read-only web queries.
- **Maintenance.** Pulling allows Denver IT to perform maintenance without coordinating with each region's database manager.

Regional database owners can push data to the central database in Denver IT whenever an update occurs, or they can use automated processes.

Future Plans

The data-sharing community from this research project is continuing to engage, leveraging prototype products from this effort with support from Reclamation's Science and Technology Program and other offices to develop a new pilot system, "Reclamation Water Information System (RWIS)." The pilot system is expected to be made available to the public in winter of fiscal year 2017, focusing initially on the reservoir water data domain with aims to broaden to other domains in future years (e.g., environmental stewardship, hydropower, infrastructure assets, etc.).

The RWIS team is focused on developing a sustainable data-sharing platform and providing an environment for datasets to become available in multiple machine-readable formats. Through RWIS, program managers will be able to make better-informed decisions and directly share data, information, and processes with the public, other agencies, and other Reclamation programs.

"This creative solution gives Reclamation a central way to share data from the many separate time series data sets that Reclamation maintains."

Karl Tarbet
Hydraulic Engineer,
Reclamation's Pacific Northwest Region

Collaborators

Reclamation:

- **Denver Information Technology**
- **Regional Database Managers (Pacific Northwest, Great Plains, Upper Colorado, and Lower Colorado Regions)**

More Information

www.usbr.gov/research/projects/detail.cfm?id=969

Pacific Northwest Region's Pisces webpage at:

www.usbr.gov/pn/hydromet/pisces/

GitHub usbr/Pisces at:

https://github.com/usbr/Pisces

For printable version see: www.usbr.gov/research/docs/updates/2016-11-timeseries-webservice.pdf