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GIS & Water Resources VI
March 29 – 31, 2010
Orlando, FL

Tuesday, March 30

1:30 PM – 3:00 PM

SESSION 17: Hydrologic Information Systems II

HIS Server: A Platform for Publishing Space-Time Hydrologic Datasets - Jeffery Horsburgh, Utah State University, Logan, UT (co-authors: David G. Tarboton, Kimberly A. T. Schreuders, David R. Maidment, Ilya Zaslavsky, David Valentine)

The Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) is developing a Hydrologic Information System (HIS) that supports sharing of distributed hydrologic data through web services and tools for data discovery, access, and publication. HIS Server is a computer server that contains a collection of databases, web services, tools, and software applications that allow data producers to store, publish, and analyze space-time hydrologic datasets. HIS Server is designed to permit local control of the data, while still being part of a distributed, national/international system allowing universal access to the data. We describe the HIS Server architecture and software stack, including tools for managing and publishing time series data for fixed point monitoring sites as well as spatially distributed, GIS datasets that describe a particular study area, watershed, or region. We then describe a case study implementation of HIS Server for publishing water resources related space-time datasets for a network of research watersheds in the northwestern United States called the Inland Northwest Research Alliance (INRA) Constellation of Experimental Watersheds (ICEWATER). The sharing of data in a common format is one way to stimulate interdisciplinary research and collaboration. It is anticipated that the growing, distributed network of HIS Servers will facilitate cross-site comparisons and large scale studies that synthesize information from diverse settings, making the network as a whole greater than the sum of its parts in advancing hydrologic research. Details of the CUAHSI HIS can be found at <http://his.cuahsi.org>, and details of the ICEWATER network can be found at <http://icewater.inra.org>.

Coupling Near Real-Time Weather Data with SWAT using CUAHSI-HIS Components - Nicholas Arnold, Graduate Research Assistant, Iowa City, IA (co-authors: Dongsu Kim, Marian Muste)

Modeling water quality and quantity over a watershed using the Soil and Water Assessment Tool (SWAT) public domain model can be a time consuming and complex task involving multiple inputs from various sources. Discovering and collecting this input data can be very difficult given the disparate and non-cohesive nature of the scientists and agencies that collect it. However, in recent years the Consortium of Universities for the Advancement of Hydrologic Science Inc-Hydrologic Information System (CUAHSI-HIS) team has worked towards minimizing this barrier to data discovery and access by creating a new technology stack that allows scientists to collect, store, publish and share both historical and real-time point-based timeseries data with unprecedented ease. In order to minimize the barrier that exists between doing science and preparing to do science (i.e., finding and accessing the data needed for further analysis or ingestion in the numerical simulations) we have created customized software that couples the CUAHSI HIS web services with SWAT in order to allow scientists to seamlessly discover timeseries data within their area of interest and ingest that data directly into the model without the need of lengthy preprocessing or data transformation steps.

Near Real Time Visualization of USGS Instantaneous Data: Integration of Open Source Data Turbine in CUAHSI HIS - Thomas Whitenack, San Diego Supercomputer Center, UCSD, La Jolla, CA (co-authors: David Ryan, David Valentine, Ilya Zaslavsky)

The CUAHSI Hydrologic Information System project has developed databases, services and online and desktop applications to support standards-based sharing and integration of hydrologic data from US federal agencies and academia. The CUAHSI WaterML 1.x schema specification for exchanging hydrologic time series has been adopted by the United States Geological Survey to provide web service access to USGS daily values and instantaneous data. An experimental service, which makes available raw measurements of discharge, gage

height and several other parameters for over 10,000 USGS real time measurement points, was announced by USGS in July 2009. We demonstrate an online application that leverages the new service for nearly continuous harvesting of USGS real time data, and simultaneous visualization and analysis of the data streams. The application integrates CUAHSI HIS software stack with the Open Source Data Turbine (OSDT) system, a software environment for robust and scalable management of multimedia data streams (e.g. observations from sensors). The application continuously queries the USGS instantaneous water data service (15-min measurements updated every 4 hours), and maps the results for each time series to a separate "channel", which is used by OSDT to quickly access and manipulate the data stream. About 15,000 channels are used making it by far the largest deployment of OSDT. Using RealTime Data Viewer (RDV), users can now select one or more stations of interest (e.g. upstream or downstream from each other), and observe and annotate simultaneous dynamics in the respective discharge and gage height values, using fast forward or backward modes, real-time mode, etc. Memory management, scheduling service-based retrieval from USGS web services, and organizing access to 7,330 selected stations, turned out to be the major challenges in this project. Stations are grouped by state and county in the user interface. Memory footprint has been monitored under different Java VM settings. These and other solutions are presented in the paper, and accompanied with a series of examples of simultaneous visualization of discharge from multiple stations as a component of hydrologic analysis.

Internationalizing the CUAHSI Hydrologic Information System: a Case Study from the Czech Republic - Jiri Kadlec, Idaho State University, Idaho Falls, ID (co-authors: Daniel P. Ames, Jakub Langhammer)

As products of the U.S. National Science Foundation supported Consortium for the Advancement of Hydrologic Sciences (CUAHSI), the Hydrologic Information System project software tools (including HIS Server) have primarily been implemented within the United States in support of U.S. universities, agencies, and experimental watersheds. This presentation will describe the development and deployment of an HIS based regional network within the Czech Republic to support data distribution and dissemination from two universities and at least one government agency responsible for management of watershed data in four major hydrologic regions within the country. Specific challenges associated with developing and deploying this HIS network include 1) handling data privacy and security concerns; 2) development of location specific language files for both the software and the keyword parameter data tables; 3) design and development of a simplified WaterML/WaterOneFlow web service system that can be deployed on existing Linux- based and third-party hosted web sites used by these universities and agencies; and 4) incorporation of open source and web based mapping solutions on these servers. Each of these challenges represents an opportunity for improving and adding to the available suite of HIS software tools and hence ultimately increasing the global appeal and adoption of such tools. Also, we anticipate that implementation of HIS services will be accompanied by use of client side data discovery software including HydroExcel and HydroDesktop - which has the added benefit of making other global climate and hydrologic data series more readily available to researchers within the Czech Republic.