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GIS & Water Resources VI
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Tuesday, March 30
10:30 AM – 12:00 Noon
SESSION 13: Hydrologic Information Systems I

Sharing Hydrologic Data with the CUAHSI Hydrologic Information System - David Tarboton, Utah State University, Logan, UT (co-authors: David R. Maidment, Ilya Zaslavsky, Jeffery S. Horsburgh, Timothy Whiteaker, Michael Piasecki, Jon Goodall, David Valentine, Thomas Whitenack)

The CUAHSI Hydrologic Information System (HIS) is an internet based system that supports sharing of hydrologic data. The HIS consists of databases connected using the Internet through Web services, as well as software for data discovery, access, and publication. The HIS is founded upon an information model for observations at stationary points that supports its data services. The CUAHSI Observations Data Model (ODM) provides community defined semantics needed to allow sharing information from diverse data sources and is implemented as a relational database model for persistent data storage. The CUAHSI WaterOneFlow Web services have been designed to publish hydrologic data using a standard data transmission markup language called WaterML. WaterML underlies the machine to machine communication of hydrologic data. CUAHSI HIS WaterOneFlow services scale from centralized services supporting access to National Datasets such as the USGS National Water Information System (NWIS) and EPA Storage and Retrieval System (STORET), to distributed data services that allow users to establish their own server and publish their own data stored in an ODM database. Data services are registered at a central HIS website, where they become searchable and accessible through the centralized discovery and data access tools available there. WaterOneFlow Web Services can be accessed directly from applications software such as Excel, MATLAB and ArcGIS that have Simple Object Access Protocol (SOAP) capability. A significant value of Web services derives from the capability to use them from within a user's preferred analysis environment, using community defined semantics, rather than requiring a user to learn new software. This allows a user to work with data from national and academic sources, almost as though it was on their local disk. Users wishing to share or publish their data through CUAHSI HIS may do so by establishing a HIS server at their institution. This provides the capability to share point and time series observations using WaterOneFlow Web services, as well as spatial data using standards-based Web feature, map, and coverage services. This paper provides an overview of the technology and tools developed as part of the CUAHSI HIS to enable community sharing and publication of data.

HydroDesktop: A Free and Open Source Platform for Hydrologic Data Discovery, Visualization, and Analysis - Daniel P. Ames, Idaho State University, Idaho Falls, ID (co-authors: Jiri Kadlec, Jeff Horsburgh)

A growing number of hydrologic information servers are being deployed by government agencies, university networks, and individual researchers using the CUAHSI Hydrologic Information System (HIS) Observations Data Model (ODM) database and WaterOneFlow web services. Metadata regarding available datasets on these servers is stored at the San Diego Supercomputer Center and is searchable through a set of predefined web services based metadata queries. Together, these servers and central catalog service comprise a federated hydrologic information system of a scale and comprehensiveness never previously available. This presentation describes the development of a new HIS software tool called "HydroDesktop" and the open source software development web portal, www.HydroDesktop.org, which supports community development and maintenance of the software. HydroDesktop is a client-side desktop software application that acts as a search and discovery tool for exploring the distributed network of HIS servers, downloading specific data series, visualizing and summarizing data series and exporting these to formats needed for analysis by external software. HydroDesktop is based on the open source MapWindow GIS developer toolkit (Version 6) which provides it with map-based data interaction and visualization, as well as an extensive plug-in interface that can be used by third party developers and researchers to easily extend the software using Microsoft .NET programming languages. HydroDesktop plug-ins that are presently available or currently under development within the project and by third party collaborators include functions for data search and discovery, extensive graphing, data editing and

export, HIS server exploration, integration with the OpenMI workflow and modeling system, and a number of geoprocessing data analysis tools.

HydroModeler: A Modeling Plug-in for the CUAHSI HIS HydroDesktop Application - Jonathan L. Goodall, Department of Civil and Environmental Engineering, University of, Columbia, SC (co-authors: Anthony M. Castronova, Daniel P. Ames)

HydroModeler is a plug-in application that extends the core HydroDesktop application to support hydrologic modeling. HydroDesktop is a client application for the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) Hydrologic Information System (HIS) designed to allow users to identify and gather data served through the HIS. HydroModeler makes use of the Open Modeling Interface (OpenMI) standard and OpenMI Association Technical Committee (OATC) Software Development Kit (SDK) to provide a "plug-and-play" modeling framework within HydroDesktop. By adopting the OpenMI standard and by leveraging core HydroDesktop functionality for data management and visualization, HydroModeler is able to focus on the more specific task of running integrated model configurations. As more models are refactored to follow the OpenMI standard, we anticipate that HydroModeler will become an increasingly powerful application for hydrologic and water resource modeling. We will discuss the design and implementation of HydroModeler and demonstrate its application with a case study.

Texas Hydrologic Information System - Timothy Whiteaker, University of Texas, Austin, TX (co-authors: David Maidment, James Seppi, Eric Hersh, Wendy Harrison, Dharhas Pothina)

The Texas Hydrologic Information System is an adaptation of the CUAHSI Hydrologic Information System for application within Texas. Water observations time series data from the principal water agencies in Texas are stored in the CUAHSI Observations Data Model and published as WaterML web services. Equivalent real-time data services are provided for the Texas Coastal Ocean Observing System by translating the TCOON web site into a WaterML web service. A centralized index of more than one million observations time series has been constructed where each series represents one variable measured by one organization at one site for a defined time period. Information themes are defined such as Salinity, Water Temperature, Streamflow, Nutrients, and Dissolved Oxygen, and observations data for each theme is harvested from the agency water data services, and merged with similarly harvested information on these themes from CUAHSI national water data services operating in Texas, principally those for the USGS. The theme information is published as an Arc Hydro II time series geodatabase. A HydroPortal and ArcGIS map services are used to provide access to each water data service and to the compiled information themes.