

# Design and Implementation of a Web Service-Oriented Gateway to Facilitate Environmental Modeling using HPC Resources

[Poster Abstract]

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## ABSTRACT

Environmental researchers, modelers, water managers, and users require access to high-performance computing (HPC) resources for running data and computationally intensive models without being an HPC expert. To address these challenges, we have developed a web-service oriented gateway to HPC storage and computational resources in order to be used by science web portals/applications. This gateway software (that we have named HydroGate) is a CGI based REST web service that takes input via HTTP methods then transmits commands to the HPC system using SSH. The gateway abstracts away many details and complexities involved in the use of HPC systems including authentication, authorization, data and job management - transferring the data back and forth as well as creation, monitoring and scheduling of the jobs without installing any third-party software on the HPC systems. The TauDEM tools and the Utah Energy Balance (UEB) Snowmelt model are executed on the HPC system taking advantage of parallel methods. The contribution of this study is the realization of the gateway service exposing an interface to the client applications that require access to the resources and services on the HPC centers in a secure and straightforward manner.

## Categories and Subject Descriptors

C.2.4 [Computer Systems Organization]: Distributed Systems

## General Terms

Design, Documentation

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## Keywords

Grid gateway web service, high performance computing (HPC), science web portal, environmental research

## 1. SUMMARY

We introduce HydroGate, a grid gateway web service, exposing a RESTful API developed to enable science web portals/applications to transparently access and use state-of-the-art HPC resources. The gateway abstracts away many details and complexities involved in the use of HPC systems without relying on any third-party software installed on HPC centers, but only basic components such as SSH server and PBS job scheduler. The major distinctive feature of HydroGate, we adopted zero-installation philosophy that no HydroGate software component needs to be installed particularly on HPC systems to manage HPC jobs. HydroGate provides the following functionality over its RESTful Web API:

- **Security** using token-based authentication to the HydroGate service, and then SSH-based authentication to the HPC centers
- **File transfer** back and forth between HPC storage and file server transparent to the service user using secure copy (scp)
- **Submission of jobs** that the user has right to perform to the specified HPC center
- **Monitoring of job status** by means of a URL call-back mechanism is carried out by HydroGate to avoid requiring end users to poll job status continuously that notifies service users when the status of job is changed
- **Automatic batch script generation** based on the HPC center preferences and program requirements
- **Discovery** functions to determine the capabilities of HPC centers, HPC programs and program parameters
- **Workflow** mechanism allows the user to submit multiple tasks that are scheduled to run in order as a unified HPC job