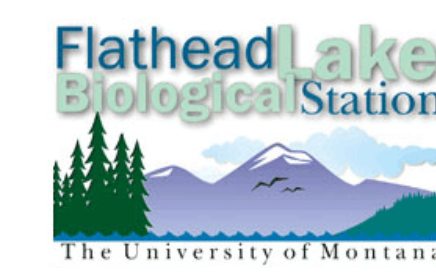# The Virtual Observatory and Ecological Informatics System (VOEIS): Using RESTful architecture and an extensible data model to provide a unique data management solution.

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Project Summary

The Virtual Observatory and Ecological Informatics System (VOEIS) intends to provide scientists and data managers with an end-to-end management solution for a wide variety of environmental data types. The system currently provides a framework for data acquisition, quality assurance/control, visualization, and provenance tracking of temporally and spatially located data. Stand-alone Java applications allow users to automatically push real-time sensor network data to VOEIS, or to publish data housed in VOEIS to a HydroServer. VOEIS is built upon a unique and extensible data model, providing an avenue for future support of new data types with unique metadata requirements, while minimizing impacts of such additions to the existing software and user-interfaces. Initially, the data model supports: 1) field observations, 2) samples, 3) simulation results, and 4) derived values. The VOEIS architecture supports Representational State Transfer (REST) methods for each data model object. This allows users to fully integrate VOEIS into existing workflows for automated data retrieval and archiving, data publication, data visualization, or simulation modeling. Furthermore, REST methods provide straightforward access to the VOEIS architecture for those users that require custom user interfaces. VOEIS is an open-source Yogo Data Management Application built with Ruby on Rails® on a PostgreSQL backend. Visit voeis.org for more information.
A preview release of the software may be accessed at: **https://voeis.msu.montana.edu/**

Software Features

- **Simple Data Upload Template Creation**
- **Project Based Data Storage and Management**
- **QAQC Tools**
- **Data Versioning and Roll-Back**
- **Complex Data Visualization**
- **Data Publication**
- **Provenance Tracking**
- **Simulation Model Support**
- **Highly-Granular User Access Controls**
- **HydroServer Publication Gateway**
- **Scientific Workflow Integration Ready**

RESTful Web Service

REST is a popular software architecture style that simplifies the sharing of data on the web. REST methods make data available over the internet by mapping site URLs to data. VOEIS provides a full set of REST methods (RETRIEVE, REPLACE, CREATE, and DESTROY) for each database object. This allows users to easily create new tools, user-interfaces, or applications that work with the data stored in the VOEIS server.
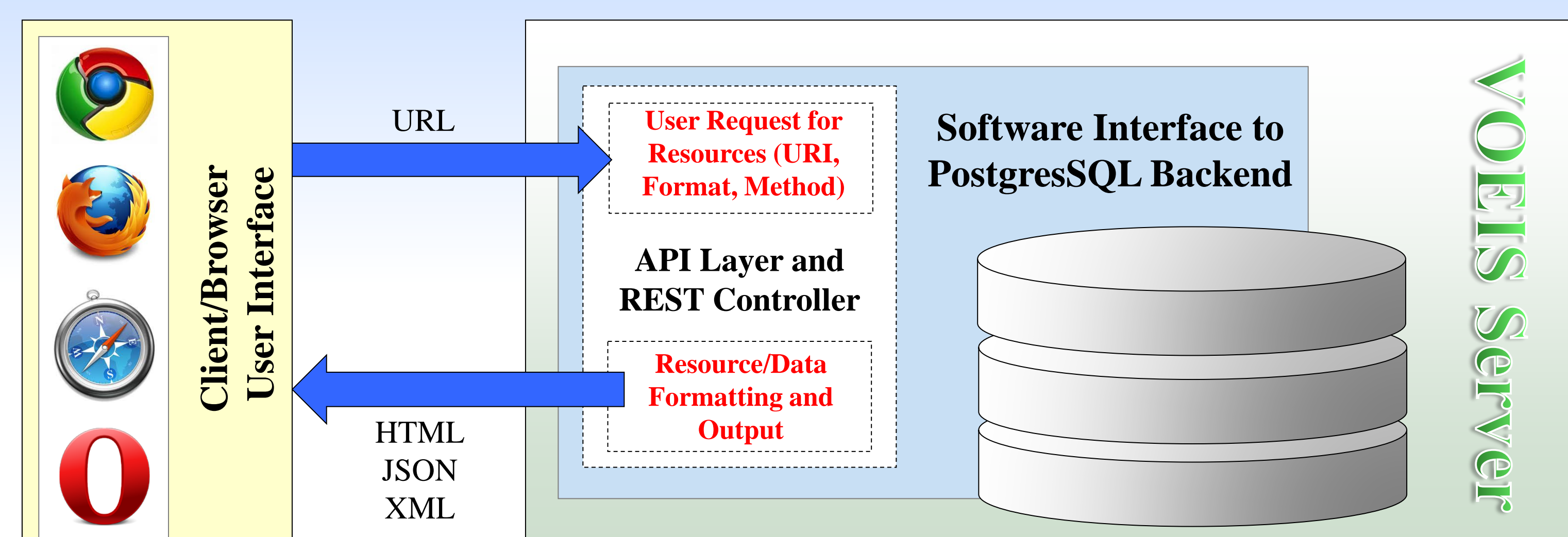
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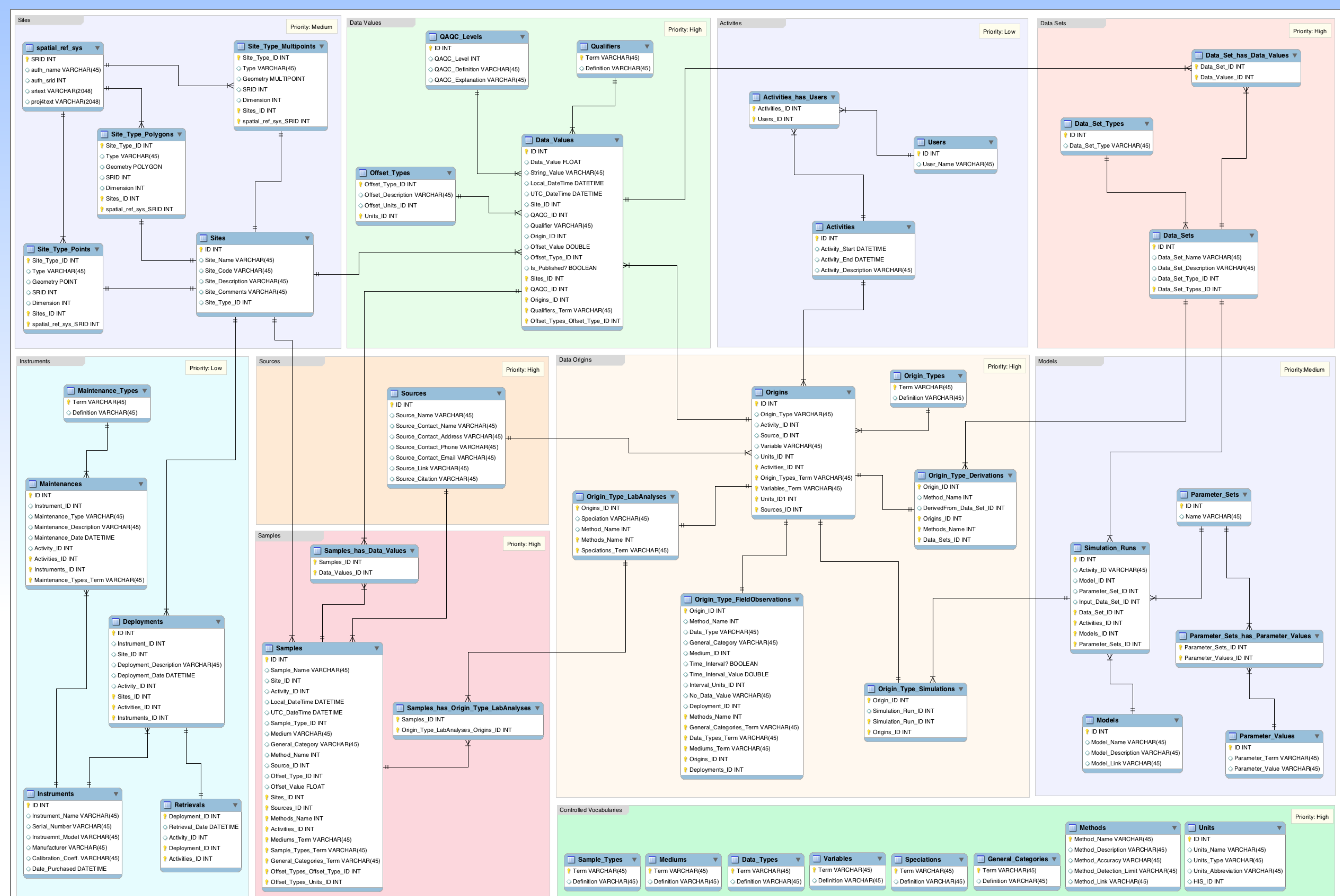
Significance

Researchers collect and analyze a wide variety of environmental data types, each with unique unique formatting and metadata requirements. This data diversity frequently creates a significant barrier to selection and use of simple data management solutions. Thus, many researchers find themselves utilizing multiple data management systems (each requiring some amount of training for proper use), or simply relying on raw data files for all archiving and analysis needs. In recognition of the significant shortcomings of the latter approach to data management, NSF now requires funded researchers to implement data management plans. VOEIS fills this need, providing a breadth of data management features for multiple environmental data types, while simultaneously minimizing the training time required of researchers and lab group members for effective use of the software. VOEIS can be easily integrated into existing data management systems as a robust archive. Alternatively, users may select to use the VOEIS software suite as an end-to-end management solution supporting data archiving, discovery, QAQC, and publication.

Acknowledgements