

Pacific Northwest Water Quality Data Exchange

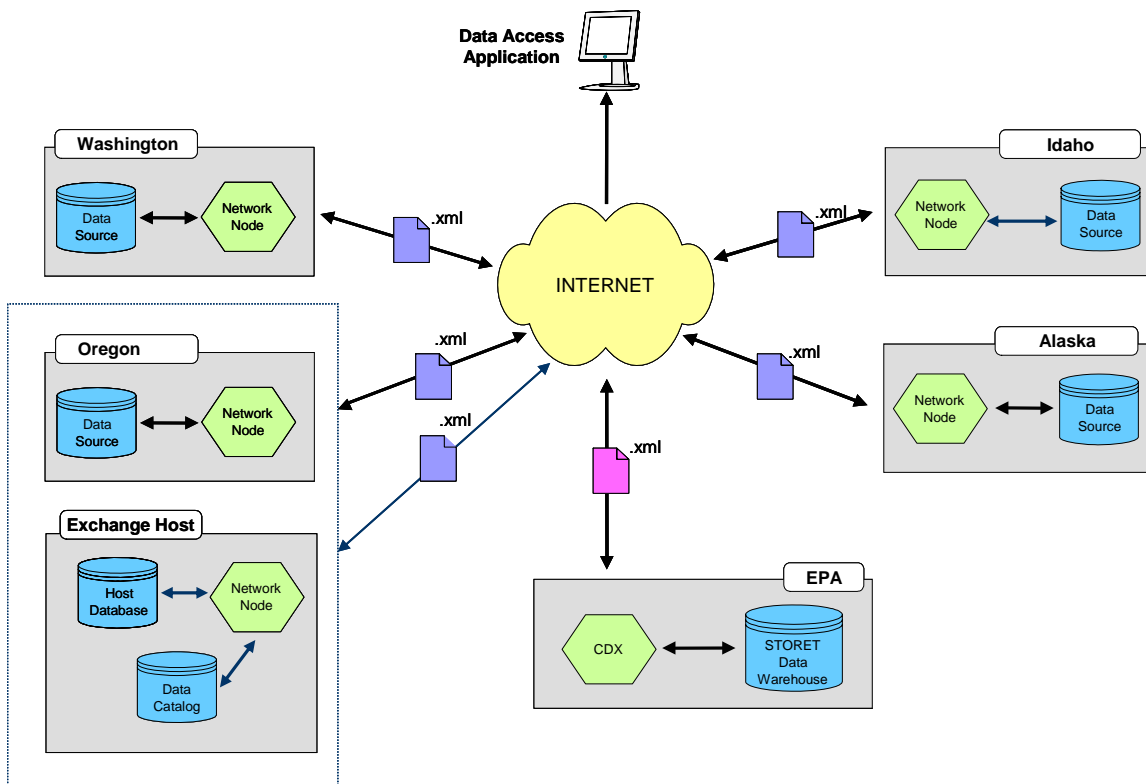
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INTRODUCTION

Using funds allocated from the EPA Network Challenge Grant program, the States of Alaska, Idaho, Oregon and Washington undertook a project to facilitate the aggregation of and access to a comprehensive source of data related to water quality in the Pacific Northwest. The States applied the concepts embodied in the National Environmental Information Exchange Network (Network) and combined actual network implementation, where appropriate, with extension of the Network principles to allow a wide range of data sources to be included. The resulting information interchange mechanism is known as the Pacific Northwest Water Quality Data Exchange (Exchange). It is intended that the Exchange will eventually be made available for data sharing throughout the Pacific Northwest region, although it initially focuses on addressing the management and research needs of jointly regulated watersheds, such as the Columbia and Snake River basins. The projects will seek to include voluntary monitoring groups, watershed councils, tribes, local, state and federal agencies, and the government of British Columbia.

EXCHANGE ARCHITECTURE

The following figure illustrates the architecture of the Exchange in terms of its major components. Some of these components will be implemented by the Network Challenge Grant activities, while others will be established through the implementation of the broader Network, for example, the network nodes operated by each of the State Exchange partners.



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Exchange Partners

The Exchange consists of a number of sources of water quality monitoring data shared by Exchange partners with one another across the Internet. The primary Exchange partners are the environmental agencies from the four States that are leading the Challenge Grant project, Alaska, Idaho, Oregon and Washington, together with EPA Region 10. However, in the longer term, the Exchange is expected to include many diverse partners, including other local, state and federal government agencies, tribes, volunteer monitoring groups and others. The purpose of the Exchange is to provide all participants with universal access to present and retrieve water quality information.

Data Exchange

Partner organizations will use their nodes to facilitate or broker information exchange to and from data sources maintained by their organization. Other partners may not have implemented a formal node but may still participate in the Exchange, by making available simple XML documents. Data will be made available by Exchange partners as XML documents formatted based on a standard schema derived from a Data Exchange Template (DET). This will enable participants to inquire on and combine data sets from various sources in order to meet their analytical and environmental management needs, and use of a standard format will allow data exchange regardless of the organization and structure of the data sources in the Exchange participants' own technical environment.

The operational aspects of the information exchange or "flow" are described by the Exchange Flow Configuration Document (FCD), which specifies the functionality or services that will be provided and used by Exchange partners to supply and retrieve information to and from one another. Two groups of services have been defined for the Exchange, one set concerned with the flow of water quality monitoring data between partners, and the second concerned with the flow of metadata about the various data sources available through the Exchange. The specified services support both *data access* needs and *data management* needs.

Finally, in order to participate in the Exchange, each partner will agree to a Trading Partner Agreement (TPA) that will be used to document the agreed level of quality and standards that an organization must meet in order to provide data to the Exchange.

Host Database

An important goal for the implementation of the Exchange is to enable the widest possible range of Pacific Northwest organizations to participate. In some instances, organizations that wish to participate may not have the necessary technical resources to make their own data available. In these cases, the Exchange architecture will provide a "host" database to act as a surrogate provider for these data sources. This host database is presently supported by the Oregon DEQ and the data contained in it will be made available to the Exchange partners using the standard data access services provided by the Oregon DEQ through the Exchange Host node. To make their data available through this mechanism, an organization will simply format the required data into an XML document using the DET and will provide this document to the Exchange Host node. Specific services will be provided by the Exchange Host node for the purposes of posting the submitted data to the host database.

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Data Catalog

A Data Catalog is included in the Exchange to provide a discovery mechanism to locate the data sources that are available through the Exchange. The Data Catalog will be hosted by Oregon DEQ on the Exchange Host node and will describe the key metadata about the data sets that are available to participants through the Exchange. The Exchange Host node will provide a specific service to allow Exchange participants to access the metadata to discover information about the location, content and quality of available data sets. The available data sets may include node-based data services, published XML documents and even off-line data sources. The metadata itself will be provided to the requester as an XML document.

The Data Catalog enables node partners to estimate the size of a solicit request, allowing for the determination of how the partner's node will handle the request, i.e., respond immediately, run in batch mode at a later time, or refuse the request as too large thus protecting the node. The Data Catalog also enables functionality of data discovery mechanisms by summarizing information about stations, analytes, and taxon provided by all Exchange data sources.

Data Access

In addition to the underlying functions necessary to enable data exchange, the Exchange also provides a Web-enabled location-based and parameter-based query tool (<http://deq12.deq.state.or.us/pnwwqx/>). This will use the Data Catalog to determine which node resources are available, as well as facilitate searching the node resources by taxon and analyte. The application will then allow the user to query (and/or solicit) those node resources with a broad suite of search parameters.

It is expected that individual Exchange partners and other interested parties, for example, academic organizations, may also develop their own data access applications in the future. An example of this is the EPA Region 10 www.storet.org application.

Data Exchange with EPA STORET

An important goal for the Exchange is to facilitate the transfer of water quality monitoring information from the Exchange partners to the national EPA STORET database. A longer-term goal is to include the national EPA STORET system as a data source for the Exchange and to enable data extraction from that source by Exchange partners. In the near term, Exchange partners are working with EPA STORET to develop a data flow to STORET. This would allow Exchange data to be made accessible to STORET Warehouse users. As technology advances and it becomes practical to simultaneously query a number of nodes for this rich and complex data, the longer-term goal will become feasible.

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PROGRESS TO DATE

Initial tasks focused on the development of the DET to facilitate the transfer of water quality information between various monitoring groups in the Pacific Northwest (*Pacific Northwest Water Quality Data Exchange: Data Exchange Templates and Directory Services Approach - Final Report, August 15, 2003*). This report included a preliminary version of the XML schema required to support the data elements described by the DET.

Following the completion of the DET, tasks turned to the development of a Flow Configuration Document (FCD) to describe the operational rules that will apply to the movement of information between partners across the Exchange (*Pacific Northwest Water Quality Data Exchange: Flow Configuration Approach - Final Report, November 14, 2003*). At this point, a final version of the XML schema required to support the information transfer was also published.

During December 2003, a simple Web-based inquiry application was developed to test and demonstrate the Exchange concept. This application queries several node-based data sources and integrates and displays the retrieved data.

In August 2004, the Exchange partners rolled out the data access application (<http://deq12.deq.state.or.us/pnwwqx/>) and related documentation (http://oaspub.epa.gov/emg/portal.navigate?P_LIST_OPTION_CD=XMLCSALL&P_REG_AUTH_IDENTIFIER=1&P_DATA_IDENTIFIER=90964&P_VERSION=3).

The Exchange partners signed the initial Trading Partner Agreement in February 2005 (http://www.exchangenetwork.net/flow/water/pnwwqx_tpa.pdf).

The Exchange partners hope to reach out to other potential data partners, and anticipate improving services as needed.

ADDITIONAL INFORMATION

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