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DISTRIBUTED DATA SERVERS AND CLIENT INTERFACES FOR THE CLIMATE DATA PORTAL

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1. INTRODUCTION

The Climate Data Portal (Soreide *et al.,* 2001) provides consistent and uniform access to geographically distributed data collections, through an interactive web interface or networked Java client application. The Climate Data Portal system is fully object oriented, utilizing off-the-shelf the CORBA (Common Object Request Broker Architecture) networking middleware to establish the communication between data servers and client interface. The use of CORBA services provides network "awareness" of the distributed data servers, and eliminates the need for a central registry or web crawlers to locate and interrogate the distributed data servers. The current Climate Data Portal system consists of distributed Data Servers located at PMEL (real-time TAO buoy date and PMEL archived in-situ data collection), University of Hawaii (sea level data from Sea Level Center), and NODC (the Global Temperature-Salinity Profile Program dataset).

2. SYSTEM ARCHITECTURE

The Climate Data Portal is a distributed object system. Within such system the data applications and interfaces are remotely accessible and easily customized. The software used to create distributed server objects are independent from the architecture and hardware platform used and are totally transparent to their clients. Clients do not need to know where the distributed objects reside. They can be located on the same machine or on different machines that sit across the network. Fig. 1 shows the system architecture of the Climate Data Portal. The system contains geographically distributed CORBA data servers and Java/CORBA-based Client interface. The distributed CORBA data servers provide a facility to extract data from the back-end database and data archives. The CORBA Client makes the request for data access by sending it to the Object Request Broker (ORB). The ORB (a collection of classes and resources) is responsible for all of the mechanisms required to find the object implementation for the request, to prepare the object implementation, to receive the request, and to communicate the data making up the request.

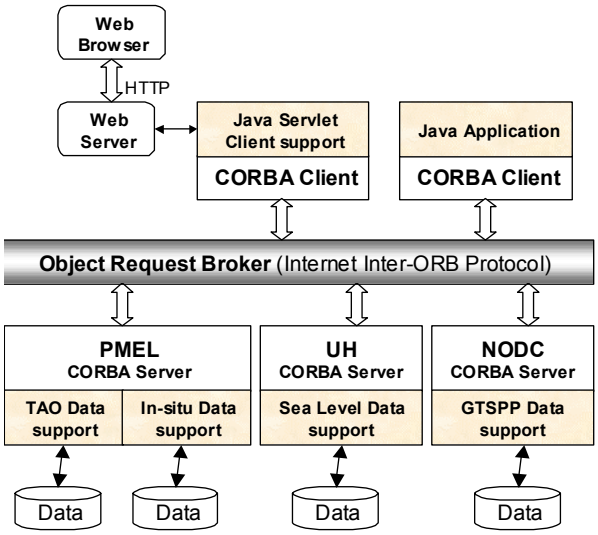

Figure 1. Climate Data Portal system architecture

When the CORBA server starts, it connects to the ORB so that the ORB can invoke a method on the server object when a request is received from a client. This connection is handled by the Portable Object Adapter (POA). The binding information, including server object host and port information as well as the object name, is necessary for a client to locate the server and establish a connection with it. The POA keeps a registration table of all the objects started and dispatches requests to the appropriate object as calls come in from the ORB. It provides policies for activating object implementations and determining how client applications can access these implementations.

3. DISTRIBUTED DATA SERVERS

In the Climate Data Portal system, a CORBA data server is running on the same machine where the data is located. The CORBA data server communicates with local database server and data files directly. The object implementations for reading the local database and data files are unique for different data sites. While most of the server object implementations can be shared, to add a new data server to Climate Data Portal, one must development corresponding object implementation for reading the database and/or data files depending on the data management system. The current Climate Data Portal system supports server object implementation that connects with back-end mySQL meta-data database and reads netCDF data file formats.

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4. CLIENT APPLICATION

The client implementation in Climate Data Portal includes a Web user interface (Fig. 2) and a Java desktop application (Fig. 3). The dual modes of access are supported by the same back-end technology, and accommodate the needs of different sectors of the user community.

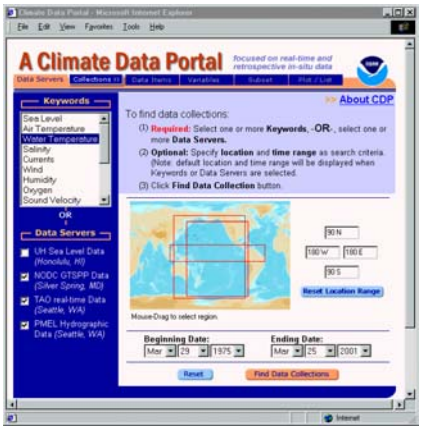

Figure 2. Climate Data Portal Web interface

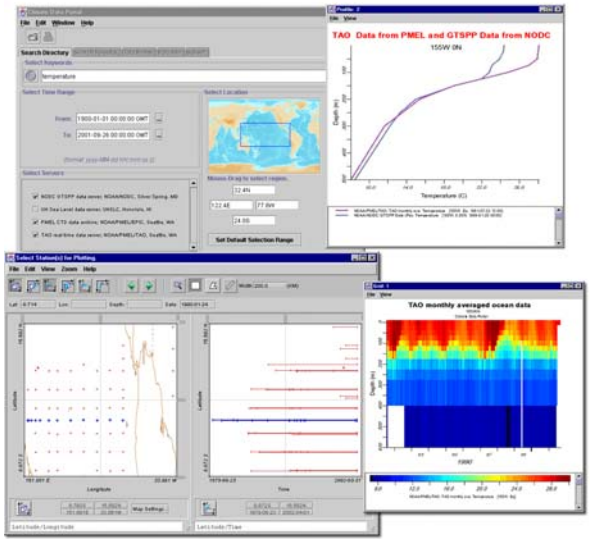

Figure 3. Climate Data Portal Java Desktop Application

4.1 *Web Interactive Interface*

Fig. 2 shows the Climate Data Portal Web interface. The Java Applet and JavaScript are implemented to enhance the Web user interface for its interactivity. It allows user to select the data by choosing the keywords, data servers, data collections, specifying the geographic location, depth, and time range for data search and access.

The Java Servlets are used to provide HTML front-end to the CORBA server. When a web client makes a request via HTTP, the web server receives the request and passes it to the servlet. The servlet then processes the request and invokes an appropriate action on the CORBA server, and sends back a result to the web client. The Java Servlets is also used to generate the result pages dynamically on-the-fly.

4.2 *Java Desktop Application*

Fig. 3 shows the Climate Data Portal desktop application. Written in java, it uses the Java Swing GUI components and Java libraries to directly connect to the data (CORBA) and directory (LDAP) servers (Donald and Zhu, 2002). The Java desktop application provides a much higher degree of interactivity than is possible on a web page including interactive 4-D utilities for sub-setting large collections of in-situ datasets. It is supported for most commonly used workstations and operating systems, and is easily downloaded and installed.

4.3 *Features*

The Climate Data Portal client application includes following plotting, listing and downloading features:

- View data collection properties
- View data item properties
- Plot/Co-plot data versus depth or height
- Plot/Co-plot data versus time
- Make time versus depth 2-D plot
- List data in ASCII format
- Download data in netCDF format

5. Availability

The Climate Data Portal Web interactive interface can be accessed from the web at http://www.epic.noaa.gov/cdp/. The Java desktop application can be downloaded freely at ftp://www.epic.noaa.gov/java/CDPclient/install.html.

6. Acknowledgments

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7. References

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