

Marine Data Exchange Prototype System Based on XML

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Abstract

In this paper, a prototype system for ARGO data exchange is discussed. The system is based on XML, taking internet as the data exchange platform and XML as the data medium, which brings about a key technology of marine data integration and exchange.

1. Introduction

- For data exchange, it is most important that both sides of data exchange must arrive at a uniform understanding of data format. Only if using uniform data format, it is possible to execute the processes of carrying and dealing with data automatically. XML is a good data medium:
- XML Characteristics
 - flexible and Simplicity--easy to study and use
 - Openness--non-proprietary, not encumbered by copyright, patent, trade secret, or any other sort of intellectual property restriction
 - Self description--provides DTD and XML Schema for describing data structure
 - Platform independent--supported on virtually every platform, any programming language

- In this paper, the marine data exchange prototype is proposed, which is designed based on the XML, ASP and database technology,
- About ASP (Active Server Page)
 - A Microsoft technology for developing application based on web
 - Combine with XML and database technology perfectly
 - Can be viewed in any browser--ASP files are returned as plain HTML

2. Application analyzing

- Marine Data Exchange Prototype has been tested with ARGO data. ARGO floats are special measuring devices for building a global ocean observing system.
- About ARGO floats
 - The broad-scale global array of temperature/salinity profiling floats
 - Observing the ocean in real time
 - Providing a global temperature and salinity data of the upper 2,000 m of the ocean

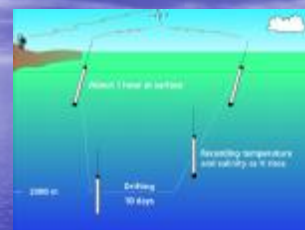


fig.1 Measure procedure of AOGO profiling floats

- The Argo data will help improve our ability to predict weather disaster (such as floods, droughts, unprecedented warm spells in winter) influenced by ENSO, and ability to understand the fluctuating climate or marine phenomena in the same way.
- NMDIS- National Marine Data and Information Service, as China ARGO Data Center, is responsible for collecting, processing and distributing the global ARGO data in real-time and delayed modes.

- NMDIS has established metadata database and ARGO profile database for Argo data management and online service.
- The Argo data in ARGO profile database are:
 - Stored in Microsoft SQL Server
 - Mainly including ARGO station information and ARGO profile data
 - ARGO station information is related to profile data by float ID (Wmo_ID) and Profile ID(cycle) (see fig.2)

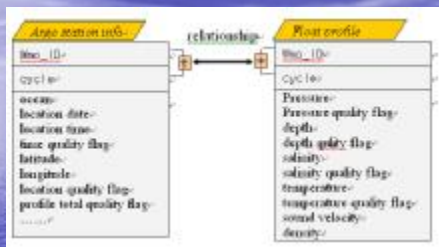
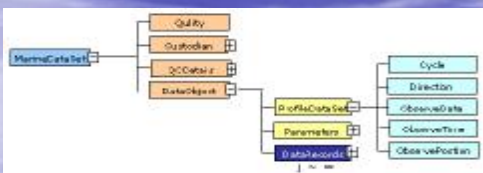


fig.2 Structure of ARGO Profile Database

- XML is a structured description language, using a tree-structured storage method, and supports nested objects. Therefore it is possible to integrate Argo station information and float profile data into a XML document.
- Fig.3 is a sketch map of tree structure of Argo data XML document.

fig.3 Tree structure of ARGO Profile data XML document



- Element "Quality" of "MarineDataSet" describe total quality about Argo profile, and Element "QCDetail" describe the quality of each item in the profile
- Element "ProfileDataSet" of "DataObject" encodes the station information (such as profile ID, observational date and observational location).
- Element "DataRecords" encodes all observational records of the profile

Argo Profile data XML Document :



Server side designing

- Server side has three tasks:
 - the first is receiving ARGO XML data uploaded from client side,
 - the second is searching ARGO database and returning profile data list to client side browser,
 - the last is dynamically generating XML data from database and returning the data to client side.

—ARGO XML data receiving

- Step1: Creating a XMLDOM object by XML parser (MSXML) to receive data packs uploaded from client side
- Step2: By setting name_space attribute of XMLDOM tree as the URL of XML Schema storing on server side, server executes the validation to ARGO XML data automatically
- Step3: Loading node data on XMLDOM object to ARGO database following the data transform rules.



fig.6 Receiving and processing XML data packages

—ARGO database searching

- Step1: The client side submits HTTP request (for search) to the application (ASP page) on server side
- Step2: The server executes application (asp page) and generates SQL statements automatically, store the query result to a instance of "RecordSet" object
- Step3: Dynamically generates HTML page (including list of ARGO station information), and return it to the client side

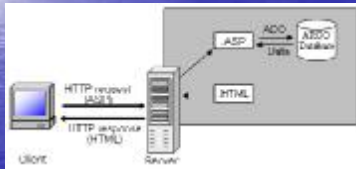


fig.7 Flow chart of Database Processing

— Generating ARGO XML documents dynamically

- Step1: Creating a ADO object for access to ARGO database, store profile records selected by users via "RecordSet" object
- Step2,3: create a XMLDOM object, encode result to XML format and return to client following the data transform formula.

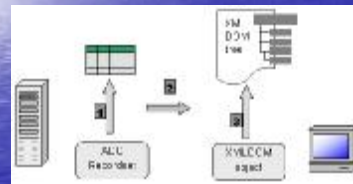


fig.8 Generating XML documents from database dynamically

Client side designing

- Step1: Building a XML data pack on client side, the source of the data pack may be any one XML document or a piece of XML document, or even a XML document dynamically generated information acquired from server by users;
- Step2: Creating a XMLDOM Object, using the MSXML parser as the carrier of ARGO XML data on client side;
- Step3,4,5: Creating a XMLHTTP object (as shown in fig.9(2)) for sending ARGO XML data pack to application (ASP page) on server side(fig.9(3),(4) and(5)) and prepare for receiving response message at the same time.

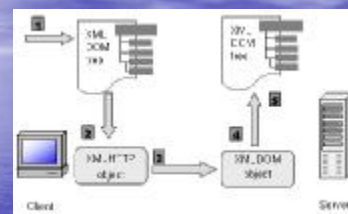


fig.9 Flow chart of transmitting XML data packages

4. Prototype system example

- Upload XML data
 - In this case XML data uploading is implemented by means of uploading XML document storing on client side to the server
 - Users input the full path of local XML document in "File Name" textbox,
 - Clicking "Submit" button, then the XMLHttpRequest object will upload XML document to destination i.e. the server application



fig.10 Upload XML data

- Search and Browse ARGO data

- We can make a query by ARGO float number (WMO number). We can also make a query by the date and location (longitude and latitude) (fig.11)
- All ARGO profiles are listed in fig.12 according to search conditions above.
- The last column is the XML icons, if you click one of them, the application on server side will generate an ARGO XML document of this float profile and return it to client side automatically (see fig.13)



fig.11 Search for ARGO data

fig.12 Browse ARGO data

- Generating XML documents dynamically

- This XML document generated dynamically is returned to client browser
- Users click menu "file" and select item "save" in browser, The XML data of this profile are downloaded to client side



fig.13 Dynamically generating XML documents

5. Conclusions

- The prototype system proposed in this paper shows that marine data exchange based on XML is a feasible method for establishing a marine data exchange system.
- Marine data exchange technology based on XML can be widely applied to data delivery, data exchange and information sharing of all kinds of marine observing and monitoring data.

THANKS FOR YOUR ATTENTION!