

# Present status of the Pandora project

# Eizi TOYODA[1]

[1] JMA NPD

<http://www.gfd-dennou.org/arch/zz2001/msj-aut-toyoda/poster/>

The author will report the present achievement and activities of the 'Pandora' project, which is also reported in this meeting in 2002 and 2003.

## 1. Overview

Processing of multi-dimensional numerical data is getting more important in the service of Japan Meteorological Agency (JMA), due to the progress in computer and weather forecast technologies. The Pandora project has been running since 2001 in order to develop a distributed database system as versatile and effective infrastructure of grid data processing including storage, distribution and visualization. The project is named after a literal translation of 'all data' into Greek, representing the goal that all data are accessible regardless its location, storage device, and format.

## 2. Network Technology

Pandora is a server-client system that performs automatic data collection and conversion. Communication protocol among client and servers are based on HTTP (Hypertext Transfer Protocol, IETF RFC 2616).

The present implementation of the server is made with apache and PHP. The choice is based on the consideration of variety, flexibility, and scalability of the data service. Firstly, HTTP has the media type framework to specify various data format in request. Secondly, apache has a CGI framework that enables versatile extension of data conversion software. Finally, HTTP is more suitable than FTP for large server that is required to have high availability, since there are already equipment for cache and load balancing. Indeed, JMA employs Pandora operationally in processing and distributing weather radar images, which is publicly accessible via Ministry of Land, Infrastructure and Transport (<http://www.bosaijoho.go.jp/>).

Client software accesses servers using data access interface libraries, which handles network communication. In addition to the interface for GMFV visualization software (reported in this meeting in 2003), another interface which is compatible to NuSDaS (reported in this meeting in 2001 and 2003) database system is developed. Application software using NuSDaS now can access remote data directly. This feature is utilized in above-mentioned radar data processing system operationally, and even by large numerical computation program such as weather forecast model experimentally.

## 3. Collaboration with Web Service Development

Recent effort lays its emphasis on collaboration with development of web service. Web service is a general term for software system whose clients are web browsers. It reduces cost for software configuration management in large organization. JMA plans to replace many operational systems with web service, and makes efforts in development.

In the short term, the most important achievement is a web browsing system of images created by GMFV. It is employed officially for a JMA's internal training course of weather forecast using numerical data. GMFV combined with Pandora reduces the effort of data preparation: it automates data distribution and format conversion.

In the long-term viewpoint, the Pandora project is in close collaboration with for more sophisticated web services of data analysis visualization named 'Togo (integrated) Viewer'. The Togo Viewer is intended to be basic tool for weather data monitoring and quantitative forecast operation, and it is planned to be flexible combination of modular web services such as data collection, analysis and visualization. The Pandora project team contributes them not only its distributed data access framework as 'glue' of web services, but also experimental implementation of modules such as map drawing or vector data visualization.

## 4. Acknowledgement

Software development of Pandora project depends on contribution of many people, including Masaki Hasegawa, Norihisa Fujikawa, and Tabito Hara in JMA.