

## Current status of NuSDaS: Numerical Prediction Standard Dataset System

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A brief review and report of recent progress of NuSDaS will be presented with relation to the Pandora project.

[NuSDaS]

As already reported on the JEPS meeting in 2001, NuSDaS (Numerical Prediction Standard Dataset System) is a data I/O library for

meteorological gridded data. It is developed at Numerical Prediction Division, Japan Meteorological Agency (JMA). Its major purpose is to reduce data management efforts in operational numerical weather prediction (NWP). Development of NuSDaS started in early 2000. It replaces long-used VOS3-based file formats when the main supercomputer of JMA is replaced from mainframe to UNIX-based HITACHI SR8000 in March 2001.

Since it is not multi-purpose I/O library nor general database management system, the interface is highly specialized for (or dependent to) NWP. All data access is done by record, a two-dimensional array usually corresponding to grids on a horizontal plane. Packing schemes and run-length encoding can be used to reduce record size. Records are identified by

- \* data type (a 16-character string containing model or grid names),
- \* base time (also known as reference or initial time),
- \* member (significant in ensemble forecast),
- \* valid time,
- \* plane, and
- \* element.

The records are grouped in a file, and files are located in a data directory, both using above identifiers. Records of different data types and base times are stored in separated files; file may also be split by member or valid time by configuration for data type.

Following progress is made recently:

- \* port to little-endian computers,
- \* port to environments with many Fortran-C linkage conventions,
- \* interface for Ruby, a object-oriented scripting language,
- \* GUI editor using Ruby/Tk for dataset configuration file (called definition file),
- \* improvement of data management tools.

[the Pandora project]

The Pandora project is started in July 2001 for wider collaboration over network: the goal is to standardize data transfer protocol, to make data format conversion easy, and to provide abstract interface independent of physical file/directory/volume structure. The project team is working on internal network of JMA.

The data transfer protocol is based on HTTP, and experience and existing software such as server, client, and proxies can be utilized. Data format is identified with MIME media type in HTTP request/response header; server dispatches appropriate convertor/driver program on demand. The standard interface of convertor/driver program is based on CGI. Detail of storage structure can be hidden in abstract URI, composed of high-level structure such as NuSDaS data identifier.

As reported in the meeting in 2001, a visualization software GMFV (Araki, 1999) is extended to issue the Pandora protocol. It can directly visualize simulation model output in NuSDaS format. Recently development of NuSDaS-compatible client interface has been started. This enables existing NuSDaS application to access remote data seamlessly.

[References]

- K. Araki, 1999: Meteorological Data Viewers at Japan Meteorological Agency. Proceedings of Seventh Workshop on Meteorological Operational Systems, ECMWF.  
Y. Matsumoto: Ruby. <http://www.ruby-lang.org/>