Department of Commerce/National Oceanic & Atmospheric Administration/
National Weather Service

December 05, 2008

Notification of Proposed NWS Information Service

NOAA Operational Model Archive and Distribution System

(NOMADS)

High Availability Implementation at the NOAA Web Operations Center

Background: The NOAA Operational Model Archive and Distribution System (NOMADS) began as a pilot project designed to provide a service orientated framework for:

- A digital archive and real time distribution of NOAA's operational weather models,
- An "innovative data access philosophy to promote interoperable access across the geosciences" (BAMS, Rutledge et. al., 2006),
- An integrator of common web services infrastructure to support the discovery, access and transport of data (NOAA GEO-IDE Concept of Operations Rept. to the DMC, 2006), and
- Real-time and retrospective format independent access to climate, ocean and weather model data.

A National Weather Service priority, as stated in the FY07-11 Baseline Assessment, is to "Disseminate and deliver NOAA's information and services", and on pp. 10, points out that there is a "…pressing need for enhancement to present capabilities needs through: improving capabilities to process and disseminate increasing volumes of environmental data." An important component of NOAA's information data base is the model output data from NOAA Atmospheric, Ocean and Climate numerical weather prediction (NWP) models operationally prepared at the National Centers for Environmental Prediction (NCEP). Recommendation 5 of the National Research Council's Fair Weather: Effective Partnerships in Weather and Climate Services, states that "The NWS should make its data and products available in Internet-accessible digital form". In the National Academy of Sciences document "Completing the Forecast", (NRC, 2006) it is stated in recommendation 3.4: "NOMADS should be maintained and extended to include

(a) long-term archives of the global and regional ensemble forecasting systems at their native resolution, and

(b) re-forecast datasets to facilitate post-processing."

To address a growing need for remote access to high volume NWP model data, NCEP created an experimental prototype network of data servers, using established technologies to access and integrate model and other data stored in geographically distributed repositories in heterogeneous formats. NOMADS is a framework for the sharing and inter-comparing of model results, and is a major collaborative effort, spanning multiple Government agencies and academic institutions.

The Real Time (RT) NOMADS (NOAA Operational Model Archive and Distribution System), project is providing a service to federal agencies, the scientific and university community, and the public by serving environmental data sets from NOAA and other organizations. It is described in a number of reports such as Alpert and Wang, 2004, Alpert et al., 2002. The RT-NOMADS project is a working prototype employing client-server technology and freely distributed utility programs to disseminate and document digital data. The software effectively provides the NOAA real time operational NWP model data sets to the public, federal agencies and the scientific community. The National Climatic Data Center (NCDC) maintains an archive of the above mentioned data so as to have seamless access to historical and real time data.

Proposed Service: High Availability NOMADS applications Service for serving NOAA's model data at the Web Operations Center server providing web/http access. The mission is to serve the NOAA model output matrix of data holdings.

NWS seeks comments on the following service:

We introduce NOMADS web based access tools:

1) grib_filter capability provides access to binary GRIB data by sub-setting through time, space and variables. Data are provided in raw GRIB format online and results are repackaged GRIB files streamed to the user's workstation. Web interfaces communicate the users request and http protocol is used to deliver results.
2) OPeNDAP (GDS/DODS) Server: The Open source Project for a Network Data Access Protocol (OPeNDAP) implemented under the GrADS Data Server (GDS)/ Distributed Ocean Data System (DODS) provides simple file-level access to download entire files or values from the matrix of server data holdings. Any web browser can be considered an OPENDAP client or user, that is, access the server to obtain data values. Information about the server's data contents, known as metadata descriptions, is presented as man or machine readable. The data is internet ready and applications may be performed on the data, such as display programs, or value added products are executed by the client (user). Thus, data from the server appears to the client application as a local file.
3) "Random access" reading of gridded files. Random access" is achieved using http protocol, the availability of an index file, an http program that supports random access. For the index file, a wgrib inventory is used. The random-access http program uses open cURL. Both are freely available, widely used, work on multiple platforms, and are easily scripted and automated.

"wget and OPeNDAP constraint expressions: In addition to the above mentioned server access using common internet browsers, clients (users) may access the server with their own utilities making requests and parsing responses. Utilizing non interactive web download commands (e.g., wget, http:///www.gnu.org/software/wget) users create suitable script/programs (unix, perl, … etc) to compose requests, send queries and parse server responses to retrieve data from the entire matrix of data holdings. The results are controlled by accompanied constraint expressions which list which of the variables, and of those variables which values or ranges of values to return. These returned results include descriptions of what data the server returned, such as dates, levels, location, array information, to confirm what data was delivered as well as the requested data values. The results can be parsed and placed in memory under the control of the user's workstation program. Thus, the GDS/OPeNDAP(DODS)provides both a simple way to query a dataset about its contents, and to selectively obtain the data from queries. Weather the user selects to use the grib_filter or OPenDAP services, each presents an extended URL web address with constraints to utilize non interactive web download commands in user scripts and may be placed in cron for automated data flow.

Comments/Feedback: Please provide comments on the proposed changes described above by January 16, 2008, to:

NCEP Environmental Modeling Center Jordan Alpert, Jordan.Alpert@noaa.gov , 301-763-8000x7205

Additional Information:

WOC information may be found at
http://nomads.ncep.noaa.gov

Users guide and related information URL's

http://nomads.ncdc.noaa.gov/guide

Documentation and HOWTO files

http://nomad1.ncep.noaa.gov
http://nomad3.ncep.noaa.gov
http://nomad5.ncep.noaa.gov

Point of Contact:
NCEP Environmental Modeling Center Jordan Alpert, Jordan.Alpert@noaa.gov , 301-763-8000x7205

Product High Availability NOMADS Applications on the Web Operations Center Server. December 12, 2008

Notice of Recent Decisions Made:

REFERENCES

Alpert, J.C., G.K. Rutledge, R. Stouffer, B. Doty, S. Hankin and B. Domenico, 2002: The plan to access real-time NWP operational model data sets using NOMADS, AMS 18th Conf on IIPS, Orlando FL, J4.16, 73-74.

Alpert, J.C., and J. Wang, 2004: The real time NOMADS project: Access to operational model data and value added products, AMS 20th Conf on IIPS. Seattle, WA, P1.25

Rutledge, G. K., J. Alpert, and W. Ebisuzaki, 2006: NOMADS: A climate and weather model archive at NOAA. Bull. Amer. Meteor. Soc., 87-3, 327-341.