PRINCIPLES OF EFFECTIVE IONOSPHERIC DATA ARCHIVING AND WEB SERVICE

T.W. Bullet[1 2], N.A. Zabotin[3], J.W. Wright[3] , L.Ye. Zabotina[3]
[1]Air Force Research Laboratory, Space Vehicles Directorate, Hanscom AFB, MA, USA
[2]NOAA, E/GC 325 Broadway, Boulder, CO, 80305-3328 USA
[3]CIRES, University of Colorado at Boulder, Box 216, Boulder, CO, 80309 USA

Abstract Submission Form

2006 National Radio Science Meeting

Abstract: bullett4479

Date Received: September 18, 2005

1. (a)
Terence Bullett
NOAA/NGDC
E/GC 325 Broadway
Boulder, CO
80305-3328 USA
Terry.Bullett@noaa.gov
(b) (303) 497-4788
(c) (303) 497-6513

2. G - Ionospheric Radio and Propagation
3. (a) S-G2
4. C - Contributed Paper
5. No special instructions

Modern advanced digital ionosondes produce abundant and diverse information about the current state of the ionosphere. For each sounding session (an "ionogram") it includes several tens of standard ionospheric parameters, an estimation of the local three-dimensional distribution of electron density, vector velocities, irregularity characteristics, trace-classified ionogram data in the form of echo tables (up to several thousand entries), etc., with attached error estimations. This information must also be accompanied by software/hardware configuration parameters or "metadata" comprising several tens of numerical and string values. The correct and modern way to handle such datasets is to use relational database technologies for storage and retrieval.

A central archival storage equipped with a relational DBMS enables data analysis from broad geographic areas (and even globally), to compare data from different locations, and to review long time series of data. Quite sophisticated scientific problems may be posed and solved this way. An example on the frontier of Dynasonde diagnostics technology is the discovery of a positive correlation between the Anomalous Attenuation (AA) of ionospheric radio echoes caused by multiple scattering, and small-scale irregularity amplitude deduced by the Phase Structure Function method. Another example is an investigation of statistical properties of radio echoes for various geographical locations that reveals both ionospheric state indications and peculiarities of hardware operation.

A relational DBMS supports straightforward ways to create and support a web service, providing easy access to data for the scientific community and for customers with both small and large data demands. Customers perceive effective operation of DBMS web services that offer: (1) customer-defined type and format of the data provided; (2) data availability both in near-real-time and in retrospect; (3) no specialized software for access: only internet browser needed for interactive sessions; (4) an XML-based (SOAP) interface for automated requests; (5) effective data mining and visualization tools; (6) data re-processing on-line, when required; (7) free access for individual customers after automated registration.

Visit http://www.ngdc.noaa.gov/stp/IONO/Dynasonde/ to exercise an operating prototype of a central repository/web service offering these features for existing Dynasondes.