IDD-BRAZIL: ENHANCING METEOROLOGICAL DATA-SHARING AND RESEARCH

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1. INTRODUCTION

The IDD-Brazil constitutes of an expansion of the Unidata Internet Data Distribution system, Domenico (1994), Davis (1994), a network that connects over 160 institutions with the purpose of sharing environmental data in a real-time basis. One of the main objectives of this effort is to distribute data in order to promote better education and research in the atmospheric sciences and related fields.

This international collaboration is creating a new method to access meteorological data. Since it's freely available for educational and research purposes, it is capable of addressing one of the biggest issues in South American meteorology, the access to real-time and vital information about the atmosphere, also offering a path to share local products to the entire community.

2. METODOLOGY

2.1 The IDD Structure

A network to share environmental data worldwide, using a decentralized distribution. The IDD is based on the principle that a highly efficient data system has to work in a distributed environment, thus providing a fast and uninterruptible access to its products.

By using the Local Data Manager (LDM) software, Davis (1994), the task of delivering data is distributed among the community globally (Fig. 1), creating an extremely reliable method of data sharing. The LDM acts, at some extent, as a peer-to-peer software: it receives data from an authorized source (or sources), and it's capable of re-distributing it to different places nearly instantly.

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Furthermore, any user of this software can also publish new products and distribute it to anyone on this network.

Figure 1 – Unidata IDD Topology.

The LDM works as an event-driven application – as soon as it receives the data it processes a defined action, such as sending it to another host, or storing it in a specific place. This feature assures a near real-time communication protocol, extremely efficient and faster than many methods of data transfer.

2.2 Project IDD-Brazil

The IDD-Brazil is a project that started from a joint effort among the Laboratório de Prognósticos em Mesoescala - Universidade Federal do Rio de Janeiro (LPM/UFRJ), Centro de Previsão de Tempo e Estudos Climáticos (CPTEC, a division of INPE) and the Unidata Program Center, with the sole objective of expanding the IDD network to South America.

Both CPTEC and UFRJ act as Relay nodes, what means that they receive data from foreign institutions and redistribute it to their counterparts (as seen on Table 1), throughout Brazil and South America.

Table 1: Brazilian Institutions on IDD

Institution	Role in IDD-Brazil
- Universidade Federal do Rio de Janeiro - Centro de Previsão de Tempo e Estudos Climáticos	Relay node, data ingestor
- Universidade de São Paulo - Universidade Federal do Pará - Laboratório Nacional de Computação Científica - Marinha do Brasil - CEFET/RJ - PUC Minas Gerais - Instituto Nacional de Meteorologia	Data receiver

This international collaboration resulted in the largest group of Unidata developed softwares users outside the United States, sharing unique sets of data in real-time.

Continued outreach efforts - mainly from UFRJ, CPTEC and Unidata – are planed in order to inform of the availability of real time data and to seek participants willing to share unique data holdings that they could have.

2.3 *Shared Data*

The LDM has been used to transfer data since 1981, sharing only satellite imagery. Since 1994, with the creation of IDD, a large amount of data has been added to the network, as seen in Fig. 2, creating the third application in data volume of the Internet2 network (as of December 2005), behind only of NNTP (news) and HTTP (web pages) protocols.

Data relayed through IDD-Brazil includes the full set of global observations from the Global Telecommunications System (GTS), NCEP and UKMET global models from US NOAAPORT, and all GOES-East imager channels.
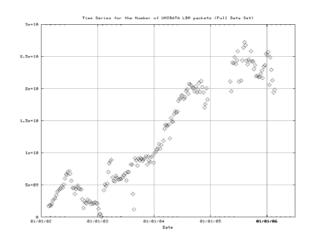

Figure 2 – Time Series in GB of data delivered using LDM packets since January 2002.

An IDD site can receive a large array of data that ranges from surface observations to GRIB files. The average amount of data transferred daily to receive the surface observations from GTS and CPTEC PCD network is approximately 300 Megabytes (an average of 12 Megabytes per hour), a value that can be acquired using a slower network connection. Since LDM has the capability to select a specific subset of data (based on its WMO header), a user can receive exactly what he needs. Consequently, in order to receive all products offered on IDD-Brazil, the participant has to be able to receive as much as 28 Gb of data daily, what can only be obtained using a direct connection to the Internet2 network.

2.4 *Brazilian Datasets*

One of the most important capabilities of this network is the possibility to share locally produced products nearly instantly. Thus, Brazilian institutions are capable of sharing many datasets that where once exclusive, or even experimental projects, to the entire community. Dissemination of data is extremely important for Brazil and South America, given the sparse coverage of synoptic reporting stations throughout the continent and the elevated cost to maintain an infrastructure to receive data from GTS.

At the present time, the major distributor of locally produced data to IDD-Brazil is CPTEC, which is sharing satellite imagery, satellite derived products, surface observations, automated reporting network observations and the output from its ETA model.

Now, for instance, a participant of IDD can access in real time more than 140 METAR stations from Brazil, compared to only 40 stations available through GTS, and over 500 automated stations – being 50 complete weather stations, and the remainder hydrological ones – from the SCD (Data Collecting System) network, Gambi (2006).

Experimental products are also being shared, such as the WRF and MM5 model outputs for Rio de Janeiro from LPM/UFRJ.

2.5 *Generating Products*

A major role played by Unidata into gearing the research and education in Earth-Sciences is the development and support of a broad array of softwares; these programs, like the LDM, are available freely for educational and research purposes.

The LDM server is responsible for receiving and sending data, and is used in conjunction with GEMPAK to generate specific products and analysis. Using a series of decoders based on WMO regulations, the GEMPAK modules are capable of creating plots from real-time products on any Unix or Linux workstation, and can also be used as a tool to generate products for an webpage, for instance.

Unidata also distributes McIDAS, for satellite imagery products and analysis, and IDV, a java application that receives data and generates products on demand.

3. Conclusions and Final Considerations

Data acquisition is a major issue in Brazil and South America, and the solutions presented in this work can address one of the foremost problems in the atmospheric sciences.

One of the foremost requirements to study the atmosphere is the proper access to data. It is extremely important for the development of Meteorology the foundation of a policy geared upon this objective. The IDD-Brazil can serve as a first step towards a continent-wide network to share locally held data, enriching this science. Therefore, there must be a commitment from every institution that has unique data holdings to share it with the community.

With the constant increase of participants in IDD, new collaborations will be forged among distinct organizations, setting new paths in the Earth Sciences research.

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