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Gridded FX-Net Prototype Project for The Bureau of Land Management, National Interagency Fire Center

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1.0 INTRODUCTION

Fire weather forecasters at the Bureau of Land Management's National Interagency Fire Center (NIFC) and the Geographical Area Coordination Centers (GACCs) are tasked to "integrate fire weather, fire danger and resource information for strategic resource allocation and prioritization." Ochoa, (2003) They have found that by integrating fire weather, fuels and fire behavior information, a focused solution can be presented to fire managers to guide their resource pre-positioning activities. Well guided, strategic resource allocation and prioritization saves the lives of the public and firefighters, and reduces property loss.

Predictive services meteorologists use a variety of tools and resources to produce daily, weekly and seasonal fire weather and fire danger outlooks. Mesoscale models, satellite imagery and local mesonet observations are available from their FX-Net, Schranz (2005), system, the Real-Time Observation Monitor and Analysis Network (ROMAN), and the Remote Automatic Weather Stations (RAWS). Due to increased research activity in the fire prediction and fire behavior area, new algorithms have been developed to produce prediction products using long-range atmospheric model grids.

The majority of Predictive Services offices have been operating without the ability to run these algorithms as they did not have access to the real-time model grids.

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The forecasters requested an AWIPS (Advanced Weather Interactive Processing System), Bullock, (1994), to provide them with these grids, and allow them to use the powerful diagnostic tools available through the D-2D AWIPS display software. AWIPS is the primary system used by NWS forecasters. The system was prototyped and the first operational systems were built by NOAA's Forecast System's Laboratory (now known as ESRL/Global Systems Division (GSD)). The system ingests real-time atmospheric observations and numerical forecast models distributed via NOAAPort and local LDAD feeds. The data are matched in space and time to allow users an integrated view of a very large and complex set of information.However, the cost associated with installing enough bandwidth to each GACC office, to distribute the high volume of data delivered to AWIPS, proved prohibitive. AWIPS units were not installed and the forecasters remained without grids.

Due to a number of enabling technologies developed at the ESRL/GSD, a prototype effort to build a centralized, gridded data distribution system to remote AWIPS D-2D clients was proposed. The BLM and USDA Forest Service decided to go forward with the proposal. As a result, the Gridded FX-Net prototype system project was begun.

2.0 SYSTEM DESCRIPTION

The Gridded FX-Net system utilizes significant, enabling technologies developed by ESRL/GSD, the AWIPS technology and the Wavelet Compression, Wang (2002), technology. The system uses AWIPS data and applications servers, and the D-2D display system. What has set this system apart from the AWIPS system is the development of multiple, remote, D-2D

clients and a centralized data delivery system, the CRMS

The System: Figure 1; The Gridded FX-Net system includes:

1) Modified AWIPS Data and file servers.
2) Remote AWIPS D-2D Client, which provides data display and manipulation tools.
3) CRMS

The Servers: The data servers and file servers are Dell 2650's running Red Hat Enterprise Linux, v. 3 and AWIPS version OB3 software. This server is located in a computer room at the NOAA facility in Boulder, Colorado. The data server ingests imagery, observations and model data from the NOAAPort SBN (Satellite Broadcast Network). It ingests local data, including all Meteorological Assimilation Data Ingest System (MADIS) data. The file server is co-located with the data server and the NOAAPort receiver in Boulder. A portion of the CRMS on the file server manages data compression and distribution to the file server on the remote D-2D PC.

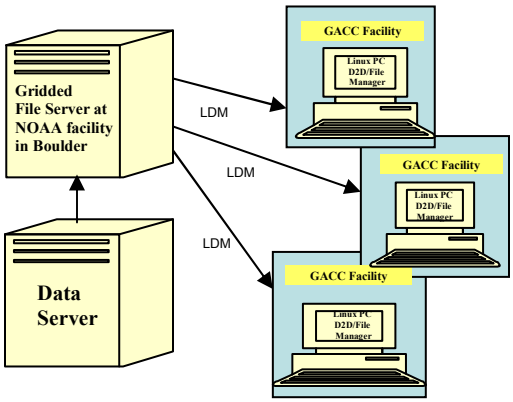

Figure 1. Gridded FX-Net System

The Remote Client: The client software executes on a desktop PC ,Pentium IV, 2.8 Ghz processor, 2 GB RAM, 80 GB hard drive, running Red Hat Enterprise Linux. V. 3 Workstation. The Client software consists of the AWIPS D-2D, v. OB3 application and a modified version of the AWIPS application server. Data are pushed to the client via the LDM feed. Data are decompressed (decoded) and made available, via a notification server, to the application server. There are no 'pull' commands available in this prototype of the system, however 'pull' commands will be added in the future.

The CRMS: The Compression and Relay Management System (CRMS), Stewart (2006), data delivery and compression management module was developed for this project to provide an intelligent 'push' system. This core system was developed using GSD technologies and existing network distribution technologies, (UCAR/Unidata's Local Data Management system (LDM)).

3.0 PROJECT SCHEDULE AND STATUS

The Gridded FX-Net Project consists of several phases implemented over a period of approximately three years and was begun in FY2005. The system was required to undergo a series of network loading and security tests prior to its distribution to the field. In November, 2005 the Phase I system passed rigorous testing at the BLM National Test Center and was certified for field distribution.

The Phase I system includes model grids from the GFS, NAM and RUC models, VIS, IR and WV satellite data, surface observations, the 10 km radar coded data set and selected, 1 km 'home' radar data sets. The Phase I system is currently fielded in the Portland, Oregon, and Denver, Colorado GACC offices, and to the BLM/NICC office in Boise, Idaho.

Phase II system development began in October, 2005. In this version, the system will include high-resolution models, additional observation data and a complete radar distribution. Phase I systems will be upgraded and Phase II systems will be fielded to six additional field offices.

4.0 WORK TO BE DONE

Gridded FX-Net Prototype: The gridded data distribution prototype provides answers to technical issues inherent in the last step of a technology transition process. Even in a highly leveraged system such as this, the last, most crucial, step to reach an operational state requires a detailed evaluation of the technical path between a system operating in a current environment and a new user's environment. While there are a number of imbedded technical issues and evaluations required to complete the

transfer to operations, many answers have come in the first phases of the prototype.

Under continuing evaluation:
- Communications bandwidth vs. gridded data volume.
- Broadcast (push) vs. request (pull) data dissemination.
- Determine optimal compression ratio - error tolerance vs. wavelet compression ratios.

Added Data Sets: Exciting new fire weather and fire behavior models are being developed through a number of universities, laboratories and research consortiums. We are pursuing the distribution of the mesoscale model grids to the Client and the implementation of dispersion and fire behavior algorithms that utilize these grids and can execute on the server or client hardware. When the predictive services offices have grids locally available, they will have greatly increased their capability to run specialized algorithms, improving their critical services to fire control managers and, ultimately, to the public.

5.0 REFERENCES

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