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INTEGRATING EXTERNAL SURFACE OBSERVATIONS INTO AWIPS USING LDAD

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1. INTRODUCTION

One of the challenges of the modernized Weather Forecast Office (WFO) is to integrate external data from outside sources into the Advanced Weather Information Processing System (AWIPS). The Local Data Acquisition and Display (LDAD) unit of AWIPS is a tool by which this can be done. LDAD simplifies the ingest of external data, decoding, and processing of this data to produce a graphical form for display on AWIPS. This is accomplished through user defined preprocessors which re-format the data into comma separated format. Alternatively the data can be sent to LDAD already in a comma delimited format without the need for preprocessors. Once this comma delimited form has been sent to LDAD a set of configuration files for that particular data set is used so that AWIPS can generate netCDF files and plot the observations on screen.

2. DATA ACQUISITION

A number of external data sets can be ingested into AWIPS via LDAD. At WFO Binghamton we have focused on acquiring surface observations from a variety of sources. These sources include:

1) Automated Weather Observing Stations (AWOS) surface observations
2) Automated Weather Source Inc. (AWS) school network surface observations
3) New York State Department of Transportation (DOT) road surface observations
4) Cornell University buoy observations over Cayuga Lake

With the exception of the Cornell buoy data these surface observations are acquired with a PC and locally developed Procomm Plus (proprietary software from Datastorm Technologies Inc.) scripts. Once per hour these scripts dial and download the observations and log them to a file on the PC.

2.1 AWOS observations

After the data is written to a PC file a Tool Command Language (Tcl) script is invoked by the PC scheduler to read this data and reformat it into a METAR observation. Once all of the observations are reformatted to METAR format they are sent to the /data/Incoming directory on LDAD. This is accomplished through SAMBA, a utility that enables file sharing between PC's and Unix/Linux. Using SAMBA the /data/Incoming directory on LDAD is mapped to a lettered drive on the PC. When the file containing the AWOS METAR observations are copied to this drive the LDAD processes take over and act on this data set creating the netCDF files used to plot this data.

2.2 AWS observations

This data set is acquired through the proprietary AWS software and uses two methods. The first method is through a traditional dial up routine within the AWS software. The second method is a less costly TCP/IP connection via the internet. The beauty of the internet method, other than reducing office phone bills, is that it is quick and therefore able to run many times per hour resulting in more frequent observations. The extra benefit to the AWS software is that the school network is ever expanding and sites using the dial up method are constantly switching over to the internet based method. Only a small subset of dial up sites remain in our CWA. Once this data is downloaded and written to a file it is copied over to LDAD via SAMBA by the Windows scheduler. Then a cron job on LDAD is scheduled to run a locally developed Perl program which decodes and reformats this data into comma delimited form.

2.3 DOT observations

Once again Procomm scripts have been developed locally to dial a select set of DOT road sensor sites within our CWA via the PC and write them to a file. This data is then copied over to LDAD via SAMBA by the Windows scheduler. Another cron job on LDAD is scheduled to run a locally developed Perl program to decode and reformat this data into comma delimited form. Recently a collaborative program has been established with WFO Albany and the New York State Department of Transportation (DOT) to install more road sensors. Over the next few years the DOT will be expanding the automated surface observation network to 600 sites across New York.

2.4 Cornell University Buoy observations

A partnership has been established with Cornell University to acquire buoy observations from their observation platform on Cayuga Lake. This gives our office direct observations on the lake which help us improve our Boater Recreation Forecast product for the Finger Lakes of central New York. This observation is posted on their web site every 5 minutes. We obtain this data by using a Perl program called Webget

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(http://www.oac.uci.edu/indiv/ehood/perlWWW/utilities/) which, given a URL, will fetch any internet object (html text, images, audio, etc) via a HTPP or FTP connection. The Cayuga Lake buoy observation is a basic HTML text document which displays the observation. A cron job on LDAD uses Webget to fetch this document every 5 minutes and then a locally developed Perl program parses this web page and formats the observation in comma delimited form for LDAD processing.

3. LDAD PROCESSING

LDAD is the gateway by which external data is brought into AWIPS. There are 3 configuration files needed on the DS side of AWIPS for each external data set that is processed. These are:

LDADinfo.txt
Station Files
Description Files

The Station file and Description files must be unique to each data set brought into LDAD. For more detailed information see the LDAD System Manager's Manual at the FSL website at:
http://www.fsl.noaa.gov/docs/proj/fsl-projects.html

3.1 LDADinfo.txt

This file is the main configuration file used by LDAD to determine how the data set is processed. It is a pipe delimited (|) file that contains information used to look for the file name of the incoming data set, the file name that lists the station description (latitude, longitude, elevation) , the description of the data format (variable names, input and output units), and a NetCDF key used for plot files.

If the incoming data to LDAD is already in comma delimited form then no preprocessor needs to run on the data set. However if raw data is stored in LDAD then a preprocessor needs to put the raw data in comma delimited form. The last field of LDADinfo.txt lists the name of the preprocessor or is blank if none is needed . An example line from LDADinfo.txt to plot AWOS observations is:

#data type | station description | netCDF plot keys | | plot type | storage directory | preprocessor
SAUS | AWOS | 87 | 86 | CVS_TYPE | mesonet | preProcessAWOS.tcl

3.2 [Data Root]Station.txt

This file contains specific information about the observation stations and must be unique to each data set coming into LDAD. The Data Root part of the filename must match the 2nd field in the LDADinfo.txt file (example for above line...AWOSStation.txt). This file contains information such as ID, elevation, location, and time zone and is in pipe delimited (|) form. For example:

#Provider ID | AFOS ID | Station Name | Elevation | Latitude | Longitude | Time Zone | | | 1 | | | |
KN17 | KN17 | Tri Cities | 254 | 42.0863 | -76.105 | GMT | | | 1 | | ||

3.3 [Data Root].desc

This file contains information such as variable names, input units, output units, and stored units in pipe delimited (|) form. The Data Root part of the filename must match the 1st field in the LDADinfo.txt file (example for above line...SAUS.desc). For example:

#netCDF variable name|data type| input units | stored units
providerID | STRING | STRING | STRING
timeObs | DATE_TIME| DATE_TIME_STRING | ABSTIME
windDir | INT | degreeN | degreeN
windSpeed | INT | kt | m/s
windGust | INT | kt | m/s
visibility |INT | miles | meter
temperature|INT | Fahrenheit | Kelvin
dewpoint |INT |Fahrenheit | Kelvin
altimeter |FLOAT | inches | pascal

Once all 3 of these files are set up properly for each new data set you wish to ingest LDAD must be restarted so that it knows about the new data sets. Then you must re-localize each workstation with the mainScript.csh -station command so that AWIPS can plot the data. After relocalizing you must restart D2D to see the new data plots.

4. REFERENCES

Webget Program can be obtained from:
http://www.oac.uci.edu/indiv/ehood/perlWWW/utilities/

LDAD System Manager's Manual:
http://www.fsl.noaa.gov/docs/proj/fsl-projects.html