WESTERN REGION "TOTAL FORECAST" AND GRAPHICAL WATCH/WARNING DISPLAYS VIA THE INTERNET

David Zaff - WRH/SSD, Salt Lake City, UT

Introduction

NWS web pages are rapidly becoming one of the most important tools in disseminating weather-related data to the public. In general, most forecast offices have developed their own web pages with a wide variety of capabilities and formats. To prepare for the AWIPS era and to provide a more robust and supportable suite of web pages, SSD and FSL have been working on a new web-data infrastructure. The infrastructure is compatible with AWIPS and will evolve to employ the AWIPS gridded forecast database. The current infrastructure provides the user with a java applet which graphically displays watches, warnings, statements, and advisories, and provides the user with text information about zones. Clicking zones on the applet provides the user with a "total forecast", complete with decoded observations. Briefly, the highlights are:

1) An infrastructure compatible with AWIPS, WARNGEN and LDADS
2) Map highlights current watches, warnings, statements, and advisories
3) Zone/County/Area of interest text information are provided
4) Relevant forecasts, watches, warnings etc., and decoded observations are presented to the user in a single, easy to read, consolidated format - the "total forecast".
5) Each office can add local links and customize text areas as appropriate, controlling the "look and feel" of total forecast web pages.
6) Minimal maintenance and easy set-up are designed to ease web-related workload on offices.
7) Common system infrastructure allows offices easily share upgrades.
8) Near future enhancements such as auto-updating, audio alerts, marine, and fire weather support.
9) Infrastructure provides a common format soon to be required by NWSHQ.
10) Provides enhanced java capability for advanced browsers and simple image/imagemap for older browsers or slower machines.

This Technical Attachment (TA) has been broken up into three parts: the first describes how the infrastructure works, the second describes some specific features of the programming, and the third explains how to configure the programming to suit individual Western Region (WR) office needs. Configuring is quite simple; it merely involves knowing some minor HTML and updating a few text files. No knowledge of computer programming or compiling is necessary.

Infrastructure

The current applet-total forecast infrastructure uses three main programs, with a few additional "helper" programs.

Program 1 - *Data Management*: A server program captures and reformats forecast and observational data that becomes the core set of information for the total forecasts. This program is run by the UNIDATA Local Data Manager (LDM). (In the future, LDAD will replace the LDM.) Zones and other segmented products are split up into individual files, METARS are decoded, and a file keeps track over all WR forecast office watches, warnings, statements, and advisories. All files generated by the server program are sent to the WR Internet server (Nimbo) every 5 minutes. In the near future, warnings will trigger an immediate file transfer to Nimbo.

> Note: This program keeps track of all products issued from WR offices. To save the office web page focal point some work, it is currently configured to run at WRH on Nimbo; offices do not need to set up any programming. The software can be run locally to support non-Nimbo servers, if desired.

Program 2 - *User Interactivity*: When a user accesses an office web site using the infrastructure described in this TA, a java applet is downloaded onto the user's computer. The applet provides an interactive map of the office's area of responsibility. The user can roam over the map, which highlights county/city names and other areas of interest, and select an area in order to generate a total forecast. The applet will also graphically highlight any current watches, warnings, etc., using a simple color scheme with short text notice appearing on the side of the map. (Fig. 1)

> Note: In WR, SSD will help the offices customize their map on a one-on-one basis. Once the desired map is achieved, a file will be available to provide users with an image/imagemap alternative to the applet, while still providing for watch/warning graphical highlights and access to the total forecast. The map is designed to overlap other forecast office areas of responsibility, although this also can be changed if desired.

Program 3 - *Generating the "Total Forecast"*. The purpose of this program is to produce a simple, consolidated, easy-to-read web page that provides the user with the most current information. Upon clicking over a zone on the above-mentioned map, the user is provided

with a single page that includes a NOWcast (if current), zone forecast, and an extended forecast. Decoded current observations are included for sites chosen to coincide within the zone. If a watch, warning, statement or advisory is in effect, a link to the associated product is created (Fig. 2). The user can easily switch back and forth between the total forecast and the watch/warning page. A display of the last 24 hours of observations for a given site is obtainable by the user by clicking on an observation site name. The user can then choose between an easy-to-read "public" observation page, a "column" delimited METAR, or the undecoded METAR itself.

> Note: In WR, this program is already set up and running on Nimbo. Each office need only configure a few text files described later in this TA.

Helper Programs: "Helper" programs are used to transfer data to Nimbo and remove expired products from the database. (There are also programs that display watch/warning products and time-series METAR information, but these are essentially the same as the program that creates the total forecast, and were created for web page statistics purposes only.)

Forecast Office Customization: This suite of programs provides the basic infrastructure to manage and produce the total forecast. The software is set up to allow offices to control the look and feel of the applet map and total forecast web page. This allows each office to address local needs and provide some local customization options. The map, generated from AWIPS files, can be reworked as desired. The names of the cities/zones and areas of interest are also customizable. The total forecast page customization includes color choices, a top "office banner" section, bottom section for additional links, choices of decoded METARs, and non-METAR links, etc. Additional localization enhancements will be available in the future.

> Note: In WR, the Forecast Office Customization is the area where forecast office web page focal points will spend most of their time. SSD has deliberately designed the format to allow offices to be able to easily tune or customize their page without an extensive knowledge of the web-data infrastructure.

SPECIFIC INFORMATION - Details on java applet and mapping/total forecast programming.

The applet is composed of an image and four text areas. The image is generated from AWIPS "shape" files, which can be customized using ArcView software. The current shape file configuration displays an image with county lines with information about zones and surrounding states. Current watch/warning, etc. products are colored over zones and/or counties when issued, allowing the user to graphically see these products. The image is clickable, providing the user with the above-mentioned total forecast.

Use of the shape files enables the program to work with products generated from AWIPS WARNGEN software. The LAT/LON coordinates that accompany these products will be displayed exactly as the forecaster draws them. This feature has not yet been implemented, but should be in place by the beginning of this summer's convective season.

The applet text areas display information pertaining to the location of the mouse. One text area displays the zone name (forecast area), another area the county name, and a third can display "header wording" for areas that have current watch/warnings, etc. A fourth text area displays additional zone information (areas of interest).

Mouse actions:

There are two features that occur as the mouse is moved: 1) zones are highlighted in gray and 2) text areas filled as needed. If a watch/warning, etc. product is in effect, zones and/or counties will be assigned a color (discussed below), and text areas will be colored accordingly as the mouse moves over these areas. Clicking on a zone provides the user with the previously described total forecast.

Other programming notes:

Each watch/warning , etc. product is treated as a distinct entity, with its own expiration time. This allows the applet to handle, for example, multiple SVRs for different counties issued by one office. In addition, segmented groups within a NPW or WSW are also treated as individual products. When multiple products are in effect for the same county or zone, a priority scheme is used. The product with the highest priority is colored in. However, ALL product "header wording" for that zone or county are displayed in the appropriate text area. In addition, all current watches/warnings ,etc. will be displayed when clicked. The following is the current priority and color scheme for most AFOS PILS. Please note that the table is subject to change in the near future. CWF and MWS products will be implemented soon.

AFOS PIL	Header Wording	Priority	Color
TOR	Tornado Warning	1	magenta
FFW	Flash Flood Warning	2	baby blue
WSW	Blizzard Warning	2	magenta
WSW	Ice Storm Warning	2	magenta
SVR	Severe Thunderstorm Warning	3	red
SVS	Severe Weather Statement	4	yellow

AFOS PIL	Header Wording	Priority	Color
SLS	Severe Thunderstorm Watch	5	orange
WSW	Winter Storm Warning Heavy Snow Warning	5	red
NPW	High Wind Warning	5	brown
FFA	Flash Flood Watch	6	cyan
WSW	Snow Advisory Blowing/Drifting Snow Advisory Freezing Rain/Drizzle Advisory	8	orange
WSW	Winter Storm Watch	8	yellow
WSW	Winter Weather Statement	8	light blue
CFW	Coastal Flood Warning	8	light brown
CWF	Small Craft Advisory	8	light brown
MWS	Heavy Surf Warning	9	orange
MWS	Heavy Surf Advisory Special Marine Statement	9	yellow
NPW	Wind Advisory	10	light brown
NPW	Lake Wind Advisory	10	cyan
NPW	Wind Watch	10	martian green
NPW	Dense Fog Advisory Non Precipitation Statement Frost Advisory Freeze Warning Wind Chill Advisory	10	mint green
FFW	Flood Warning	11	baby blue
SAB	Avalanche Warning	12	magenta
FLS	Flood Statement	13	pink
FFS (other regions)	Flash Flood Statement	13	pink
SPS	Special Weather Statement	14	green

Configuring the Programs for Your Office

Each WR office now has a directory on the WR Internet Server (Nimbo) with a subdirectory "javaLinks" containing eight files:

       TopSection.txt
       BottomSection.txt
       ObsSection.txt
       MiscObs.txt
       Color.txt
       test.html
       MetarInfo.txt <Office>.
       Info (where <Office> is an office name)

The following describes the current format/structure of these files. Please note, however, that this format may change in the future, and other files will likely be added. All attempts will be made to make these changes generally transparent to the user, with easy implementation for each office.

<u>TopSection.txt</u>

Anything placed in this file will appear in the top section of a total forecast. It is anticipated that each office will place their name in this spot, along with other links, words, or images that indicate that the page is coming from that office. Any suitable HTML code can be placed in this file.

<u>BottomSection.txt</u>

Anything placed in this file will appear in the bottom section of a total forecast. It is anticipated that each office will place links to other pages related to the office. Any suitable HTML code can be placed in this file.

<u>ObsSection.txt</u>

This file contains information about METARs that may show up in the current weather section of the total forecast page. Examples of how this file should be formatted have been included in the file itself. In short, each line should contain four pieces of information: a zone name, a 3-letter METAR ID, the time zone it is in, and whether CLI information is available. Each zone should contain at least one METAR. If a METAR is not available for that zone, the nearest METAR should be used. Changes to and from daylight savings time will be automated except for files in the Flagstaff, Phoenix, and Tucson directory. (These offices will have to make changes manually for METARs outside of AZ.) Links to climate information have yet to be implemented, but will be available in the future.

MiscObs.txt

This file should contain links to other observations that are not available as METARs, but should be included in a total forecast. Once again, examples have been included, with each line containing a zone name, a link name, and the actual link.

Color.txt

In order to keep a continuous look and feel for each office total forecast, this file was created. It gives offices control over what colors the forecast and observation sections should have. Limited color control for offices issuing forecasts with a temperature/ precipitation is also available. Any HTML code that uses colors can be substituted for the examples given.

test.html

This file provides each forecast office with the applet used to graphically display current products. It is assumed the "test.html" name will be changed and information inserted as needed as long as the general structure between the <APPLET> and </APPLET> tags remains. The file may also be moved or copied to other directories.

> *Note: NWSHQ will soon require NWS offices to have a common web page format. This format has yet to be chosen. The infrastructure explained in this TA is designed to accommodate a common format, but still allow for office web page individuality. Please see the following link for a proposed common NWS format:*
>
> http://www.wrh.noaa.gov/Saltlake/javaLinks/test.html.
>
> *The proposed WR format includes major office links on the left and this TA's infrastructure (the applet linking to total forecast) on the right.*

<Office>.Info

This file contains two columns of information: UGC (FIPS) codes in the first column and their corresponding full names in the second. Data within this file will be used by the applet to fill the text areas appearing to the right of the map. Changes can be made to the second column as needed. For zone names, by adding a "/" followed by additional information, one can place text into the "AREAS OF INTEREST" text area. (Multiple "/"s are useful when dealing with several cities.)

> Example: The line UTZ002 Northern Wasatch Front/Brigham City/Ogden/Bountiful will place "Northern Wasatch Front into the "Forecast Area" section, and Brigham City, Ogden, and Bountiful in the "Areas of Interest" text area.

<u>MetarInfo.txt</u>

This file is not currently in use, but it displays the wording used to decode the METARs. NOT included in this file are the words "BREEZY" and "WINDY", which have been hard-coded into the program temporarily for wind speeds (or gusts) in excess of 20 and 30 mph, respectively. The word "MODERATE" is also hard-coded for moderate precipitation.

Current Problems

Programs generating the Total Forecast and decoded METARs are quite robust. Links to watches, warnings, statements and advisories are reliable, too. However, there are lingering problems with creating images and choosing "header wording" for watches and warnings. Work will continue on bugs related to this area in the coming weeks. Currently, if header wording for WSW's or NPW's cannot be determined, the program will use "Winter Weather Statement" or "Non Precipitation Statement", respectively.

On a 33K modem, the applet generally takes 30 seconds or less to load, although this time may vary depending on how busy the WR Internet server is at the time of downloading, and to other unforseen delays when downloading via the Internet. Download time will also depend on the memory and speed of each computer (since the applet runs on the user's PC), as well as caching capabilities of individual browsers.

Lastly, the applet design is currently limited in that it can only accommodate the browser versions Netscape 4.5 and Explorer 4.0 and above. Java programming is capable of automatically sensing older brower versions and can download a non-applet version of the map, however this has not been implemented yet. The applet also seems to perform poorly on UNIX workstations. We suspect that the browser developers have been focusing their attention on the larger PC market and these UNIX related problems will be fixed with time.

The Future

Because each office will be using the same programming for the applet and total forecast, upgrading and making enhancements will be easy, and generally transparent to each forecast office. Notifications on major short-term upgrades will be mailed to office web-masters as necessary. Instructions and/or suggestions will be included in these mailings.

Some short-term goals on the applet include auto-updates and audible warning notifications. Enhancements to the total forecast will be made as suggestions are provided. Total forecasts/java applets for marine and fire weather interests will also be implemented.

The applet technology/AWIPS shape file usage advantages will become clearer as offices begin to issue gridded-based forecast products. Rather than create total forecasts via zones, the program will be able to literally create point forecasts, or point-to-point forecasts.

Lastly, user control will be added. Some examples include allowing the user to specify what maps are to displayed (roads, rivers, etc.), and configuring the applet to look for or monitor specific types of weather.

Summary

All WR offices now have access to a java applet providing Internet users with a total forecast interface which graphically displays watches, warnings, statements, and advisories. Total forecasts are comprised of NOWcasts, zone forecasts, extended forecasts, decoded observations, and links to other observations and watch/warning products. Each office has control over their total forecast look and feel, while maintaining a common format among all WR offices.
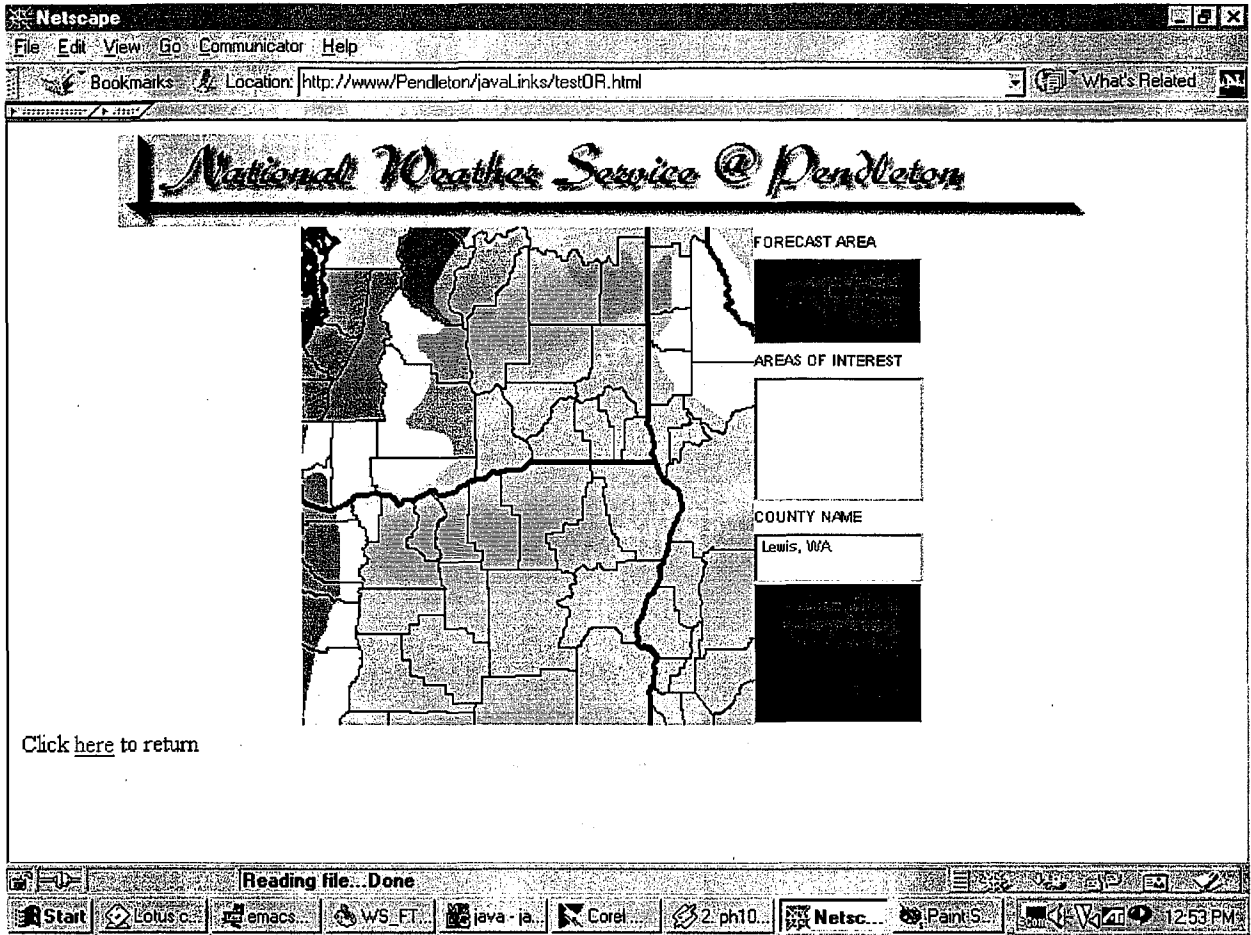
Acknowledgments

Fig 1: Java applet for Pendleton. Watches and warnings are highlighted over Cascades and over Idaho panhandle. Mouse (not shown) was placed over the Washington's "West Slopes Central Cascades and Passes" zone, which had a Flood Warning, Winter Storm Watch, and High Wind Warning in effect at the time this figure was developed.

Salt Lake City
National Weather Service Forecast Office

**FORECAST FOR: NORTHERN WASATCH FRONT-SALT
LAKE AND TOOELE VALLEYS-
SOUTHERN WASATCH FRONT-
INCLUDING THE CITIES OF...BRIGHAM
CITY...OGDEN...BOUNTIFUL...LEHI...
PROVO...NEPHI...SALT LAKE CITY...TOOELE**

Issued: 500 AM MST TUE MAR 2 1999

TODAY...MOSTLY SUNNY WITH HIGHS 50-55.
TONIGHT...INCREASING HIGH CLOUDS. SOUTH WINDS 10-25 MPH.
LOWS NEAR 40.
WEDNESDAY...CLOUDY AND WINDY WITH A 50 PERCENT CHANCE OF
RAIN OR SNOW. HIGHS IN THE MID 50S EARLY...TURNING COOLER IN
THE AFTERNOON.

EXTENDED FORECAST FOR NORTHERN UTAH
Issued: 400 AM MST TUE MAR 2 1999

THURSDAY THROUGH SATURDAY...COOL AND UNSETTLED WITH A
CHANCE OF SNOW SHOWERS EACH DAY. LOWS 15-30. HIGHS 35-45.

NWSFO SLC   (single page version)   (text version)

Forecasts | Current | Climate | Aviation | Fire | Snow | Hydrological | Warnings | Satellite | Radar | Camera | General | Other | Projects

Current Weather for
Salt Lake City

Date/Time	Mar 02 12:56PM MST
Weather	Cloudy/Overcast
Visibility	10 miles or better
Temperature	50 F
Dewpoint	19 F
Relative Humidity	29%
Wind	Variable 3 MPH

Nearby Weather

Station	Time	Sky/Weather	Temperature
Tooele	11:58AM	Mostly Cloudy	46 F
Ogden	12:53PM	Fair	46 F
Provo Municipal	12:55PM	Fair	45 F

Other Observation Links
Mouth of Parleys Canyon
Point of the Mountain (Bluffdale)
Lake Point
Grantsville

Document: Done

Fig 2: Total forecast for Utah's Wasatch Front. Zone forecast and Extended Forecast displayed, along with decoded observations for select locations and links to other non-METAR sites. No NOWcasts or watches/warnings etc., were in effect at this time for this area.