

3.42 NEW TOOLS TO TRACK DATA THROUGH THE ADVANCED HYDROLOGIC PREDICTION SERVICE PROCESSES

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1. Introduction

The National Weather Service's (NWS) Advanced Hydrologic Prediction Service (AHPS) web pages (Austin 2002) are quickly becoming the most popular way hydrologic data are presented to the public. Therefore, it is important for the Hydrologic Program Manager at an NWS Weather Forecast Office (WFO) to keep tight control of what appears on these pages and have the necessary tools to quickly isolate and fix any problems that might arise. Unfortunately, these tools did not exist until recently, and for many managers their WFO AHPS system was challenging to troubleshoot at times.

Two programs were recently developed by the author and were released to WFOs to fill this void, AHPStrace and RiverPost.

2. AHPStrace

The first program is AHPStrace. This program opens up the WFO AHPS processes and allows the manager to follow hydrologic information as it moves through the WFO system on its way to external AHPS servers. With this tool, the manager can discover where problems might exist in processing data. At this point, the manager can try to fix the problem or alert the necessary external technical support people of exactly where the breakdown occurred so they can fix it remotely.

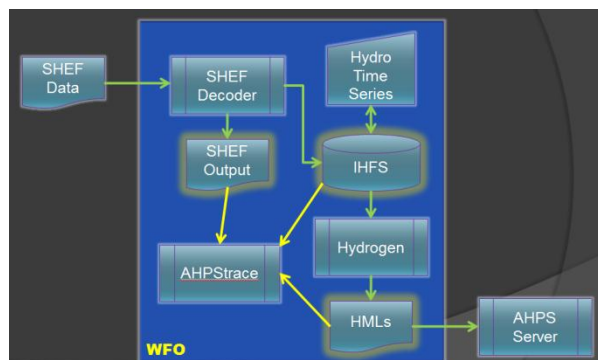


Fig.1 – Flowchart showing how AHPStrace can monitor AHPS data flow through a WFO system

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The flowchart in Fig. 1 shows how data move through a WFO AHPS system and how AHPStrace acts as a viewer for critical locations. The data enter the WFO system in Standard Hydrometeorological Exchange Format in SHEF messages (Mack 2008). The SHEF decoder processes these messages and stores the resulting data in the Integrated Hydrologic Forecast System (IHFS) database (Glauderma 2002). Many times during the hour (usually every 15 minutes), another program, HydroGen (Fenbers 2008), retrieves the data in the IHFS database and generates XML products called HMLs which are stored in the WFO text database. These products are sent out to the remote AHPS servers. The servers maintain their own database and generate the hydrographs that are displayed on AHPS web pages.

Notice that the critical areas in the WFO system are the IHFS database, SHEF decoder messages, and HML products. AHPStrace makes it easy to view these areas.

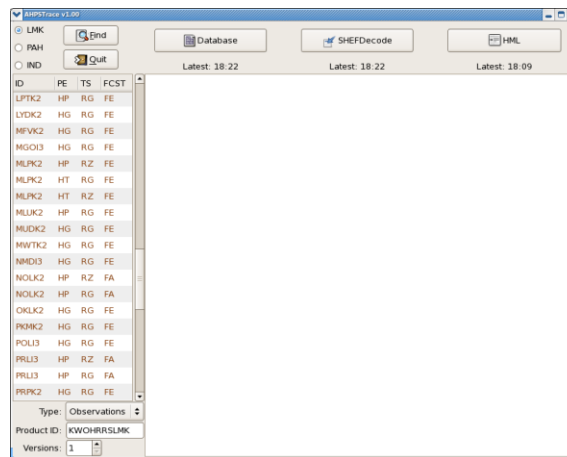


Fig. 2 – AHPStrace interface

AHPStrace has a simple interface, shown in Fig. 2. The left side of the screen is a list of all the locations that are in the AHPS system (basically a listing of the “hgstation” table in the IHFS database, which is what HydroGen uses.) Below this location window is the data select area which switches between observations or forecasts, product IDs, and number of versions to display. The right side of the screen is reserved for the data viewing area. AHPStrace supports three types of

data viewers: database values, SHEF decoder messages, and HML messages. At the top of the viewing area are the buttons for switching between the different viewers. Beneath each button shows the latest time stamp of each type of data. In the upper-left corner are radio buttons that switch between the primary and backup WFOs. To the right of this are the “Find” and “Quit” buttons.

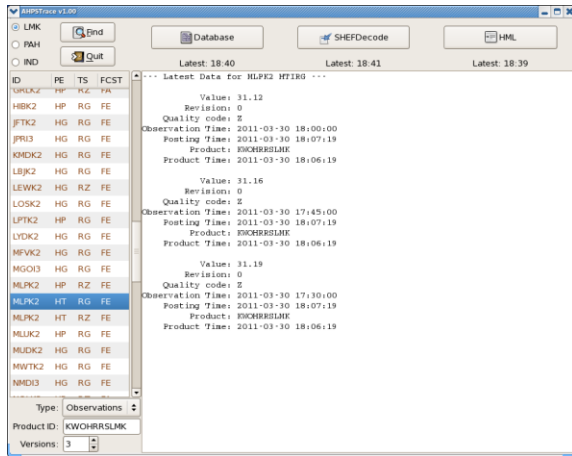


Fig. 3 – The IHFS database viewer

Figure 3 shows the IHFS database viewer. In this example, we are looking at the latest three observations for the river location, MLPK2. Note that not only are the values displayed, but the metadata as well. The user can see the revised value flag, SHEF quality code, observation time, database posting time, what product these data came from, and time stamp of the product. Also the user can see that the latest information in the database was posted at 18:40 UTC. This way, the user can quickly determine if the database posting routines are working.

The IHFS database is critical to all aspects of the WFO hydrology system, not just the AHPs parts. The information on this page can also be seen on the table viewer in “Hydro Time Series,” but using AHPStrace is easier to look at the most recent data. The Hydro Time Series table viewer shows every type of data that is stored in the system, whether it is current or not. Also, the other viewers in AHPStrace make the database viewer useful when trying to troubleshoot any bad data issues. The user can quickly switch between viewers with a mouse click.

Figure 4 shows the SHEF decoder message viewer. Almost all data that are in the IHFS database must move through the SHEF decoder. If data are incorrect or missing in the database, the first place to look for errors is in the output messages from the SHEF decoder. Unfortunately, these are not easy to view without this application. Messages are written to an

AWIPS subdirectory (/awips/hydroapps/shefdecode/logs/ product/) labeled by the product name and time of processing, e.g., KSDFR1SDF.1110.120345

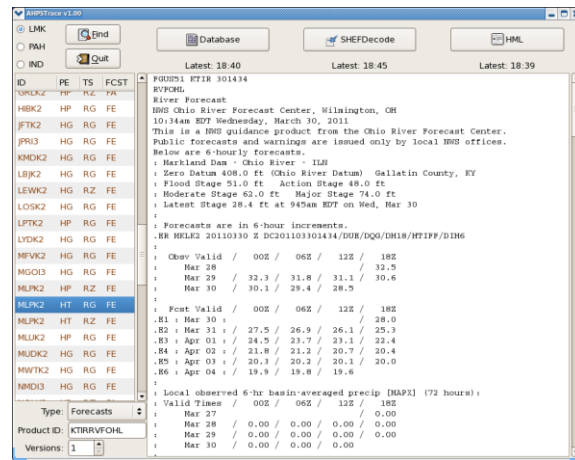


Fig. 4 – The SHEF decoder message viewer

The user would have to start a terminal window, change to that directory, select the desired file, and view it. Using AHPStrace, viewing these messages is quite simple. The user simply selects the desired location and clicks on the SHEFDecode button.

Since SHEF decoder messages can be quite long, a “find” feature was included in AHPStrace. When the user clicks on the “Find” button, the viewer will scroll to the first line which contains the selected location and highlight the location identification. Clicking on Find again will scroll to the next line with that location and highlight the identification as well.

The Product ID window is filled in automatically when the user clicks on a location. SHEF messages are written for the product which contains the desired location, not the location itself. However, the user can override this window to view SHEF messages for that location in any product they wish.

If the user deselects the location, the SHEF viewer will show the latest message for that product for any location. And if the user deselects the location and leaves the Product ID window blank, AHPStrace will display the latest SHEF decoded message in the system. This can be quite instructive to see all the different products the SHEF decoder processes.

Figure 5 displays the HML viewer. HMLs are special XML files that contain the data used by the AHPs servers to create the hydrographs. These products are generated by HydroGen and stored in the

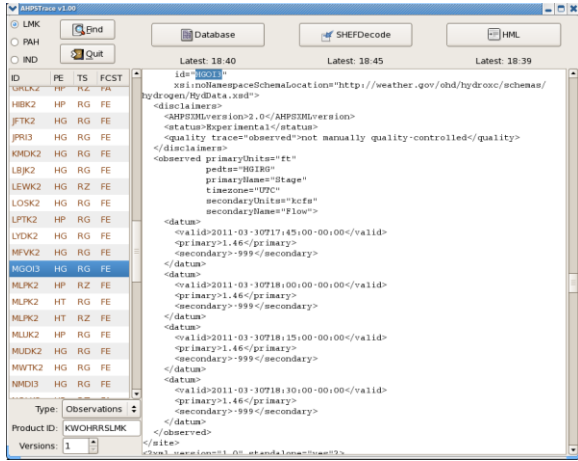


Fig.5 – HML viewer

office's text database, e.g., SDFHMLLMK. Without using AHPSTrace, a user would have to examine all the HMLs and try to find the lines for the desired location. Again, this is not easy. AHPSTrace quickly locates the last HML entries for any desired location. Since these products can be very long, a find feature, similar to that in the SHEFDecoder viewer, was implemented.

Also, similar to the SHEF decoder viewer, if no location is selected, then AHPSTrace will display the last HML generated. The presence of a correct HML for a location indicates that the WFO AHPS processing is complete, and if any problems are present, they must be on the server side.

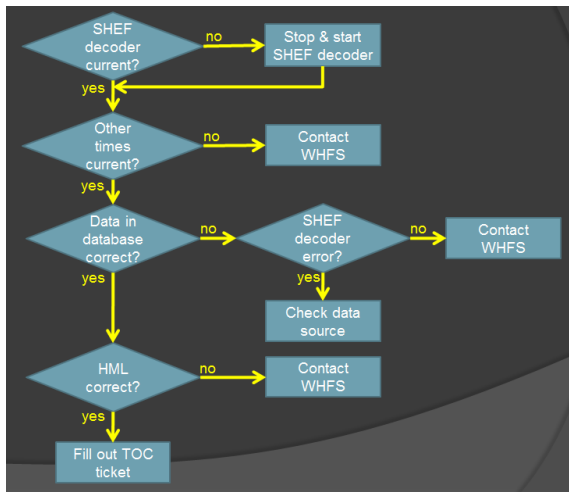


Fig. 6 – Troubleshooting flowchart

The flowchart in Fig. 6 guides the user to deal with AHPS problems. First, just by starting the program the user can quickly determine if the processes are currently running. Note, while it is easy for the hydro program manager to fix a hung SHEF decoder, to fix stopped database ingest and HydroGen routines help from the WHFS support group

(Glaudemans 2002 et al.) usually by contacting the AWIPS Network Control Facility. The user, by knowing where the problem exists, can expedite WHFS's response to the problem. If all processes are running, the user can trace any bad data by looking at the SHEF decoder messages. If the data are bad there, then the problem is at the source which generated the data. If the SHEF decoder messages show no error, but there still are bad or missing data in the database, then WHFS needs to be contacted. Finally, if everything is fine up to this point, the user can look at the HML messages. If there is an error, then WHFS must be contacted again. However, if the HML is correct, then the problem is not in the WFO's system and the NWS Telecommunication Operations Center needs to be contacted via an email trouble ticket. Thus, in a matter of seconds using AHPSTrace, any problems in the AHPS data flow can be quickly isolated and the necessary actions taken.

3. RiverPost

The second program, RiverPost, allows a WFO to control which hydrologic forecasts are displayed on the web.

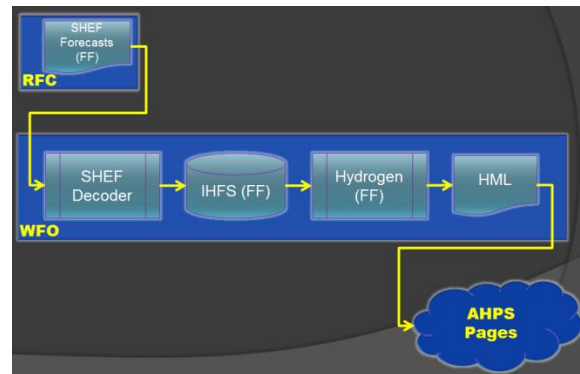


Fig. 7 – Flowchart of forecast data moving through a normal WFO system

Normally, River Center Forecast (RFC) forecast data follow the path shown in Fig. 7 without human interaction. RFC SHEF forecasts enter the WFO system and are processed by the SHEF decoder. These data are next stored in the IHFS database. Then, HydroGen takes these data to generate the HML which is sent to the AHPS server. This process usually takes place every 15 minutes, and depending when the forecasts arrive, the WFO may have little time to quality control them before they appear on the AHPS web pages. Also, if a bad forecast makes it through the system, it can be difficult to remove quickly.

RiverPost breaks this automatic flow of forecast data by taking advantage of the forecast SHEF type code as shown in Fig. 8. The SHEF type code for RFC

forecasts is usually “FF.” However, HydroGen can be changed to look for forecasts with a SHEF type code of “FE.” RiverPost lets the user screen which FF forecasts will be copied to FE and released to the AHPS web pages. Also, RiverPost can quickly set the forecast values to “missing” which results in a forecast being removed from the web pages. Thus, the user is given complete control of which forecasts are automatically posted to the web by choosing which locations in HydroGen are set to FE or FF.

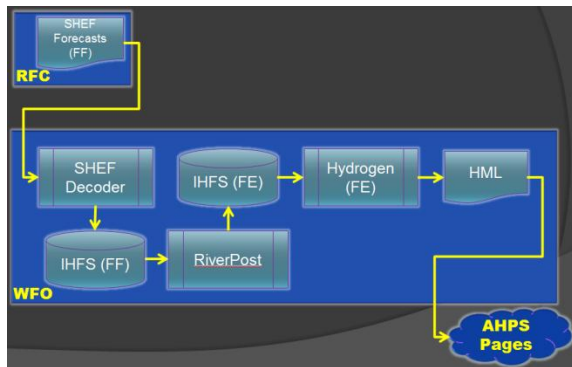


Fig. 8 – Flowchart of forecast data moving through WFO system with RiverPost

The interface to RiverPost is simple. When the program comes up (Fig 9), it displays all forecasts that are in the WFO system, their ages, and their status. The status can be one of four states: “Waiting” indicates the forecast has not been released yet, “Posted” means the forecast should be displayed on AHPS pages, “Removed” means that a forecast was displayed but was set to “missing,” and “???” means there is a problem with the WFO configuration. A “Waiting” forecast location is colored by the age of the forecast. The thresholds and colors can be configured by the installer.

| Group | ID | Forecast Point | Age | AHPS Status |
|----------------|-------|-------------------|-------|-------------|
| OHIO RIVER | MLRK2 | McAlpine Lower | 01.44 | **Waiting** |
| OHIO RIVER | CNNI3 | Cannelton Lock | 01.44 | **Waiting** |
| KENTUCKY RIVER | FODK2 | Ford Lock | 01.55 | **Waiting** |
| KENTUCKY RIVER | HIBK2 | High Bridge Lock | 01.55 | **Waiting** |
| KENTUCKY RIVER | FFTK2 | Frankfort Lock | 01.55 | **Waiting** |
| SALT RIVER | SHPK2 | Shepherdsville | 01.55 | **Waiting** |
| | TVLK2 | Taylorsville Lake | 01.17 | Posted |
| | NOLK2 | Nolin River Lake | 01.17 | Posted |
| | PRLI3 | Patoka Lake | 01.17 | Posted |
| | BRRK2 | Barren River Lake | 01.17 | Posted |
| | RRLK2 | Rough River Lake | 01.17 | Posted |
| | GRLK2 | Green River Lake | 00.07 | Removed |

Fig. 9 – RiverPost interface

Normally, the user will click on the “Waiting” button to select all the waiting forecasts, and then click on “Post.” However, users can also click on only the points they want and leave the other forecasts in a “Waiting”

state if they feel that the forecasts are bad. The screen will automatically refresh every minute, but the user can click on the “Refresh” button to refresh instantly. This will also unselect all points. Bad forecasts displayed on AHPS pages can be quickly removed by selecting the forecast point and clicking on “Remove.” If a point is accidentally removed, the user can restore it by clicking on “Restore.” Finally, if problems exist in the database by using RiverPost incorrectly, these entries can be deleted by clicking on “Clean.” Also, like AHPStrace, users can quickly switch WFOs by clicking on the correct button at the top, if they are in backup mode.

4. Conclusion

AHPStrace and RiverPost allow the WFO to take control of their AHPS pages, including both observations and forecasts. Users can also quickly trace any problems that develop and inform the necessary group of the particular point of failure in their system to expedite the elimination of the problem. These programs will help the WFO ensure that the AHPS pages are serving the public with correct and current data.

Both programs and their documentation have been loaded onto the NWS AWIPS Local Application Database where any WFO can download and install them. The application number for AHPStrace is 2664 and the application number for RiverPost is 2675.

5. References

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