Office of Hydrologic Development
Hydrologic Software Engineering Branch
Bi-Monthly Activity Newsletter
December 1, 2004

Software for NWS hydrology!

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1. HIGHLIGHTS FOR OCTOBER AND NOVEMBER 2004

The development of the RFC-only software for AWIPS OB5 (Release 26) has completed the beta testing and has been delivered to AWIPS. We will coordinate the delivery to the RFCs with the HSD support team. Joy Simms joined our development team in mid-December. She brings us some useful web development and systems administration experience; Joy has worked in OHD for a number of years in the Information Technology Support Group and recently graduated from Bowie State with a Bachelor's degree in computer science. Welcome Joy!

The AWIPS WHFS/IHFS and RFC-only software is moving along with the various AWIPS builds. OB4 is deployed to nearly all offices and new text workstations are installed at most offices. Other formal OB4.X releases are also nearing deployment, including OB4.1 which has an enhanced RiverPro version to support VTEC and other functions, and OB4.2 for the replacement of the AS machines and introduction of the new DX machines at selected sites. The only functional changes for OB4.2 is the introduction of a new Dam Catalog application (DamCREST), which supports the Simplified DamBreak Model operations. An ATAN is also being provided to WFOs to address some OB4 issues with SiteSpecific. OB5 is currently being wrapped up in testing and is scheduled for deployment in April 2005. OB6 development activities consist almost solely of PostGreSQL implementation and are well under way.

On NEXRAD, we began an effort to streamline and modernize parts of the WSR-88D Radar Product Generator (RPG) Precipitation Processing System (PPS). Other longer term efforts are now beginning to take shape.

2. DETAILS OF TASKS

2.1 NEXRAD SOFTWARE DEVELOPMENT

Visit our web page: http://www.nws.noaa.gov/oh/hrl/hseb/nexrad.htm

2.1.1 RPG BUILD 8

PPS Streamlining

With resources unexpectedly released due to cancellation of the Range Correction Algorithm (RCA) project in August, the HSEB team began focusing on streamlining and modernizing portions of the PPS in anticipation of future PPS modifications. A piece of logic, known as the "Time Continuity Test", executes within the precipitation rate and accumulation algorithm of the PPS. The original software was written to handle hardware instabilities associated with earlier radars; however such instabilities are not a problem in the WSR-88D and the software can be removed to save system resources and to ease the maintenance burden. At the same time the NEXRAD group is converting the precipitation rate and accumulation algorithm from its original Fortran programming language to C - this will also ease the maintenance burden, and will better position the group to handle future science infusion work. The project is being managed via the Hydrologic Operations & Services Improvement Process (HOSIP). Gate 3 for the Time Continuity Test removal was held on November 10; Gate 3 for the C conversion will be held in early December.

While making streamlining improvements to the software, the NEXRAD group will also implement fixes for 2 Configuration Change Requests (CCRs): NA04-27811 ("DPA 'TOTAL HYBRID SCAN RAIN AREA' TOO SMALL DURING HURRICANE") and NA04-28102 ("SPD PRODUCT DOES NOT DISPLAY VCP 121"). The former was revealed as Hurricane Ivan moved across the southeastern U.S. and was mentioned in the October 2004 newsletter.

The November meeting of the NEXRAD Software Recommendation & Evaluation Committee (SREC) in Norman, Oklahoma was canceled due to issues associated with the Open Radar Data Acquisition (ORDA) system's impact on RPG Build 8. The SREC will be re-scheduled for January 2005.

2.1.2 SOFTWARE ENGINEERING IMPROVEMENTS

As part of our PPS Streamlining effort, the group worked on developing the first 8 "baseline" test case reports. Most of our testing involves use of Archive Level II radar data ("test cases") retrieved from NOAA's National Climatic Data Center (NCDC). As we run the test cases, the RPG generates output for our analysis. Baseline reports provide us with a set of test run results which we can compare with corresponding output generated after changes to the software have been made. Discrepancies can then be investigated and accounted for. We are using this method to ensure that we break nothing while streamlining the PPS.

This period we also began to develop design documentation for the precipitation adjustment algorithm (Gauge Bias functionality).

2.1.3 OTHER NEXRAD DEVELOPMENT NEWS

The effort to bring Canadian Weather Radar data into NWS forecast operations continues to be managed via the NWS Operations & Services Improvement Process (OSIP). OHD's HL HSMB is currently investigating NSSL's application of Canadian Weather Radar data, to determine how (if) the data can usefully enhance hydrologic forecast operations.

We learned in November that the NEXRAD Program Management Committee (PMC) has approved moving to the next phase of the RPG Processor Replacement Project proposed by the Radar Operations Center (ROC). OHD's NEXRAD group will focus on migrating the PPS from Solaris to Linux for RPG Build 9, and target some already known Linux-based bugs.

The project to increase the resolution of the WSR-88D Digital Storm-Total Precip (DSP) product is now being managed via HOSIP. HSMB has written the Need Identification Document (NID) ready for Gate 1. The NEXRAD group can being implementation when the project receives approval at Gate 3 to proceed to Stage 4.

Meetings to discuss Dual Polarization plans are beginning. HSMB and HSEB received a status briefing from the National Severe Storm Laboratory on their prototype software, which appears to be ready for NWS evaluation. A program level meeting, to be led by OS&T PPD, will be held in December. The project is expected to be managed under OSIP.

2.2 AWIPS RELEASE OB4.X

2.2.1 RFS (no updates to this section in this newsletter)

Development for the RFS OB4 delivery is complete and this build is now in the maintenance phase. Please see the HSD support page for the status of bug reports.

http://www.nws.noaa.gov/om/water/RFC_support/hseb_buglist.shtml

We have made four interim releases for the OB4-R25 software.

a) Corrected the ingest pairs portion of the new verify software suite, so the TS code in existing pair files is interpreted correctly. Bug R25-11.

b) Corrected the dates on the espadp CARD file display . Bug R25-8.

c) Corrected the National Statistics output from the new verification software. Bug 25-23.

d) Corrected problems with pointers being out of bounds so stations could not be re-defined with PPINIT. Bug R25-6.

e) Made more corrections to the PPINIT HRAP calculations. Bug R25-20.

Please contact the HSD support team if you have questions about these two interim releases.
Contact HSD Support Team

2.2.2 WHFS/IHFS DATABASE

Please visit the OCWWS/HSD web page for the WHFS software at: http//www.nws.noaa.gov/om/whfs/
This web page contains the OB3 Release Notes, which detail the numerous changes, large and small, made for OB4 and OB3. One last reminder about AWIPS Patch Release OB3.1 for WFOs - it includes the ability for RiverPro to produce products with probabilistic forecast information. OB3.3 introduced the new headline section in RiverPro, which replaces the previous summary header section - this headline section will play a larger role as the VTEC and 10-922 (WFO Hydrologic products) product changes are implemented.

Primarily due to some issues with Warngen's ability to do "extended-in-time" products and the Corporate Board decision to replace the Watch, Warning, Advisory (WWA) application with the Graphical Hazard Generator (GHG) application, VTEC will not be used for any hydrologic products for the previously planned date of February 2005. All remaining "warning" products will implement VTEC by Fall 2005. AWIPS Release OB5.1 is scheduled to address any remaining items for VTEC and 10-922 implementation.

OB4 is at most offices by now. Some problems were discovered with the SiteSpecific application. An ATAN will be automatically installed at your office sometime by early January.

As mentioned previously, the web-based Dam Catalog application which ran on the AS machines will be replaced at offices receiving new DX hardware. All other offices will receive the new Dam Catalog

Reviewer and Estimator Tool (DamCREST) with Release OB5.

In summary, the existing browser-based Dam Catalog application will be replaced/upgraded with the DamCREST application. The DamCREST implementation provides a much easier interface, with particular attention paid to getting catalogued results displayed quickly and to facilitating the entry of model input data and subsequent model execution.

A new catalog database is not provided with DamCREST; it will use a slightly changed version of the existing database. Field sites will not have their dam catalog data disturbed. There is a recognized problem with the accuracy of the data and break scenarios already provided in the catalog due to the limited data which led to assumptions made in the Simplified DamBreak model runs used to populate the catalog. The OHD/HL/HSMB is investigating methods to improve the input data. The method by which the catalog data and model output data were assembled is detailed in a document available from OCWWS/HSD or HSEB.

2.2.3 PRECIPITATION PROCESSING SOFTWARE

Release OB4 changes include the addition of two new MPE fields generated by the MPE FieldGenerator application and usable in the interactive HydroView/MPE application: local bias adjusted multi-sensor precipitation field and bias adjusted satellite precipitation field.

2.3 AWIPS RELEASE OB5

2.3.1 RFS

For this build the major development tasks are:

1. integrating the new UHGCDATE mod which has a start and end date
2. developing an initial NDFD-to-NWSRFS pre-processor
3. upgrading the NWSRFS fs5file locking process to allow ESP to run with batchpst and the pre-processors
4. adding new features to the RES-J operation
5. making FLDWAV dump out files needed by the FLDVIEW application
6. porting ts2oh and gs2oh to Linux
7. completing the esp hindcast generating GUI (formerly espvs)
8. completing 49 HSD Bug List bug fixes

Notes from last months newsletter about the ndfd2rfs pre-processor:
"We have received review comments on the requirements for the NDFD pre-processor from Tom Adams. He pointed out to us that the requirement for picking out a single point value from the grid,

which we did not plan to complete in this build, was critical to the western region RFCs. Unfortunately, that requirement made the project too large for the available FY2004 AHPS resources for this task. We have several questions about the way we should extract single grid values, starting with the scientific validity of extracting a single grid cell from the NDFD grids and assigning this value to the entire basin on through how the information about the grid cells to extract should be stored."

No FY 2005 AHPS funds were allocated to the task of enhancing the ndfd2rfs pre-processor. One way to continue to move this project forwards is for local offices to run the pre-processor and become familiar with the characteristics of the NDFD data.

RFCs should also be aware we are passing a requirement to OCWWS/HSD for a more robust method for RFCs to download the NDFD grids. The only method currently available is to pull them off the Internet outside the AWIPS Firewall. We believe that this method is unacceptable for basic system operations. We plan to work with OCWWS/HSD and AWIPS to provide NDFD grids inside the AWIPS Firewall and sectored for RFC coverage areas. Until we achieve this better AWIPS system solution, we will not be able to provide the *mechanism* to retrieve NDFD grids for processing even though the *processing* capability is provided.

Notes from last months newsletter about the new OFS locking process:
"We have developed the code for allowing multiple concurrent locks in the RFS databases -- we think that is the good news! Unfortunately, as we test and evaluate the new lock process, it does not look promising for us to be able to develop a finer locking mechanism within the current structure of the fs5files. We need to move to a relational database where we can lock by rows to enable ourselves to run multiple forecast groups and the like. At least that is how it looks to us now."

2.3.2 WHFS/IHFS DATABASE

WHFS/IHFS OB5 software was delivered to AWIPS in August 2004, with AWIPS Systems Integration Testing (SIT) commencing December 6, 2004, and full deployment beginning April 12, 2005.

The following is part of OB5:

a) Sites which were not included as OB4.AS sites will receive the DamCREST application for the first time.

b) Assorted enhancements were performed for the Site-Specific application. It is expected that the OB4 ATAN version of SiteSpecific will be the same as the OB5 version of SiteSpecific

c) Enhancements to the TimeSeries application were performed, including some requests from the Western Region.

d) The Station Observation Display (a.k.a. Point Data Display) feature currently in HydroView/MPE

will be implemented within the D2D application. This will allow overlay of point data from the IHFS database onto D2D. This work is being performed by OS&T/MDL with significant assistance from OHD/HL/HSEB.

2.3.3 PRECIPITATION PROCESSING

a) An overhaul in the way that gage precipitation estimates are handled in the WHFS OB5 will ensure that all software has consistent algorithms for deriving precipitation accumulations and will improve the speed of the precipitation data processing. Gage data was formerly stored in the Precip and CurPrecip tables, with the CurPrecip table containing the same data types as the Precip table, but for a much shorter duration (e.g., the last 3.5 days). This redundant storage method was adopted to provide performance improvements when reading the data (from the CurPrecip table).

The Precip table data will now be stored in three new IHFS_DB tables: 1) RawPC 2) RawPP; 3) RawPother. The CurPrecip data will now be stored in two new IHFS_DB tables: 1) CurPC, 2) CurPP. Two other new tables - one for hourly PC and one for hourly PP data - have data stored in 24 hourly slots for each day (similar to methods used in CBRFC's fastetc database). This is expected to improve performance when reading hourly data.

Local applications which use the Precip, CurPrecip, or ProcPrecip **MUST** be converted for OB5. Additional instructions will be provided in separate correspondence, but is summarized here. The application conversion is not complicated if accessing only the Precip/CurPrecip tables, because only the table names have changed; i.e., the table structure has not changed. The conversion should be performed as follows: Change all database access of PC or PP data from the CurPrecip table to the CurPC or CurPP tables, respectively. If the Precip table was accessed instead of CurPrecip, then change the access to RawPC, RawPP, or RawPother, as applicable.

If is not possible to convert the local applications for OB5, the new shef_post_precip token can be set to ON to populate these tables needed by the local application. This should be avoided if at all possible, as significant redundant processing and storage will result.

If applications read data from the ProcPrecip table, the local application will need to be changed to adapt to the new storage method for this data. Please consult the GPP document, and consult OHD/HSEB if necessary for assistance.

b) The MPE operations are being modified to allow individual grids to be turned off, as per the local office wishes. Currently, MPE produces 8 QPE grids, some of which are independent of other grids (e.g., radar-only mosaic), others of which are dependent (e.g., local bias multi-sensor mosaic). By turning off unwanted grids, the MPE FieldGen operation will be completed more quickly. These changes will also facilitate the addition of objective analysis grid generation techniques, such as those employed at Tulsa RFC and within Mountain Mapper.

c) Improvements are being considered for the MPE component in HydroView to improve the management of user polygon edits in gridded precipitation fields. At this point, we believe that this activity will be pushed out of OB6 to OB7.

2.4 AWIPS RELEASE OB6

2.4.1 RFS

The NWRFC has asked OHD to update the MAT pre-processor to use different coefficients to disaggregate the daily Max/Min temperature forecasts. The Hydrometeorological Analysis Group in the Science Branch has been conducting analyses of the diurnal variations in the NWRFC area of responsibility the derived coefficients will be integrated into the RFS by early March. This rush development job is being driven by customer dissatisfaction with the accuracy of the NWRFC melt forecasts and concern they might stop using the NWRFC forecasts. At this time, no objective evidence has been offered to demonstrate these changed coefficients will improve the forecasts, so lets all keep our fingers crossed they do.

All our applications will be ported to the PostGreSQL database in this build.

We are cleaning up the ProbVS which had been developed by RTi and tested at the CBRFC. We have many RFCs issuing probability forecasts and no way to verify them and the ensemble science group needs verification support for their research. Once we get the program running, we will be using it in house and will be able to support the RFC use of this application.

2.4.2 WHFS/IHFS DATABASE

Work is progressing on the transition of the OHD HSEB software from using an Informix DBMS on HP-UX servers to using a PostgreSQL DBMS on Linux workstations. We have completed the work required to convert an IHFS_DB from Informix to PostGreSQL; work is progressing on converting all the application software to access the PostGreSQL database. In late December, OHD will install key components (SHEFdecoder, db_purge) at FSL for test and evaluation. In January, OHD will be working with AWIPS to install software at the formal test site, NWRFC.

2.4.3 PRECIPITATION PROCESSING

No new precipitation processing functionality is planned for OB6. However, during the OB6 development period, design work is underway for incorporating the ABRFC P3 application into MPE operations. Also, design work is beginning for incorporating the Mountain Mapper functions used in the Western Region into MPE operations. The goal is to provide a nationally-supported baselined application for all offices to perform QPE operations.

2.5 DEVELOPMENT SUPPORT ACTIVITIES

2.5.1 New OHD Software Architecture

We have had two contractors working to make the RRS pre-processor run with a Data Service underneath it instead of the straight fs5files access routines. If all goes well, the RRS will read and write data by sending a message to a Data Access Controller which may access fs5files or a PostGreSQL database or XML files with the actual data located on the local machine or on a remote machine. We are developing this code to test our architectural ideas and the migration path we think will take us from the fs5files to an RDBMS or other data storage technologies. If we are convinced the architecture and the migration path are sound, then we will make the code operational and deliver it via AWIPS to the RFCs so we can field test the results. If the software works, the RRS will read observations from the IHFS database or the fs5files depending upon how an RFC set up their configuration.

This project has proven to be a very good example for testing our migration path. All the RFS programs read data by using pointers into the fs5files database. At the start of the RRS, for example, it reads a record from the fs5files database which consists of record numbers for the observations in the fs5files. When the RRS needs data for a station it simply requests data for some record; the name of the station and the datatype are not available in the access routines. This makes it very hard to access the data in any database which is not the fs5files, unless the application is rewritten. Rewriting the applications was not considered an acceptable migration path. In order to leave the RRS intact and read from an RDBMS, we simulate this fs5file data access process. Though reading observations from a PostGreSQL database appears on the surface almost trivial in terms of software modernization, it is a huge step for us because it validates the complex migration path required by the embedded nature of the fs5files and the RFS code.

2.5.2 Beta Testing

The OB5 SiteSpecific application, with the Sacramento rainfall-runoff model is in ongoing beta testing at SERFC/SJU.

The VTEC (Valid Time Event Coding) and 10-922 features of RiverPro will be tested in the Spring of 2005 as part of a formal Operational Test and Evaluation (OT&E).

Testing of modifications of RiverPro made to support CNRFC-WFO operations is ongoing. These features are initially provided in OB3, and are undergoing refinements through OB5.

2.5.3 AWIPS System Changes

Because of their importance, these previously announced items are repeated again.

On the AWIPS systems front, the PostgreSQL DBMS has been selected as the next Relational Database Engine for AWIPS, and will replace Informix as the HP-UX DS machines are retired and replaced by the Linux DX machines. Here is the PostgreSQL web site for those who would like to find out more about this DBMS, http://www.postgresql.org. There is an interesting FAQ in the Docs section. To support field development activities, a web site has been established by the HSEB which provides helpful information on PostgreSQL development: http://www.nws.noaa.gov/ohd/hrl/hseb/postgreSQL/index.htm.

Plans are for all of the OHD software to use PostGreSQL in AWIPS Release OB6. These plans are quite involved so as to accomodate the many dependent activities, including the field conversion of local applications which use the existing Informix database. OHD will automatically convert the IHFS database to PostGreSQL, and can provide guidance information to offices for conversion of local applications. Offices that have their own Informix databases or tables should begin to plan for the eventual transition to PostGreSQL for OB6, which will being deployment in late September 2005.

Lastly, the Red Hat Enterprise Linux Workstation Basic Version 3 has been selected as the operating system for AWIPS Release OB6 and beyond. This may have some impact on local scripts or methods that are possibly changed during the OB6 installation. Please coordinate with your office or regional focal point if you have questions on the status of the AWIPS COTS (Commercial-Off-The-Shelf) software.