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

Software for NWS hydrology!

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1. HIGHLIGHTS FOR AUGUST & SEPTEMBER 2004

The development phase of the OB5 NWSRFS Release 26 closed on September 24. We will spend two weeks testing the executables and then work with MARFC and OHRFC for about four weeks to beta test the software prior to delivering the software to AWIPS on November 19.

The AWIPS WHFS/IHFS and RFC-only software is busy with multiple builds. OB3.3 is currently part of the very active Operational Test and Evaluation for Valid Time Event Coding (VTEC). OB4 is starting normal deployment to all offices. Other OB4.X releases are also planned, including OB4.AS for the replacement of the AS machines and introduction of the new DX machines at some sites, and the release tentatively designated OB4.1 for the VTEC updates. OB5 is currently undergoing testing and minor updates and is scheduled for deployment in April 2005. OB6 development activities consist almost solely of PostGreSQL implementation and are well under way. Currently, the number of sites with each AWIPS version are: pre-OB3.3: 18; OB3.3: 119; OB4: 25.

On NEXRAD, the Range Correction Algorithm (RCA) project was canceled in August in response to a NEXRAD Technical Advisory Committee (TAC) recommendation; OHD plans to focus on an alternative approach using dual polarized reflectivity data.

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 5

Enhanced Pre-Processor (__EPRE__)

We continued to provide support to the OOS ROC Applications Branch concerning both high and low radar precipitation estimates at some sites. There are so many variables in play (such as clutter suppression, radar calibration, and adaptable parameter settings) that it is impossible to isolate any single cause. OHD will continue to assist the ROC in their investigations wherever possible.

A minor latent bug was revealed as Hurricane Ivan moved through the southeastern U.S. When the total area of rain within the radar umbrella exceeded 99,999.99 Km^2, one of the data fields in the DPA product alphanumeric layer became unreadable. However, the operational impact appears to be negligible because the data field value does not form the basis of any hydrologic calculations, and is only used for display by AWIPS MPE. Since the bug apparently causes no operational harm, it will be assigned a low priority.

2.1.2 RPG BUILD 8

Range Correction Algorithm (__RCA__)/Convective Stratiform Separation Algorithm (__CSSA__)

On August 9 the NEXRAD TAC released a memo to the NEXRAD Program Management Committee (NPMC) recommending against the program's implementation of OHD's Range Correction Algorithm at this time. The TAC pointed to a lack of demonstrated (quantitative) forecast and hydrologic model improvement, as well as anticipated deployment of an improved precipitation measurement technology (dual polarization) in the medium term. The TAC acknowledges the need to correct precipitation estimates, but is not convinced that OHD's algorithm is the best approach. The NEXRAD software development group has therefore stopped all activity on the RCA project, and will instead focus on a joint collaboration between the National Severe Storms Laboratory (NSSL) and OHD to get polarimetric-based precipitation estimates into operations, at the same time as incorporating range and bright band mitigation techniques into the new science. Dave Kitzmiller (OHD HL HSMB) and Chris Dietz will travel to Norman, Oklahoma in November to discuss with NSSL.

2.1.3 DOCUMENTATION

During August and September, we worked on further updates to the Federal Meteorological Handbook No. 11 - Doppler Radar Meteorological Observations (WSR-88D), otherwise referred to as FMH-11, to incorporate recent changes to the RPG precipitation processing software. Our second set of updates were delivered on September 13 for incorporation into a final version of the document which is expected be published by OOS/ROC.

In September we completed our documentation of existing radar precipitation product formats and content. Detailed specifications of the following Level III radar products include: Hourly Digital Precip Array (DPA), Digital Hybrid Scan Reflectivity (DHR), One Hour Precip (OHP), Storm Total Precip (STP), Digital Storm Total Precip (DSP), Hybrid Scan Reflectivity (HSR), Three Hour Precip (THP), User Selectable Precip (USP), and Supplemental Precip Data (SPD). The documents should be posted sometime within the next week at: http://www.nws.noaa.gov/ohd/hrl/wsr88d_prods/index.htm

Cham continued to work on software documentation for the RadClim system. We are helping get the documentation in shape so that the AWIPS software development group can incorporate RadClim into the AWIPS baseline and assume long-term maintenance responsibility. The documentation will undergo internal review early next month.

2.1.4 OTHER NEXRAD DEVELOPMENT NEWS

In response to a query from North Central RFC, Chris Dietz led a conference call to share information concerning the NWS's effort to acquire Canadian Weather Radar data. The project is being managed via the NWS Operations & Services Improvement Process (OSIP). Staff from OS&T, OHD, OCWWS, and NCRFC participated in the conference call. We all generally agreed that some adjustments may need to be made in order to jump start the project and to ensure that hydro requirements are addressed.

In support of the OHD Science Infusion and Software Engineering Process Group (SISEPG), Kelley Miles continued experimenting with using the NESDIS "CasaNOSA" collaborative project development tool for configuration management (CM) of NEXRAD PPS software baselines. He is also piloting the use of the Subversion (http://subversion.tigris.org/) CM tool component of CasaNOSA to see if the combination of CasaNOSA and Subversion can possibly meet our internal needs for software CM as well as expand our CM environment to include collaborative development outside OHD. Kelley will also investigate use of a GUI front-end for Subversion, called RapidSVN. The project chosen as the pilot for these efforts is one which involves streamlining the PPS software and converting the remaining source code from Fortran to C. We hope to use Kelley's experience to evaluate the use of all these tools for AWIPS/AHPS software development too.

2.2 AWIPS RELEASE OB3.x

2.2.1 RFS

OB3 has been superseded by OB4 (available to the RFCs). AWIPS is now delivering OB4 to everyone.

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 OB3. AWIPS Patch Release OB3.1 includes the ability to specify probability attributes when retrieving forecast data for inclusion in a generated product from RiverPro.

AWIPS Patch Release OB3.3 includes significant new features to support RiverPro VTEC, and is being used to support VTEC OT&E being conducted from August 30 thru October 8. The OT&E also became a chance for evaluation of the NWSI 10-922 changes, which involve significant changes to the hydrologic product policy. Due in large part to the hurricanes, we have had a lot of interesting weather to test out the VTEC operations. There have been some minor software issues, and some realizations about the need for improved RiverPro configuration support and user training on VTEC in general and on RiverPro's specific VTEC implementation.

Also, some issues have been identified regarding the use of WWA versus WarnGen for certain areal hydrologic products. These are currently being assessed. Depending on these discussions, changes resulting from this OT&E will be incorporated in either the OB4.1 release or OB5.1 release. If in OB4.1, implementation will result in VTEC "turn on" in February 2005. There is not total uniformity in referring to release OB4.1. It is sometimes called "OB4.VTEC" too.

2.2.3 PRECIPITATION PROCESSING SOFTWARE

A major collection of enhancements, and some bug fixes, have been incorporated into the MPE component of HydroView.   In addition, a new quality control feature was added that makes use of lightning data and which performs spatial consistency checks on gage data. All these changes are detailed in the WHFS web page.

2.3 AWIPS RELEASE OB4.X

2.3.1 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.

1) 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.

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

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

4a) Corrected problems with pointers being out of bounds so stations could not be re-defined with PPINIT. Bug R25-6.

4b) 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

2.3.2 WHFS/IHFS DATABASE

The final submission of the WHFS/IHFS OB4 software to the AWIPS Contractor was recently completed and full deployment has commenced. The OB4 release notes document is posted on the WHFS web page. The highlights of the Release OB4 changes include:

a) Added the Sacramento rainfall-runoff model into Site-Specific, with supporting RFC-WFO communications functions, and an improved user interface.

b) Removed the old DamCatalog tables in the IHFS_DB in lieu of the newer database used by the browser based application; this frees up database space.

c) Established consistent service backup controls in the WHFS software that are based on the HSA definitions, instead of county based assignments.

d) Completed many minor enhancements and bug fixes.

As part of the possible OB4.1 Patch release, the RiverPro application will contain numerous enhancements to support the WFO product formatting policy changes as specified in NWSI 10-922.

Since the August newsletter, the following plans have become nearly final. A special release of AWIPS software is planned, termed the OB4.AS release, coincident with the AWIPS hardware changes involving the replacement of the AS machines and other changes. Because the AS, which hosted the browser-based Dam Catalog application, will be removed, the replacement DamCREST application will

make an early arrival at those 30 sites recieving the new confguration with OB4.AS.

In summary, the existing browser-based Dam Catalog application will be replaced/upgraded with the DamCREST (Dambreak Catalog Reviewer and EStimation Tool) 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.

2.3.3 PRECIPITATION PROCESSING SOFTWARE

The highlights of the Release OB4 changes include:

a) Updated the DPA product decoder to handle new data and associated format changes in RPG Build 5 (EPRE) products while also handling RPG Build 4 products properly.

b) Added 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.

c) Removed obsolete Stage 2/3 IHFS_DB tables and software.

2.4 AWIPS RELEASE OB5

2.4.1 RFS

For this build the major development tasks are:

- integrating the new UHGCDATE mod which has a start and end date
- developing an initial NDFD-to-NWSRFS pre-processor
- upgrading the NWSRFS fs5file locking process to allow ESP to run with batchpst and the pre-processors
- adding new features to the RES-J operation
- making FLDWAV dump out files needed by the FLDVIEW application
- porting ts2oh and gs2oh to linux

- completing the esp hindcast generating GUI (formerly espvs)
- completing 49 HSD Bug List bug fixes

Notes from last months newsletter:

"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."

With FY2005 AHPS resources we will work with the interested RFCs to develop and validate precise requirements for this phase of the development. 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.

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 mutliple forecast groups and the like. At least that is how it looks to us now.

2.4.2 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, including a new blending algorithm to blend the observed data with the forecast data in the initial time steps.   We strongly encourage offices to provide feedback on the OB4 Site-Specific application.

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

Western Region.

d) The 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.

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. This is the beginning of our OB6 work.

2.4.3 PRECIPITATION PROCESSING

a) An overhaul in the way that gage precipitation estimates are handled in the WHFS will ensure that all software has consistent algorithms for deriving precipitation accumulations and will improve the speed of the precipitation data processing. This will affect the Shefdecode, RiverPro, HydroView/MPE, PrecipPreProcessor (siipp), and OFS Data Entry (ofsde) applications. 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 preformance improvements when reading the data (from the CurPrecip table). These "raw" data will now be stored in four new IHFS_DB tables: 1) "raw" PC data; 2) "raw" top-of-the-hour hourly PP data; 3) non-top-of-the-hour or non-hourly PP data; and 4) other precip data such as precip type reports. The two new raw tables will be used to maintain two additional new tables - one for hourly PC and one for hourly PP data - which 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. To aid in transition of local applications, a configuration option will exist in OB5 to allow the population of the old Precip and CurPrecip tables in addition to the new tables. However, this should be used very carefully as it will cause double storage of precip data. In a later build the Precip and CurPrecip tables will be removed.

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 OB5 to OB6.

2.5 DEVELOPMENT SUPPORT ACTIVITIES

2.5.1 New OHD Software Architecture

Our effort to develop a new software architecture for our operational applications slowed as we very carefuly laid out the exact path we want our contract partners to follow. On September 27th we started up the second phase of our Data Services architectural experiment with the RFS RRS pre-processor. We are testing the design of of the Data Service proposed to us by Apex Digital Systems in the first half of this task. (See http://www.nws.noaa.gov/oh/hrl/hseb/DataService_Requirements_RRS.pdf especially page 11, for a description of the architecture.) The task should be complete this March, with several demonstrations of the functions to OHD staff as the development progresses. We should be seeing the RRS pre-processor reading observations from either the fs5files or a PostgreSQL database when this phase is delivered. If this architecture works as anticipated, we will work on two more phases of this task, designing an operational version and then developing it. Follow-on work would address the parametric data.

2.5.2 OHD starting to use XML

We have been surveying the hydrologic community for existing XML schemas. It is surprising how much has already been developed. We are organizing a consortium of interested hydrologists from the Government, academia, and the private sector to push the idea of a single XML ontology for hydrology, as opposed to many. On September 29 we held an initial conference call/meeting with other groups that are interested in this topic. In attendance were: the Army Corps HEC, ESRI, NRCS Water Center, ABRFC, NWRFC, USGS, Drexel University (representing Consortium of Universities for the Advancement of Hydrologic Science Inc., CUAHSI) University of California Berkley, Virginia Tech, and Weir and Associates, a hydrologic consulting firm. The meeting was facilitated for us by Apex Digital Services. Everyone presented a short description of how they use and would like to use XML, and then we discussed a next step. We agreed to have Apex Digital Services (who are under contract to OHD) follow up with all participants to collect any XML schemas they may have and then to have Apex review these schemas to determine where they overlap and agree or disagree. Our intention is to get back together this Spring and have Apex present their results to us, and then hopefuly have the group ratify a Version 1.0 of an hydrologic XML. The group would then continue to develop the schema through a review and evaluation process. This is just the start of this large project; let's hope we succeed.

2.5.3 Beta Testing

The OB4 Site-Specific application, with the Sacramento rainfall-runoff model is in ongoing beta testing at SERFC/SJU.

The VTEC (Valid Time Event Coding) features of RiverPro are being tested as part of a formal Operational Test and Evaluation (OT&E) at selected sites from August 30 - October 8. VTEC will be

implemented in February 2005 and represents a major change in the way hazard products are issued by the NWS.

The OB5 DamCREST application is being beta tested at Dodge City WFO and ABRFC.

Testing of modifications of RiverPro made to support CNRFC-WFO operations is ongoing. These features are provided in OB3.

2.5.4 AWIPS System Changes

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

The AWIPS program office is finalizing the PostGreSQL deployment schedule. Plans are for a significant portion, if not 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.

Lastly, the Red Hat Enterprise Linux Workstation Basic Version 3 has been selected as the operating system for AWIPS Release OB6 and beyond.