

**Office of Hydrologic Development  
Hydrologic Software Engineering Branch  
Bi-Monthly Activity Newsletter  
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*Software for NWS Hydrology!*

Chief, HSEB, Jon Roe  
Group Leader, AHPS & NEXRAD, Chris Dietz  
Group Leader, AWIPS, Mark Glaudemans

**1. HIGHLIGHTS FOR JUNE AND JULY 2005**

One new AWIPS OB5 NWSRFS bug arose during this period; a fix is being beta tested at MARFC. A pre-release version of OB6 has been made available to RFCs to facilitate migration of their local applications to the PostgreSQL database in OB6. Meanwhile the OB6 delivery of NWSRFS to AWIPS (including most of the interim releases) was completed, and the group is now turning their attention to OB7.

For the AWIPS WHFS/IHFS and RFC-WFO shared software, installations and development march on. As reported in the summary status page available via: [https://www.ops1.nws.noaa.gov/Secure/awips\\_software.htm](https://www.ops1.nws.noaa.gov/Secure/awips_software.htm), the OB5 installations are well underway. Immediately after installing Release OB5.0, WFO offices should install Release OB5.0.1, which involves a RiverPro patch. Release OB5.1, which includes a minor upgrade to SiteSpecific, started deployment August 2. The Release OB6 software, scheduled for field deployment October 17, will include the hydro-VTEC software for use in the Operational Test and Evaluation (OT&E). Besides some OB5 support activities and OB6 testing work, our efforts are focused on OB7 development, primarily for the upgrades to the Multi-Sensor Precipitation Estimator (MPE) suite of applications to integrate the functionality of the Tulsa RFC P3 and the Western Region Daily QC applications. Much of the information given below for OB5 is unchanged, but is repeated until all offices have moved beyond that specific release version.

Most of the NEXRAD RPG Build 9 work is complete and we are waiting for a development system upgrade to RedHat Enterprise Linux (RHEL) version 4 before beginning final testing prior to handoff to the Radar Operations Center (ROC) in January 2006. In response to OS&T's suggestion the NEXRAD RPG software development group has begun to investigate the feasibility of TDWR-based precipitation estimates for the Supplemental Product Generator (SPG). We also continued support for OS&T's Dual Polarization effort.

The OHD HSEB has had several recent personnel changes. Dr. Edwin Welles officially left OHD for OS&T on June 11. His vacancy (along with Scott VanDemark's vacancy from May) will not be filled until FY06. Mr. Andi Voellmy, an RSIS contractor, joined the AHPS group on June 6. Andi will be focusing on software architecture issues related to numerous OB7 and future projects. Mr. Jeremy Su returned to the NEXRAD group on June 20 as a summer student once again; he has been helping the NEXRAD group finish development of their new software engineering tool NAILS. Jeremy will be with us until August 5. Chris Dietz is standing in as AHPS group leader at least until October.

We hope you find this newsletter issue to be helpful and informative. Feedback is always appreciated.

## **2. DETAILS OF TASKS**

### **2.1. NEXRAD SOFTWARE DEVELOPMENT**

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

Level III radar precipitation product specifications for the RPG are available on OHD's website: [http://hsp.nws.noaa.gov/oh/hrl/wsr88d\\_prods/index.htm](http://hsp.nws.noaa.gov/oh/hrl/wsr88d_prods/index.htm).

#### **2.1.1. RPG BUILD 9**

Work for the Build 9 RPG refresh project (migration to Linux) is progressing on schedule. With the exception of one potential bug yet to be fully investigated, all anomalies have been addressed. Full regression testing is due to begin in November to make sure everything works under Linux the way it currently works under Solaris. We are awaiting a development system upgrade from RHEL 3 to RHEL 4. The development hand-off date to the ROC for Build 9 is the end of January 2006. Build 9 is expected to deploy in the spring of 2007 after integration and system testing by the ROC.

#### **2.1.2. OTHER NEXRAD DEVELOPMENT NEWS**

**SREC:** A NEXRAD Software Recommendation & Evaluation Committee (SREC) meeting was held June 15-16, 2005 in Norman, Oklahoma. OHD representatives attended via video teleconference. The SREC produced recommendations for Builds 9 and beyond, to be presented later this year to the NEXRAD Program Management Committee (NPMC). For the latest information on software Build contents, visit the ROC's web page at <http://www.roc.noaa.gov/ssb/cm/sbuilds/>.

**Dual Polarization:** The NEXRAD software development group continued to support the Dual Polarization project through regular meetings led by the project manager (Greg Cate, OS&T/PPD) and the Independent Validation & Verification (IV&V) task lead (Dave Kitzmiller, HSMB). The Dual Polarization project as a

whole is tracked via the NWS Operations & Service Improvement Process (OSIP) (see <https://osip.nws.noaa.gov/osip/index.php> ). Dual Polarization is tentatively targeted for Build 11. OHD scientists in HSMB have received a copy of NSSL's prototype polarimetric algorithm and they are in the process of conducting an independent validation and verification of the algorithm. HSEB's role will be to re-engineer the NEXRAD RPG PPS to accommodate the new algorithm and any other known planned enhancements to the NEXRAD system, such as faster VCPs. HSEB will also place particular emphasis on developing production quality software for national deployment. During the next few months we plan to start looking at the software and coordinating with other development organizations (OS&T SEC, ROC), beginning to identify tasks and lay out a detailed schedule.

**TDWR PPS:** Based on feedback from the field, OS&T has determined that, aside from Dual Polarization, the two highest priority items for NEXRAD are enhanced data resolution (aka "Super-Res") and TDWR data. In response to this guidance HSEB has begun a preliminary investigation of the feasibility of generating a hybrid scan reflectivity product based on TDWR data. A Statement of Need is being written to get the project into OSIP. HSMB believes they can have a prototype algorithm for the SPG ready by mid-CY2006 for HSEB to turn into production code. No release date has been set, due to a dependency on plans for the NEXRAD baseline incorporating the SPG.

## **2.2. AWIPS RELEASE OB5.X**

### **2.2.1. NWSRFS**

Refer to the OCWWS/HSD web page for the RFC software support at: [http://www.nws.noaa.gov/os/water/RFC\\_support/index.shtml](http://www.nws.noaa.gov/os/water/RFC_support/index.shtml).

We issued two additional interim releases for the OB5-R26 software during this period:

a) FFG

Corrected a problem where the headwater guidance being produced is not realistic. Bug R26-23.

Corrected a problem where the ffguid program generates incorrect times in the gridded xmrp files. Bug R26-38.

b) Verification

Corrected a memory problem in the Verification Software where the buildpairs program runs out of memory and cannot write the results of the run back to the Informix database. Bug R26-39.

### **2.2.2. WHFS/IHFS DATABASE**

See the HSD web page for WHFS Support at <http://www.nws.noaa.gov/om/whfs/> for the Release OB5 release notes. The following are the OB5 highlights, mostly repeated from previous newsletters:

- a) Numerous enhancements were made to the Site-Specific application and to the TimeSeries application, including requested changes from the Western Region.
- b) The Station Observation Display (aka Point Data Display) feature currently in HydroView/MPE will be implemented within the D2D application. For the first time, this allows overlay of point data from the IHFS database onto D2D.
- c) The VTEC implementation schedule specifies that “hydro-VTEC” will be “turnkeyed” for all offices in the spring 2006. Release OB5.0 RiverPro has many of the changes necessary to support VTEC, but most of these features will go unused until VTEC is mandated for hydro products. Release OB6 will include additional changes to match the latest NWS 10-1703 and NWS 10-922 directives. In particular, the OB6 version will use a new method to determine which forecast points to include and which product category to generate, based on the VTEC events previously issued.
- d) HydroView/MPE is able to display dam locations from the DamCREST database, and allows user selection of a dam and direct access to invoke the DamCREST application for the given dam.
- e) Some new SHEF physical elements for snow data were added and new data processing is provided for handling areal observed and forecast data.

### **2.2.3. 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 be stored in three new IHFS\_DB tables: 1) RawPC; 2) RawPP; and 3) RawPother (this includes any precipitation data that does not have a physical element of either PC or PP). The smaller CurPrecip data will be stored in two new IHFS\_DB tables: 1) CurPC and 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 improves performance when reading hourly data.

Local applications which use the Precip, CurPrecip, or ProcPrecip MUST be converted for OB5. Additional information on the new storage and processing details are provided on the WHFS Support Team web page at: <http://www.nws.noaa.gov/om/whfs>. The document is entitled: "Gage Precipitation Processing (GPP) Operations Guide".

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 DailyQC (part of Mountain Mapper).

c) The Radar Climatology (RADCLIM) software suite was incorporated into the national software baseline and delivered with AWIPS for the first time. These applications are used to generate radar climatology "maps" for use in the precipitation processing, so that the "best" radar is chosen (if coverage exists) when multiple radars cover a given area. This software requires local collection of historical radar data.

### **2.3. AWIPS RELEASE OB6**

The primary purpose of this build is to port our applications to PostgreSQL and to the new RHEL 3 operating system. After a last minute AWIPS mandated system change (to use a different compiler), we made final deliveries to AWIPS in July.

### **2.3.1. NWSRFS**

For NWSRFS, all OB5-R26 interim releases will be included in AWIPS OB6, with the exception of 2 updates (OFS and RAX SHEF Decoder mentioned above); these latter fixes will be delivered to RFCs as OB6-R27 interim releases at a later date.

A pre-release version of OB6 has been made available to RFCs to facilitate migration of their local applications to the PostgreSQL database in OB6 with the understanding that it is not supported by HSD and OHD in the way that a standard release is supported. For now, the standard supported release is OB5-R26. Although HSEB doesn't have resources to actively support this early version of OB6 NWSRFS, we do welcome any comments or problem descriptions noticed at RFCs.

### **2.3.2. WHFS/IHFS DATABASE**

Work is complete 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 change affects both the IHFS database and the DamCREST database. As part of the installation, the Informix data are automatically moved in the PostGreSQL rendition of the IHFS. OB6 is currently undergoing alpha testing.

A few features are new to OB6 and include: the ability: to view MPE hourly grids in D2D; to include flow-based impacts in RiverPro; to assign proper durations to AWOS METAR precipitation data that has unique sensor reset times; to better control duplicate data SHEFdecoder posting; and to display Contingency data in TimeSeries. The HydroGen (Hydrograph Generator) function, which replaces the RivDat local application, will be provided as part of the national AWIPS baseline in OB6.

It also includes additional RiverPro changes to ensure compliance with NWSI 10-1703 and NWSI 10-922 changes and to be compatible with the workstation test mode operations to be introduced in OB6. With this latter feature, an AWIPS workstation is designated to be in Operational, Test, or Practice mode, and the formatter applications respond accordingly.

Lastly, the WHFS "oper" user cron, which prior to OB6 was implemented on the DS systems, will be re-distributed so that data ingest operations are scheduled on the DX system and data processing operations on the PX.

A full listing of changes is contained in the WHFS OB6 Release Notes, which will soon be placed on the HSD support page.

### **2.3.3. PRECIPITATION PROCESSING**

A major change in OB6 involved adding the ability to display locally generated MPE output in D2D. To support this, the GRIB product generation code was moved in OB6. Its directory location is controlled via updated national application token values. RFCs should review a new script which supports transmission of the GRIB products, in order to add locally selected destinations such as the NPVU NCEP destination.

## **2.4. AWIPS RELEASE OB7**

### **2.4.1. NWSRFS**

We are now in the development phase for AWIPS OB7. Software handoff is scheduled to occur approximately early May 2006. Aside from general bug fixes, items targeted for OB7 include:

#### a) Verification

New functionality will include computation of confidence intervals for the verification statistics, and new graphical displays. The Verification project was recently de-scoped by separating out the “Raw Model Run” activity to its own project. From on-going investigations of the requirements, it became clear that deriving the requirements for the “Raw Model Run” would take significantly more time than originally thought.

#### b) Conversion of OHD’s RAX software to RHEL/PostgreSQL

The SHEF decoders and Verification software, both of which run on the RAX, will be migrated to access the new PostgreSQL database.

#### c) Distributed Modeling

New distributed hydrologic modeling techniques will be introduced into RFC operations. Refer to the OSIP website for more information (<https://osip.nws.noaa.gov/osip/index.php>).

#### d) Historical Data Browser (HDB)

The HDB will be ported to run on Linux (at the moment it only runs on HP-UX), interfacing with the new PostgreSQL database.

#### e) Rivers, Reservoirs and Snow (RRS) Pre-Processor

As an initial delivery of CHPS capability, we are hoping to deliver a revised RRS pre-processor that can obtain its observation data from the IHFS Database rather than from the fs5files via using the new CHPS Data Services architecture. There

are dependencies on outside contract activities that could affect the delivery schedule.

#### **2.4.2. WHFS/IHFS DATABASE**

Changes to the WHFS for OB7 include the implementation of the “Mapper” (not to be confused with “Mountain Mapper”) function into WHFS. The Mapper currently operates as a local application used primarily in the Western Region. It provides a robust method for displaying hydrometeorological data, in many ways similar to the existing WHFS TimeSeries and HydroView point data control functions. Its benefits are in its more direct methods for displaying desired data sets (i.e., less clicking), its time-stepping features, and its speed of display. Implementation of Mapper functionality into WHFS will allow the existing local application, which is dependent in part on the Western Region HydroMet system, to be retired.

Preliminary work is continuing on an application for monitoring differences between river forecast and observations. River forecasting can be highly dependent on precipitation forecasts, and some precipitation events are highly unpredictable. This can result in unreliable river forecasts. An automated monitoring tool is being considered which would fit within the existing, albeit expanded, WHFS Alert/Alarm functionality. A complementary interactive monitoring application is being considered which would monitor not just observed-forecast differences, but also the receipt of observed and forecast data, and the active state of any ongoing VTEC events, etc.

#### **2.4.3. PRECIPITATION PROCESSING**

During the OB6 development period, design work was completed for incorporating the ABRFC P3 application into MPE operations. Improvements are planned for the MPE component in HydroView to improve the management of user polygon edits in gridded precipitation fields. This activity will be delivered in OB7.

Also, design work is ongoing for incorporating the DailyQC functions used in the Western Region into MPE operations. The goal is to provide a nationally-supported and baselined application used by all offices to perform QPE operations. Craig Peterson from CBRFC recently visited OHD to demonstrate and discuss the DailyQC application, which Craig has installed on OHD development systems.

HSEB is also working to coordinate the delivery of RFC-generated QPE products to the SBN for subsequent receipt and use at WFOs. Changes are being coordinated to make these RFC QPE products displayable in D2D at WFOs, to complement the locally generated QPE products which can be displayed in D2D as of OB6.



Early planning is also underway for the eventual migration of HydroView functionality into D2D, which will occur after Release OB7. This migration would result in the current HydroView/MPE application, which by that time will have P3 and DailyQC functionality integrated with it, being “morphed” into a comprehensive NWS QPE application dedicated to QPE support.

## **2.5. DEVELOPMENT SUPPORT ACTIVITIES**

### **2.5.1. NEW SOFTWARE ARCHITECTURE**

Phase 3 work for the CHPS Data Services task is underway. This phase builds on earlier proof of concept results by developing the first OHD Data Service in a Services Oriented Architecture (SOA). The effort will focus on integrating the RRS data pre-processor into the new architecture.

Preparations for design and development of a Mean Areal Temperature (MAT) CHPS Architecture Shell are underway. The purpose of this effort is to develop an architecture shell for a new NWSRFS MAT data pre-processor. We are still awaiting the contractor’s proposal. Meanwhile a draft HOSIP Statement of Need (SON) is being prepared.

The Ensemble Streamflow Prediction (ESP) component of the NWSRFS has been selected as a pilot project to develop the first CHPS Control Service. This new ESP Control Service is expected to improve RFC operations by providing a framework for setting up and controlling various sub-components of the ESP. The AHPS prime contractor has submitted a technical proposal; we will be reviewing and responding to the proposal early next month.

The first phase of the contract task to create and promote The Hydrology XML Consortium (HydroXC) came to a close in late July with the conduct of four mini-workshops with Consortium members. The purpose of these workshops was to engage the members with real world data transfer examples (contributed by them) to test out the first version of HydroXC XML schema for hydrologic data transfers. These four workshops were very successful in energizing the Consortium and in improving the details of the schema. The second phase of work to continue to refine the schema using more member data examples and RFC data examples is waiting to be awarded through NOAA Contracts at this time.

The external project to provide RFCs access to the USACE Reservoir Simulation (ResSim) model from NWSRFS resumed progress this period. Rob Hartman, HIC at CNRFC, is leading the way in engaging OHD and USACE’s Hydrologic Engineering Center (HEC) in a joint project to provide this linkage, funded entirely by the Yuba County California Water Agency (YCWA). Rob and HSEB

are working hard on crafting project agreements between YCWA and OHD and between OHD and HEC. Work should commence in the next several weeks.

### **2.5.2. UNCHEDULED AWIPS RELEASE ACTIVITES**

In this section we try to capture activities that are occurring that do not necessarily have an AWIPS release identified as yet.

a) A task order for design and development of Streamflow Regulation Accounting (SRA) tool enhancements has been issued to the AHPS prime contractor. This task focuses on enhancements to the RES-J operation that will enable the RFCs to model basins with complex reservoir operations and water diversions which they cannot model at this time. The contractor's proposal has been accepted as of late July and we are awaiting task order award.

b) Preparations for Interactive Calibration Program (ICP) enhancements are also now underway. Re-implementing the ICP into a better design with better documentation and more structured code will enhance the ability of the NWS OHD to support and extend this calibration tool. The contractor's proposal has been accepted as of late July and we are awaiting task order award.

### **2.5.3. AWIPS BETA TESTING**

A fix to OFS is currently undergoing beta testing at MARFC. The symptoms of the problem involve the program generating an output file that is abnormally large, and the file contents invalid. This bug is un-numbered at the moment.

Another fix - to the RAX SHEF decoder - is being beta tested at several RFCs. This version corrects 2 bugs (R26-45 and R26-29).

The VTEC (Valid Time Event Coding) and NWSI 10-922 features of RiverPro will be tested in the Summer 2005 as part of a formal AWIPS Initial Operational Test and Evaluation (OT&E), and later at field sites starting in the Fall 2005 as part of the OT&E.

### **2.5.4. AWIPS SYSTEM CHANGES**

As should be known to all by now, the PostgreSQL DBMS will be used by the hydrologic applications as of Release OB6. The PostgreSQL web site <http://www.postgresql.org> and an HSEB web site <http://www.nws.noaa.gov/ohd/hrl/hseb/postgreSQL/index.htm> provide helpful information in managing this transition. The HSEB has also been active in supporting the NWS Training Center course for PostGreSQL understanding. Courses were given in April and July.

All OHD database software will use PostgreSQL in AWIPS Release OB6 except the software on the RFC Archive server machine (RAX) which will continue with Informix for OB6 (more on that below). Field offices which have local database software must be ready when AWIPS OB6 arrives. OHD has provided downloadable scripts to convert a site's current IHFS database to OB6/PostgreSQL. A tar file containing the OB6/PostgreSQL version of software has been available for download for sites that need to test their local applications with a real-time data feed.

The Red Hat Enterprise Linux Workstation Basic Version 3 Update 4 (RHEL3u4) is the operating system for AWIPS Release OB6 for all systems except the RAX, which stays at Red Hat 7.2. Recently, AWIPS announced plans to upgrade to RHEL 3u4 as the second phase of the OB6 upgrade. The first phase is the PowerVault relocation, while the third phase is the conventional installation of OB6. The RHEL upgrade may have some impact on local scripts or methods. 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.

AWIPS has announced that RHEL 4u1 has been selected as the operating system for AWIPS Release OB7; if RHEL 4u2 is available in time, AWIPS will consider RHEL4u2 for OB7.

The RAX will be converted to RHEL 4 in OB7 and the database engine will be converted to PostgreSQL version 7.4.7. Julie Meyer at MBRFC recently installed a test database on our local development and test platform (NHDR) for use by the RAX database team. We thank all of our RFC partners in this project, especially Julie and Steve Shumate who have worked very hard to plan and get started on the OB7 database transition for the RAX.