4.9 EXPANDING WEATHER EVENT SIMULATOR CAPABILITIES FOR NATIONAL WEATHER SERVICE TRAINING

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1. Introduction

The Weather Event Simulator Version 1.0 was released in August of 2001 to provide a cost-effective weather event playback and simulation capability using a Linux workstation, the Advanced Weather Information Processing System (AWIPS) software, National Weather Service operational AWIPS datasets, and other locally developed software (Magsig and Page 2002). Following the release of WES1.0, versions 1.1 (Magsig and Page 2003), 1.2, and most recently 1.3 (Figure 1) have been released to provide updated versions of the AWIPS software, WES software, and other simulation support software. The WES capability has been heavily used by the primary developers at the Cooperative Institute for Mesoscale Meteorological Studies (CIMMS) and the Warning Decision Training Branch for training and research (Wood and Quoetone 2000, Jones et al 2003, Magsig and Page 2003, Grant et al 2004), and it has been used in many innovative ways by National Weather Service (NWS) forecast offices (Ferree et al 2003). Forecasters are able to train like they fight, while researchers and trainers are able to learn more about warning decision making issues without negatively impacting real-time operations.

One of the issues that has somewhat limited the growth of the use of WES inside and outside the NWS has been the need for the Informix database for creating warning products. Following the release of WES1.0, the price for the necessary Informix licenses rose substantially, and purchasing the licenses became cost prohibitive. Recently, however, the Forecast Systems Laboratory (FSL) created an Informix-free version of a portion of AWIPS that writes warning products to flat files instead of to the Informix database. The first version of the Informix-free AWIPS software was incorporated into the WES1.3 release in October of 2003. This release allows the installation of WES cost free on multiple desktops and laptops. WES1.3 is also available to non-government agencies from the WES distributor, Dr. Robert Rozumalski (roz@comet.ucar.edu), at the Cooperative Program for Operational Meteorology, Education, and Training (COMET). The cost free WES1.3 has the potential to significantly enhance collaboration inside and outside the NWS in the areas of operations, education, research, and training. With increased collaboration there are new issues to address about WES support and proprietary lightning data.

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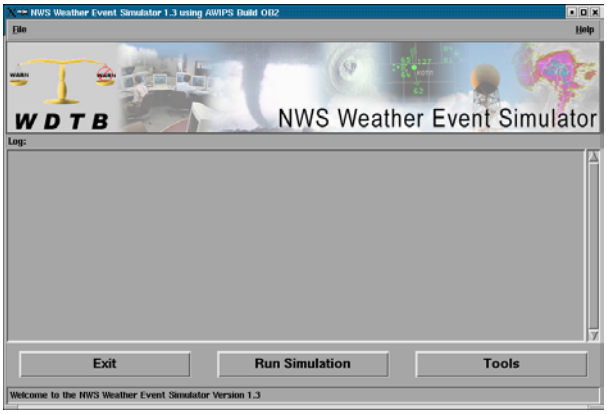

Figure 1. WES1.3 user interface.

2. WES1.3

Version 1.3 of the WES was released on CD in October of 2003. The installation CD includes the following items shown in Fig. 2:

- WES1.3 simulation software,
- an Informix-free version of AWIPS version OB2.1,
- a new easy to use scripting language called WESSL to allow for the timed display of non-AWIPS data during a simulation,
- WES1.3 installation instructions that cover how to install WES, verification of a successful installation using a small test case, and customizing the AWIPS in WES
- and more

2.1 *WES Simulation Software*

The Weather Event Simulator software is primarily a set of tcl/Tk programs written by CIMMS and WDTB that effectively acts as a data pump for the AWIPS displays and processors. The clock is reset on the Linux machine during a simulation, and data is made visible through the use of symbolic links. The WES manipulates data that have already been processed through AWIPS. Because software written through CIMMS is owned by the University of Oklahoma, the WES software has been made available cost free for non-profit use, though it is not to be redistributed.

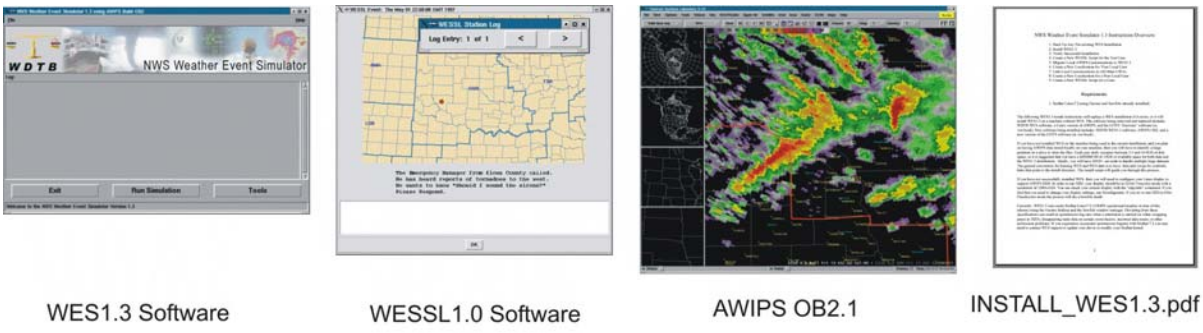

Figure 2. Main components of the WES1.3 installation CD.

2.2 *AWIPS OB2.1*

AWIPS OB2.1 is the AWIPS software build used with WES1.3. It is the most recent build released by the NWS for displaying operational data and creating warnings. Although some of the warning and data display applications of AWIPS have been incorporated into the WES release CD, there still is a lot of AWIPS functionality that is not currently available with WES1.3. The AWIPS software used with WES is taken from the official AWIPS install CDs after each AWIPS Build release, and all proprietary software is removed and authorized for release by the NWS Office of Science and Technology (OS&T).

In preparing the AWIPS for use with the WES, some AWIPS files are modified, and other files are added from FSL for implementing the Informix-free version of the AWIPS software. The new textdb and warnGenWish binaries from FSL enable the writing of warning product files to the data case. When a warning product is created in the AWIPS used with WES, a directory is created for the product based on the official NWS product descriptor (i.e. product PIL), and the file is named with the time that the product was written using the standard AWIPS naming convention down to one-minute accuracy (e.g. 19980408_2334). If two similar product types are issued in the same minute (e.g. OKCTOROKC) then the first file will be overwritten. The next version of the flat file warnings, slated for inclusion into WES2.0, will write out the warnings with accuracy to the second to prevent this (e.g. 19980408_233401).

2.3 *WES Scripting Language*

To facilitate the timed release of non-AWIPS data, a WES Scripting Language (WESSL) was developed for use with WES. The simulation developer creates a wessl file with an authoring tool, builder.tcl, written in tcl/Tk. The wessl file contains commands to be run at specific times during a simulation. Potential commands to be triggered during a simulation include launching an audio file or a popup window with: a map showing a spotter report, a distracting report or request, a popup query request that logs your input (see Figure 3), and more. An easy to use map image generation function is included in the builder.tcl program that requires only the latitude and longitude as input. When the developer issues the command to build the final wessl file, any specified maps are created with a red circle over the display location.

The wessl file to be run during a simulation is chosen through the WES interface, and the WES software runs the wessl script after the clock has been set back during a simulation. CIMMS and WDTB plan to continue collaborating to enhance WESSL support, including other data formats (e.g. streaming video) and new simulation evaluation tools.

2.4 *WES Installation Instructions*

The WES installation CD comes with a set of installation instructions, INSTALL_WES1.3.pdf, for installing and testing the software. A small test case complete with accompanying localization files is included with the installation CD to assist in the verification of a successful installation of AWIPS, WES,

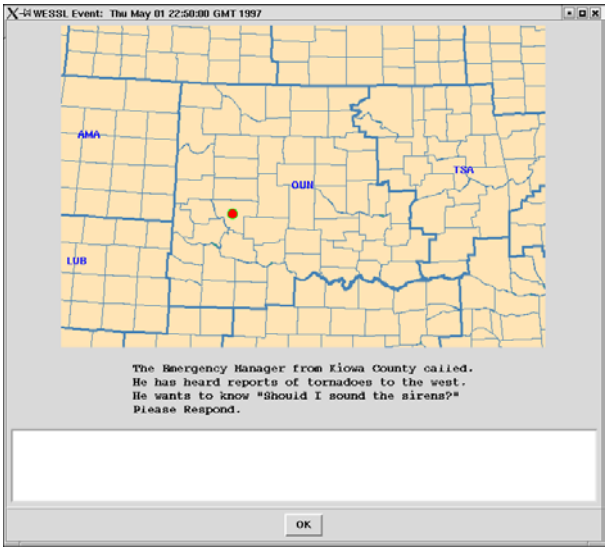

Figure 3. WESSL popup map with a request. The user's typed input in the log window is logged.

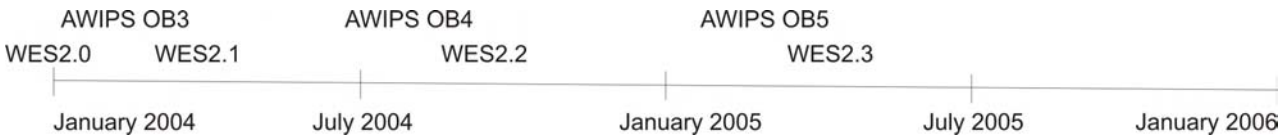

Figure 4. Planned AWIPS and WES release schedules (all subject to change).

and WESSL. The install instructions also contain a detailed set of instructions on how to customize the AWIPS on WES from another AWIPS. This allows operationally used AWIPS color tables, warning templates, and procedures to be transported to the AWIPS in WES. The customization instructions were based on instructions by Dan Baumgardt, the Science and Operations Officer at the LaCross, WI NWS Forecast Office. Some new scripts were developed to allow a single set of customizations to be spread throughout all localizations to facilitate creating localizations for any County Warning Area (CWA) in the US based on one set of customization files. This is particularly useful when using cases outside of the local AWIPS area.

3. Future WES Releases

As new AWIPS versions are released, and more training capability is developed, CIMMS and WDTB will continue to develop new releases of the WES. Figure 4 shows the WES development schedule that includes the next major AWIPS builds. The next planned WES release is for WES2.0 later in 2003 or early 2004. This version is planned to have the additional AWIPS warning functionalities of the Flash Flood Monitoring and Prediction System (FFMP) (Filiaggi et al 2002) and perhaps the System for Convection, Analysis, and Nowcasting (SCAN) (Smith et al 1999). WDTB has contracted out with FSL to port the FFMP processor and the SCAN processor over to the Linux operating system used with WES. These processors are needed to develop simulation capabilities with WES. Another planned enhancement to WES2.0 is to have the file names for each warning type written out to the nearest second in accuracy. This will minimize the chance of potential product storage loss if two similar products (e.g. two tornado warnings) are written in the same minute.

Outside of WES2.0, WES releases are planned to shortly follow each major AWIPS build release. Final WES development and testing occur after each AWIPS build is officially released. With the February 2004 release of AWIPS OB3, WES2.1 is currently planned. With the August 2004 release of AWIPS OB4, WES2.2 is currently planned. WES2.3 is planned to be developed after OB5 is released, sometime in March 2005. In order to help shorten the development time for WES in the current setup, the WES developers are becoming familiar with the changes in AWIPS from with the alpha and beta builds of the AWIPS software development cycle.

4. New Issues

4.1 Support

If many external NWS collaborators (e.g. Universities) become interested in using WES, support will become a big issue. Linux and AWIPS are sufficiently complex to create significant problems with slight deviations from the hardware and software specifications. The current NWS WES support structure is not designed nor intended for use outside the NWS. Until an official non-government support structure is established, collaboration could be hindered.

4.2 Case Generation

Currently NWS offices locally archive significant events for use with WES on DVD due to the large size of the data cases. This capability does not yet reside outside of the NWS. Thus, non-NWS WES users will need to rely on collaborations with NWS offices or the Training Division to obtain data cases for WES. Lightning data, that can be locally archived at NWS forecast offices, is proprietary data however. So lightning data must be removed from any WES cases shared with parties outside the NWS lightning agreement.

5. Discussion

The Informix-free and cost-free WES1.3 will provide a new opportunity for collaboration inside and outside the NWS in the areas of operations, training, research, and education. The complexity of the WES hardware and software setup (including AWIPS) requires that a new support structure be established for the growth of non-NWS WES users. Until such structure can be established, non-NWS WES users will need to rely on their NWS collaboration partner for guidance and assistance with WES. WES will continue to evolve as more AWIPS builds are released by the NWS and more training tools are built for WES by CIMMS and WDTB.

6. Acknowledgements

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