





Overview



- **The Why and What of AWIPS Evolution**
- **Objectives**
- **Re-architecture Approach**
- **Roadmap**
- **What does AWIPS II mean to ensembles?**
- **Summary**



Why Change?



- Case for change briefed to NWS Corporate Board – Nov 2004
- AWIPS Present State Summary
 - *Hardware*
 - *AWIPS hardware was in good shape*
 - *Communications Infrastructure*
 - *AWIPS communications infrastructure was in OK shape*
 - *Data*
 - *AWIPS Data was in need of improvements*
 - *Software*
 - *AWIPS software was in critical need of improvements*
 - *Costly software development, maintenance and inability to meet NWS and customer needs*
- **Corporate board direction to focus on addressing software shortcomings**
 - *Plan and requirements developed*
 - *Shaped portions of the AWIPS O&M re-compete activity*



What is AWIPS Evolution?



- **AWIPS Evolution**

- *A long-term project which delivers a modern, robust software infrastructure that provides the foundation for future system level enhancements*

- **AWIPS II**

- *Implements a modern Services Oriented Architecture (SOA) infrastructure*
- *First output of AWIPS Evolution and provides the foundation for all subsequent improvements*

- **AWIPS II Extended - Creation of a seamless weather enterprise spanning NWS operations**

- *Migration of NAWIPS into the AWIPS II SOA*
- *Delivery of thin client*
 - *Support to the Weather Service Offices and Center Weather Support Units*
- *Integration of “orphan” systems (e.g., Weather Even Simulator)*

- **AWIPS II Enterprise Enhancements**

- *Data Delivery Enhancements*
 - *“Smart push-smart pull” data access*
 - *Katrina satellite WAN back up*
- *Integrated visual collaboration*
- *Visualization Enhancements*
- *Information Generation Enhancements*



AWIPS Evolution Objectives



- **Establish Service Oriented Architecture for AWIPS and NAWIPS**
 - *Create a seamless weather enterprise that supports all levels of NWS operations from National Centers to WSOs*
 - *Build a common development environment that will be used by all developers*
 - *Establish infrastructure for GIS integration*
- **Enable access to data independent of its location, i.e., provide access to data not resident locally at the WFO or RFC.**
- **Provide infrastructure for real time graphical collaboration between**
 - *WFOs, RFCs and centers for enhanced internal collaboration*
 - *Other NOAA entities and*
 - *Trusted partners, e.g., Emergency Managers*
- **Implement a Common AWIPS visualization environment (CAVE) used by all applications**
- **Standardize generation of NWS products and services**



AWIPS II

Re-Architecture Approach



- **Perform “black-box” conversion**
 - *Preserve existing functionality, look and feel on top of new infrastructure*
- **Thorough field validation and acceptance before deployment**
- **No loss of functionality**
 - *Deployed system current with deployed AWIPS capability (i.e., OB9)*
- **Use open source projects - No proprietary code**
 - *JAVA and open source projects enable AWIPS II to be platform and OS independent*
 - *No plans to move from Linux*
- **ADE enables collaborative development**
 - *OS, Platform independence allows non-Linux based research to be easily integrated into AWIPS II*



AWIPS II

Features



- **AWIPS Development Environment (ADE)**
 - *Used by all AWIPS developers (National, Regional, & Local)*
 - *Developers concentrate on new capabilities, not re-implementing existing ones (i.e. screen I/O, communications protocols, data access routines, logging routines, or other previously developed capabilities)*
 - *Software can be developed on a variety of platforms*
- **Robust infrastructure for improved software O&M**
 - *Use of plug-ins: visualization extensions; new data types and transforms*
 - *System level, remediation, core services reduce system complexity*
 - *Improved support for local requirements (e.g., local apps, scripts, plug-ins)*
- **Common AWIPS Visualization Environment (CAVE)**
 - *Provides a common development and execution environment for AWIPS GUIs (e.g. D2D, NMAP, GFE, etc.)*
 - *Ability to pan/zoom large data sets (Raster & Vector) with flexibility over data rendering*
 - *GIS tools*
 - *Thin Client (Web Browser) enabled*
- **Dynamic Load balancing**
 - *Processing dynamically allocated among available CPUs*







AWIPS Evolution Governance Model



- **What is it?**
 - *Governance model controls the development, test, integration, configuration management, deployment and support of the new system -- both hardware and software*
- **Why?**
 - *AWIPS II offers new levels of flexibility and extensibility*
 - *New rules needed to take advantage of system capabilities and also define limits*
 - *Tension between unlimited modifications and ability to support the system*
- **Sample issues for consideration**
 - *Monolithic configurations no longer required -- how do we manage site specific configurations?*
 - *Plug ins can be down loaded and installed on demand*
 - *Scripting that modifies AWIPS menus, functions*
- **Flexible Governance Model needed for limited open source implementation**



AWIPS II



What does it mean to ensembles?

- **NAWIPS migration**
 - *Same infrastructure supporting both NAWIPS and AWIPS applications*
- **Algorithms**
 - *Common library for meteorological and hydrological calculations and tools*
- **Data delivery**
 - *Smart push-smart pull may provide more flexibility for access to large data sets*
- **Visualization**
 - *Supports new tools and techniques for visualizing ensemble data*
- **Information Generation**
 - *New architecture for product generation and delivery will allow tailored products capturing uncertainty*



AWIPS II Training



- **Strategic Training Plan developed**
- **Training targeted for the following groups:**
 - *ESAs*
 - *ITOs*
 - *AWIPS and application focal points*
 - *Developers (both baseline and local)*
 - *NCF*
 - *SST*
- **Training Organizations involved in planning, developing and implementing courses**



AWIPS II Testing



- **Layered testing strategy**
 - *Different testing phases overlap – functionality tested multiple times in different settings*
- **ADE usage**
 - *Not formal testing, but expect to get feedback as developers use the ADE*
- **Algorithm V&V –**
 - *Assist algorithm choice*
 - *Verify port of algorithms*
- **V&V**
 - *Task order validation*
 - *Executed by dev orgs in controlled setting*
 - *Performance testing – Evaluate system against known and developing benchmarks*
 - *Acceptance testing – part of the task order acceptance process*
- **Risk reduction**
 - *Side by side testing of new system by field personnel in a “lab” environment*
 - *Testing at limited number sites in manner that doesn’t impact operations*
- **Operational Test & Evaluation (OT&E)**
 - *Formal testing of the entire system*
 - *Tests system interfaces, operations, support, training, etc.*



AWIPS II

Risks and Challenges



- **Organizational challenges**
 - *Significant off contract workload on Government*
 - *Matrixed structure increases project complexity*
- **Performance**
 - *Supporting the short fuse warning mission*
 - *Handling large global data sets*
- **Schedule**
 - *Completing the migration and testing*
- **Migration of local applications**
 - *Local applications outside the baseline*
 - *Not a Raytheon responsibility*



Summary



- **New architecture defined and infrastructure delivered**
 - *ADE 1.0 delivered June 14, 2007*
- **Application migration underway**
 - *Migration Plan delivered June 2007*
 - *AWIPS baseline migration to be completed FY09*
 - *Local applications migration planning in progress*
- **Incremental approach will extend AWIPS II architecture throughout NWS**
- **AWIPS II and subsequent enhancements will provide more flexible foundation for delivering products that capture uncertainty**



National Weather Service

Back Up



AWIPS II

Local Applications



- **Survey – completed August 31, 2007**
 - *4191 local applications identified*
 - *37% critical, 44 % important, 19% less important*
- **Migration plan to address approach based on survey results**
 - *Training requirements and approach to be refined based on survey*
 - *Raytheon to provide sample migration and code samples for approach*
 - *“Integrate with” vice “interface to”*
- **Level of effort required uncertain**
 - *Raytheon estimate that 80% of local apps will be able to be rewritten in Javascript, without extensive programming in the ADE*



AWIPS II



What gets us excited so far...

- **Dynamic load balancing**
 - *Failover handled automatically*
 - *Enables consideration of tailored hardware configurations*
- **Mathematically intensive calculations handed off to the graphics card**
 - *Significant performance improvements*
- **Progressive disclosure of all data**
 - *Imagery via quad tree tiling, grids and observations*
- **Integrated thin client**
 - *Allows baseline solution to be extended to CWSUs, WSOs, and IMETs*
- **Integrated drawing and graphical collaboration**
 - *Tools built into the infrastructure, implemented in 2011*
- **Built in GIS via geotools library**
- **Scripting level access to practically all system level services and functions**
- **LESS CODE**
 - *Potential order of magnitude reduction in amount of software with increase in functionality*



AWIPS II GIS Capabilities



- **GIS functionality integrated into AWIPS II architecture via GeoTools**
- **GeoTools**
 - *Open Source Java code library*
 - *Provides OGC compliant methods for manipulation of geospatial data*
 - *Equivalent to ESRI's arc engine*
- **AWIPS II will support JavaScript access to GeoTools library**
 - *ADE 1.0 supports limited access*
 - *Read, write shape files*
 - *Create GeoTiffs*
 - *Spatial queries of ingested data*
 - *Task Order 10 will deliver full JavaScript access*
- **GeoTools does not make AWIPS a stand alone GIS system**
- **Reference:**
 - *GeoTools home: <http://geotools.codehaus.org>*
 - *GeoTools & Eclipse: <http://docs.codehaus.org/display/GEOT/Eclipse+Developers+Guide>*



AWIPS Evolution Outcomes



- **Short-term (1-3 years)**
 - *Shorten transition of research to operations*
 - *Improve software O&M and technology refresh*
 - *Fewer DRs and TTs*
 - *Focus on hardening and productionizing for life cycle support*
 - *Minimize adverse impacts on operations from software and hardware upgrades*
- **Long-term (3-10 years)**
 - *Increase integration of AWIPS and National Center AWIPS*
 - *Improve performance and functionality of AWIPS*
 - *Improve collaboration at all levels of NWS operations*
 - *Increase access to all environmental data for decision making*



AWIPS Evolution Data Delivery



- **OSIP Project 05-040**
- **Enables “smart push - smart pull” data delivery**
 - *Implements a discovery service within the SOA*
 - *Access to data not available locally*
 - *Freedom from the tyranny of the SBN*
 - *Enables consideration of new data delivery architecture*
 - *What data to you broadcast over SBN?*
 - *What data do you make available on servers?*
- **Schedule**
 - *IWT starting Q4 2007 to define concept of operations and operational requirements*
 - *IOC - 2011 - software implementation for remote data access*
 - *FOC 2012 - enterprise configuration (servers, comms, etc.) that enables remote data access*



AWIPS Evolution Collaboration



- **OSIP Project 05-041**
- **Objective**
 - *Integrated graphical collaboration throughout the NWS Weather Enterprise and beyond*
 - *Phase 1 - Integrated collaboration between all levels of NWS operations*
 - *Phase 2 - Collaboration between NWS offices and other NOAA entities*
 - *Phase 3 - Collaboration between NWS offices and trusted external partners, e.g., Emergency Managers*
- **Schedule**
 - *Phase 1 IOC - 2011*
 - *Phase 2 IOC - 2012*
 - *Phase 2 IOC - 2013*



AWIPS Evolution

Information Generation & Visualization



- **OSIP Projects 05-042 (IG) and 05-021 (Vis)**
- **Information Generation objective**
 - *Re-architect generation of all NWS products and services*
 - *Separation of content generation from formatting and dissemination*
 - *Enable faster response to emerging customer demands*
- **Visualization objective**
 - *Common user interface - standardize User Interfaces across applications*
 - *3-D visualization*
 - *Improve user interfaces based on latest principles and research*







Architectural Compliance



- **Collaboration on Achieving Enterprise Solutions**
 - *AWIPS is the Integrating Element of the Modernized Weather Service*
 - *AWIPS Uses Enterprise Red Hat Linux support contract*
 - *AWIPS Contract supports Climate, Weather and Water, Transportation, and extensible to Coastal and Ocean Resources*
- **Reuse of existing assets**
 - *HazCollect uses AWIPS IT infrastructure for message handling/creation and routing to dissemination systems*
 - *Shared use of NOAA-Net for Wide Area Network in progress*
 - *AWIPS provides NEXRAD visualization and data collection functions*
 - *AWIPS software used by other Government projects - RSA II, WES, FX-Net*
- **Usage of Standards**
 - *Complies with statutory requirements*
 - *Information Quality (Section 515) & Accessibility (Section 508)*
 - *Government Paperwork Elimination Act (GPEA)*
 - *FISMA/NIST Standards and Guidance*



AWIPS Evolution

An EA Perspective



- EA perspective focuses on hydrological and meteorological mission operations
 - *Administrative functions not part of AWIPS*
 - *Supercomputing functions outside of AWIPS*
- AWIPS II compliant with current DMIT data standards
- Some services, e.g., discovery service, not implemented as part of AWIPS II
 - *Will be implemented in the Data Delivery system enhancement*
- Exploring partnerships with other agencies within and outside of NOAA
 - *NESDIS and NPOES NDE*
 - *NASA SPORT and NASA Goddard*





