(N)AWIPS Evolution

Service Enhancements – Center Challenges

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Jason Tuell
Office of Science and Technology

Steve Schotz
NCO

Purpose

- Provide an understanding of the case for change for NAWIPS
- Provide an understanding of the overall AWIPS Evolution Project
- Provide an understanding of the NAWIPS Migration task
- Provide an understanding of the work load for **all** NCEP Centers

AWIPS Evolution
NWS Enterprise Improvements

- More responsive to partner needs – reduce development time of new products by 50%
- Direct and integrated visual collaboration with all levels of NWS operations - National Centers, RFCs, WFOs, WSOs
- Streamlined generation of products in industry standard formats
  - CAP, GIS, etc.
- Expanded access to data for NWS and external partners
  - SBN enhancements, smart push-smart pull
- Improved and integrated incident support for Emergency Managers and DHS
- Better weather support for the FAA at CWSUs through enterprise level integration

NAWIPS Migration
Case for change

- NAWIPS built on mid 1990's architecture
  - Difficult taking advantage of new trends in the software industry
    - Need to deliver products and services in industry and customer centric formats

- Current AWIPS and NAWIPS architectures inhibit collaboration among Centers, WFOs and RFCs
  - Operations integrated at the lowest common denominator
    - Text and fixed graphics products
  - Dependent on conference calls in some cases to exchange information

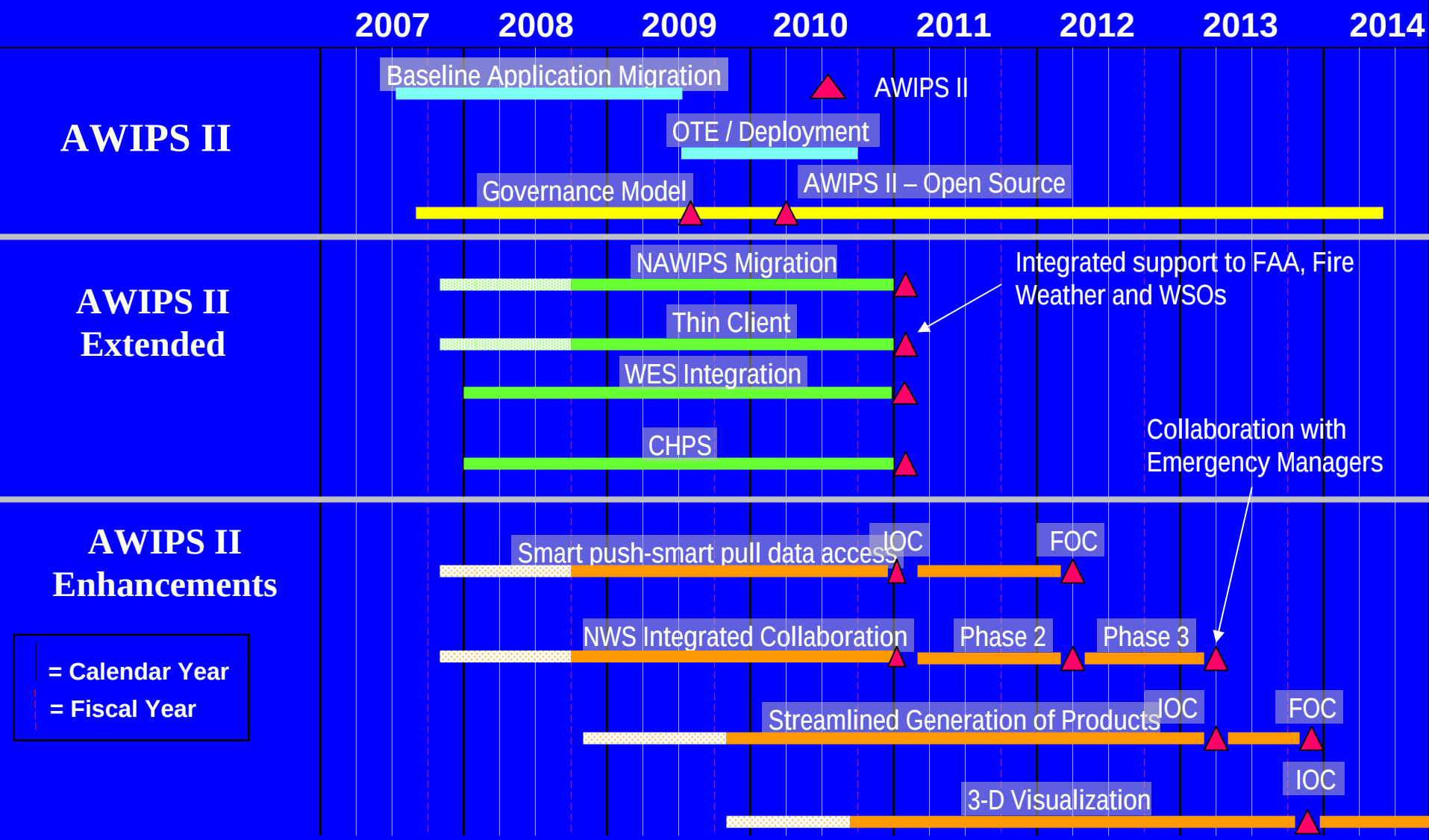
- Budget constraints
  - Duplicative development and introduction of new science
  - Cost of O&M, new science development increasing

NAWIPS Migration
Case for change

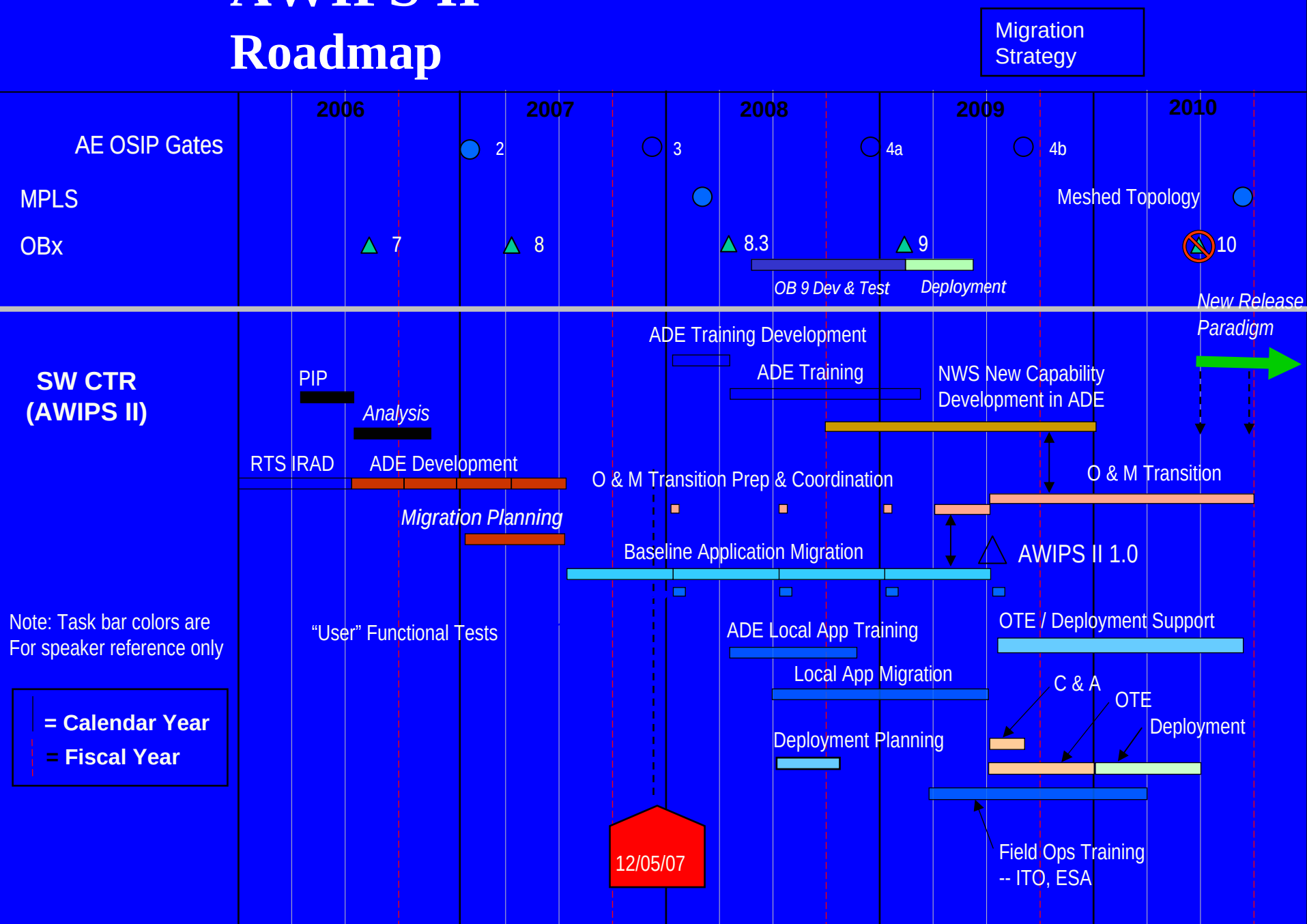
- Free operations from technology constraints
  - Seamless, flexible and extensible weather enterprise that integrates all levels of NWS operations
  - Integrated service delivery via the migration of AWIPS and NAWIPS into a common Service Oriented Architecture
  - Integrated visual collaboration throughout the organization
- Put new science into operations faster – more accurate warnings and forecasts
  - Make same science tools available to all levels of NWS Operations via common algorithm library and tool sets
  - Enable collaborative development between local, national and outside developers
    - Open source – closed community – open up development to local apps developers and those outside traditional development community, e.g. NASA, academia
- Opportunity to leverage NWS AWIPS hardware and centralized support
- No more VTECs

AWIPS Evolution Overview

AWIPS Evolution
Roadmap



AWIPS II Roadmap



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 exploit system capabilities, define limits
  - Tension between unlimited modifications and ability to support the baseline 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 enhances open source implementation
  - Open source – closed community model
  - Path to baseline defined for local and externally developed applications
  - Definition of “sand box” for development and execution of local applications without impacting operations

AWIPS II Infrastructure
What gets us excited…

- Dynamic load balancing
  - Failover handled automatically!!!
  - Takes full advantage of all available hardware
- Significant performance improvements
  - Borrows techniques from video games - mathematically intensive calculations handed off to the graphics card
- Google Earth-like disclosure of imagery, grids and observations
  - Allows zooming in of satellite imagery with full resolution
- Integrated drawing and graphical collaboration
  - Tools built into the infrastructure, implemented in 2011
- Improved reliability
  - LESS CODE - Potential order of magnitude reduction in amount of software
  - Reduced code complexity

NAWIPS Migration

NAWIPS Roadmap

NAWIPS Migration
Responsibilities

- Planning
  - NCO and OST, Center participation requested
  - Some Raytheon support for architectural discussions
- Application Migration
  - NCO migrates NAWIPS with Raytheon support
  - Testing
    - Functional and system testing in partnership with Centers
    - Three major test activities
      - Incremental (“alpha”) field testing of migrated components
      - Field verification and validation – test to break
      - OT&E
- Training
  - Developer training
  - System admin training
- Government (NCO) will maintain migrated NAWIPS applications in AWIPS II era
  - NCO develops new application level functionality
  - Raytheon maintains infrastructure and architecture

NAWIPS Migration
Re-Architecture Approach

- Preserve existing NAWIPS functionality
- Minimize changes to user interfaces – "Grey Box" conversion
  - Minimizes user training of forecasters and administrators
- Leverage use of AWIPS II services, functionality and development tools to optimize migration
  - AWIPS II uses open source projects - No proprietary code
  - AWIPS II is platform independent
- Migrate NAWIPS functionality incrementally to AWIPS II to reduce risk
  - Multiple deliveries planned for FY09 and FY10 for Center testing and evaluation purposes

NAWIPS Migration FY08 Activities

- Goals
  - Gain expertise in AWIPS II technologies and architecture
  - Ensure that AWIPS II architecture can support NCEP requirements
  - Develop NAWIPS migration plan for FY09/10 implementation
    - Utilize Project Management approach
- Activities
  - Take training: SOA, Java, RTS developer
  - Participate on AWIPS II teams : IV&V, IWT testing
  - Conduct NCO-OST monthly coordination meetings to support migration planning
  - Participate in RTS TIMs, including NCEP-specific issues
  - Conduct NAWIPS vs. AWIPS II Gap Analyses
    - Software, hardware, network and data flow
  - Prototype in AWIPS II ADE
    - GUIs, decoders, displays, diagnostics

NAWIPS Migration Issues and Challenges

- NAWIPS moratorium required during migration period
  - Migration complexity – enhancing existing NAWIPS while migrating not practical
  - Resource constraints
- Routine NAWIPS maintenance only
  - Bug fixes only
  - Table, map updates as necessary

NAWIPS Migration Issues and Challenges

- GEMPAK batch processing
  - How do we support batch processing with an interactive system?
  - How do we support batch processing in a super computer environment?
- GEMPAK scripting
  - Will GEMPAK scripts now be JAVAScript?
  - How does this drive training and local application development?
  - What is the impact on transition?
- Conversion of archived data sets to new data standards
- University and Unidata support

NAWIPS Migration Issues and Challenges

- Performance in AWIPS II architecture
  - Handling large global data sets
    - Some testing will be done as part of IVV during the AWIPS II migration
  - Handling number of concurrent users
- Use of AWIPS II vs. NCEP hardware and network infrastructure
  - AWIPS II must support ingest of NCEP unique data sets
  - AWIPS II must scale to support NCEP processing requirements
  - Can we leverage off of AWIPS workstation hardware?
  - Evaluating gaps and deltas between AWIPS and NAWIPS current system implementations

NAWIPS Migration Issues and Challenges

- Organizational
  - Government executes the migration RTS supports AWIPS II Infrastructure
    - How do we get Raytheon to extend/add to ADE if NAWIPS unique infrastructure services are needed?
  - Matrix structure increases project complexity
  - Significant Center workload anticipated

NAWIPS Migration
Issues and Challenges

- Training
  - Will training in NAWIPS be done NWSTD post migration?
    - Rationale: Same architecture, framework implies that training might be combined with AWIPS training.
    - Note: This is a conceptual change, dependent on requirements and funding
- Developer training
  - Should there be joint developer training for NAWIPS and AWIPS developers?
- Local apps
  - How will "local apps" for National Centers be handled?
- Governance
  - Insuring that the Governance model is flexible enough to cover the needs of National Centers
  - Release paradigm, requirements process, etc.

NAWIPS Migration Workload

NCO Migration Workload

- FY08
  - ~ 2 FTE (4 part-time individuals) for planning and coordination
  - Entire NAWIPS team obtaining SOA and Java training
- FY09 – FY10
  - NAWIPS team ~ 17.5 FTEs (5.5 Feds and augmented contractor support - 12 contractors)

Local Application Migration Work Load

- Need to better understand issue
  - Survey coming to define magnitude
- Need assistance of Centers to better understand this problem
  - Number of GEMPAK scripts, enhancements and modifications
  - Not clear extent to which GEMPAK scripts might have to modified

NAWIPS Migration
Training Needs

- Training development and delivery
  - Leverage NWSTD development of AWIPS II training
  - Remote training
- User training
  - Grey box conversion should minimize User Interface training
- Focal point training
  - Training on how to configure and tailor applications
  - GEMPAK scripts?
- Installation and site administration training
  - Installation will change; training required!
  - System administration will change, training required!
  - Different troubleshooting techniques
  - Will leverage and build upon the AWIPS II training

Training

Work Load

- Exploit AWIPS II training already in place
- Developer training
  - Developer workload – highly variable depending on developer familiarity with languages and tools
    - 50-100 hours of pre-cursor distance learning based training
    - JAVA, JavaScript, Eclipse, Mule, Service Oriented architecture principles
  - ADE training -
    - >24-40 hours of distance learning based training per each task order
    - Assume 2-4 months becoming familiar and comfortable with working in the new environment

NAWIPS Migration
Work Load Summary

- AWIPS Evolution and NAWIPS Migration requires significant work on the part of the Government
  - Government resources will be essential to the overall success of NAWIPS migration
  - Challenge in keeping resources available and focused on long term project
- Government participation critical to making Raytheon-Government partnership work

What do we need to do?

- Your help is needed
  - Secure National Center level focus on NAWIPS Migration
  - Need specific help
    - Focal points for planning
      - Attend monthly NAWIPS/OST planning mtgs
    - Test planning and test case development
    - Local application migration planning and execution
    - Prototype testing
  - Review and approve migration plan

NAWIPS Migration can only succeed with a partnership between NCO, Centers, OST and Raytheon

Summary

- AWIPS Evolution planned and funded
  - Migration to AWIPS II underway
  - AWIPS II delivered June 2009
  - Deployment complete FY10
- NAWIPS Migration an essential part of AWIPS Evolution
  - Migration preparation and planning underway
  - Migration FY09 and FY10
  - Deployment complete FY11
- AWIPS Evolution will improve NWS products and Services
- National Center focus and support of NAWIPS migration critical to its success

Back Up

Why Change?

- Case for change briefed to NWS Corporate Board – Nov 2004
- AWIPS Present State Summary – 2004-2007
  - System struggling to keep pace with the demands of new data and new science
  - System falling behind in meeting commitments for new products and services to the partners
  - Software architecture holding AWIPS back
- Corporate board direction to focus on addressing software shortcomings
  - AWIPS O&M re-compete activity shaped by plans developed as a result of Corporate Board direction
  - Raytheon software re-architecture being executed within current budget due to cost savings from O&M
  - Follow on enhancements being funded with projected budget increases in FY09-14

What is AWIPS Evolution?

- AWIPS Evolution
  - Overall project that delivers a modern, robust, flexible and extensible software infrastructure which is the foundation for future system enhancements
- Three major phases
  - AWIPS II – Today's functionality in a new Service Oriented Architecture
  - AWIPS II Extended - A seamless weather enterprise that spans NWS operations
    - Migration of NAWIPS into the AWIPS II SOA
    - Inclusion of Weather Service Offices, FAA (Center Weather Support Units) and Fire Weather via an integrated thin client
    - Community Hydrologic Prediction System (CHPS) – Modern flood forecasting technology integrated into the new architecture
    - Integrated training and case studies
  - AWIPS II Enterprise Enhancements – new enterprise level functionality that enhances operations
    - Improved and more robust data access to handle data from emerging technologies (e.g., NPOES, GOES-R, new models, etc.)
      - "Smart push-smart pull"
      - Katrina satellite WAN back up
      - NOAAPort/SBN bandwidth increases that support internal and external customers
    - Integrated visual collaboration at all levels of the NWS operations out to trusted partners (Emergency Managers)
    - Streamlined generation of products and services
    - Three-dimensional visualization to improve detection of severe weather

AWIPS Evolution
Objectives

- Eliminate the technological constraints that get in the way of operations
  - Create a seamless, flexible and extensible weather enterprise that integrates all levels of NWS operations from National Centers to RFCs to WFOs to CWSUs and WSOs
  - Integrated service delivery via the integration of AWIPS and NAWIPS into a common SOA
- Enhance the data and tools used to improve services and service delivery
  - Smart push- smart pull and SBN enhancements that put more data in the hands of forecasters and external NOAAPort customers
  - Improved collaboration within the NWS and with trusted partners such as Emergency Managers and DHS
  - Stream-lined generation of products and services – creating products that users need in formats (e.g., GIS) they can exploit
- Put new science into operations faster – more accurate forecasts and warnings
  - Enable collaborative development
  - Open source – closed community – open up development to local apps developers and those outside traditional development community, e.g. NASA, academia

AWIPS II
Testing

- Objective: Deliver a system that delivers today's functionality with no impact on operations
- Layered testing strategy
  - Different testing phases overlap – functionality tested multiple times in different settings
  - Significant field participation in testing
- ADE usage
  - Not formal testing, but expect to get feedback as developers use the ADE
- Algorithm Verification & Validation –
  - Assist algorithm choice
  - Verify port of algorithms
- Verification & 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
- Field Evaluation
  - 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

Operational Impacts

- Forecaster
  - Little to no impact anticipated
    - Look & Feel preserved
- ESA/ITO
  - New architecture drives changes to:
    - Release Installations (projected to be easier & shorter in duration)
    - System Maintenance
    - System Troubleshooting
- Application Focal Point
  - Definition of application changes under new architecture
  - Application configuration likely to change
    - Do not know by how much at this time. Better idea around end of calendar year (2007)
- Local Application Developer
  - Local applications need to be migrated to new infrastructure
    - Migration path needs to be determined for each local app
  - New development accomplished within ADE
    - Will need to learn new concepts - object oriented programming, SOA principles
    - Will need to learn new languages -- JAVA script and potentially JAVA --

AWIPS II
Government Workload

- How many people support AWIPS Evolution today?
  - ~80 throughout NWS involved at least part time or participate in discussions
  - Number to grow with expansion of FY08 planning, testing and development activities
- Planning
  - NAWIPS migration
  - Thin client
  - Data delivery
  - Collaboration
- Development
  - Baseline migration (Raytheon)
  - Local Applications migration (Government)
- Testing (Mostly Government)
  - ADE evaluation
  - Verification & Validation
  - Field Evaluation
- Training

Testing
Work Load

- Verification & Validation
  - ~10 FTEs over 50% time each six months
  - Workload will increase with each task order as functionality is added to the system
- Field Evaluation
  - ~1.5 FTEs to set up and maintain each test site
    - Three currently planned
  - Number of field personnel participating only limited by resources
- OT&E planning
  - 6 FTEs used 25% in initial planning
  - Use and test case development will require at least 5-8 FTEs full time over next two years
- OT&E execution
  - ~20-25 WFOs/RFCs/NCs to participate in OT&E
  - OT&E management and oversight - ~10 FTEs