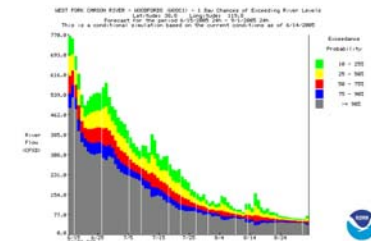
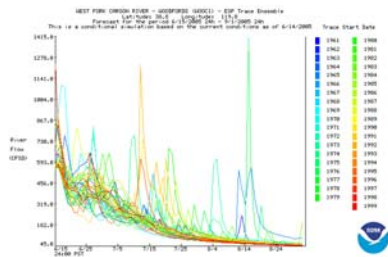


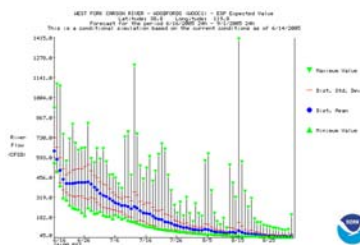
# Experimental Ensemble Forecast System (XEFS)



Prepared by:

The XEFS Oversight Committee

Chris Dietz, Rob Hartman, Mary Mullusky, DJ Seo



Presented at the HIC Meeting, Silver Spring, MD  
24-26 July 2007

# XEFS Team activities Jan-May

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- XEFS Design & Gap Analysis Team chartered by Gary Carter on Jan 3 2007
- Goals:
  - Develop XEFS design
  - Analyze gaps between existing prototype components & desired XEFS
  - Develop a plan to implement within 2 years
- Team held focused discussions on all aspects of operational ensembles January through May 2007
- Report delivered to Gary Carter on May 11, 2007

# XEFS Design & Gap Analysis Team

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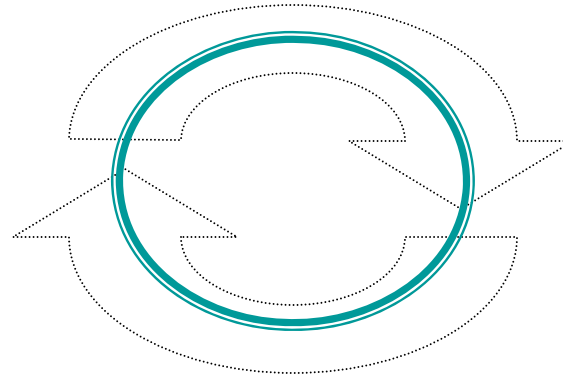
## Team leaders

**Rob Hartman, CNRFC**  
**DJ Seo, OHD/H SMB**



## Services representative

**Mary Mullusky,**  
**OCWWS/HSD**



## RFC representatives

**John Halquist, NCRFC**  
**Bill Lawrence, ABRFC**  
**Joe Ostrowski, MARFC**  
**Steve Shumate, CBRFC**

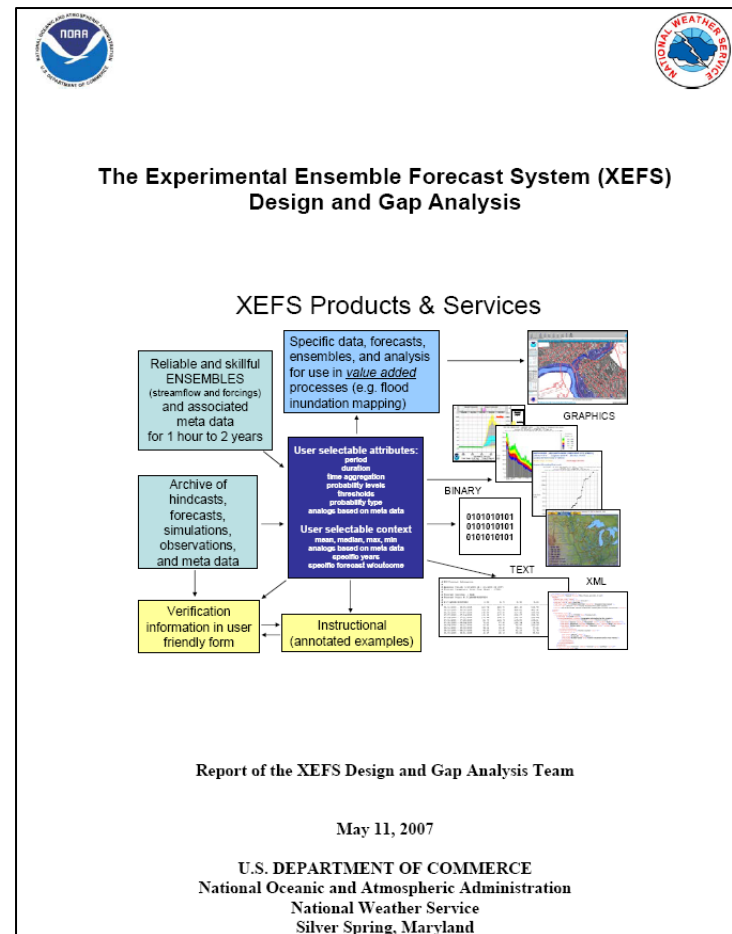
## Software Engineering representative

**Chris Dietz, OHD/HSEB**



# XEFS Report

[http://www.weather.gov/oh/rfcdev/docs/XEFS\\_design\\_gap\\_analysis\\_report\\_final.pdf](http://www.weather.gov/oh/rfcdev/docs/XEFS_design_gap_analysis_report_final.pdf)

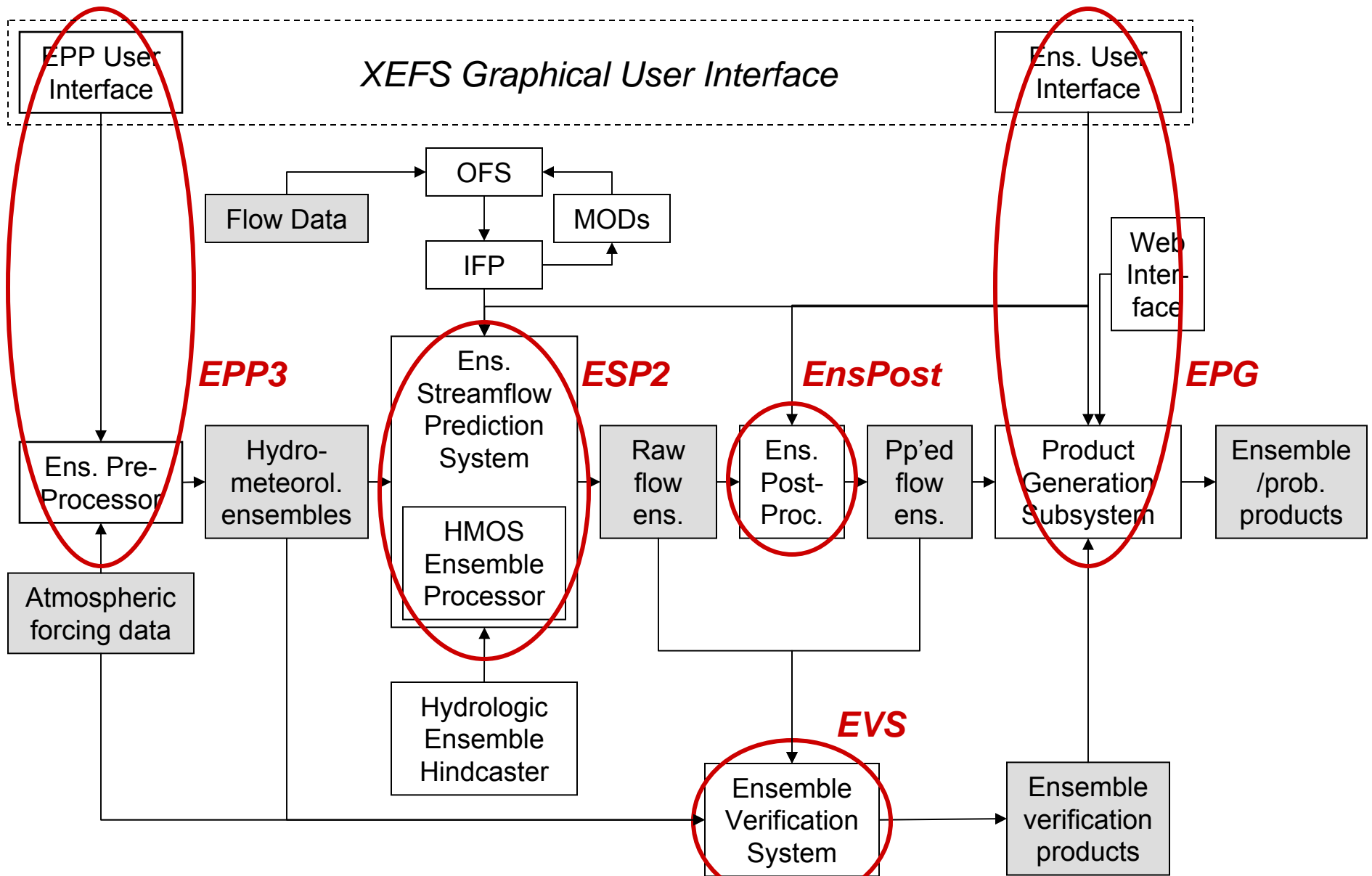


XEFS presentation for HIC  
Meeting 24-26 July 2007

# Report Highlights

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- XEFS will be the ***first step*** towards a fully operational Hydrologic Ensemble Forecasting System (HEFS)
- XEFS achievable in a 2-3 year timeframe
- Activities needed to implement XEFS:
  - Upgrade existing prototype components with additional functionality
    - e.g., Additional verification statistics
  - Extract software from operational environment (e.g., Ensembles Post Processor in NWSRFS) to function in XEFS
  - Systematize prototype software design
    - e.g., migrate away from BFPX to XML
    - Provide uniform access to data transparently
  - Begin new prototyping
    - e.g., MOS-like approach for short-range stream flow ensembles (“HMOS”)
  - Design & develop a single suite of GUIs to be shared across subsystems
  - Provide external users with Web-based access to ensembles
  - Training, training, training



# Final Outcome

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- OHD Director decision: proceed
  - Key: maximize compatibility with CHPS
  - Key: prioritize XEFS above other OHD Software Engineering projects
- Assign Execution Manager:
  - HSEB/Chris Dietz (Project Area Leader for all current CHPS projects)
  - Responsibilities:
    - Develop execution plan to address the gaps identified in report
    - Establish primary work groups
    - Monitor all phases of execution
- Create Oversight Group:
  - HSMB/DJ Seo, RFC/Rob Hartman, OCWWS/Mary Mullusky, HSEB/Chris Dietz
  - Responsibilities:
    - Priority setting
    - Resource allocation
    - Reconcile trade-offs among software architectures, scientific discovery, and user requirements

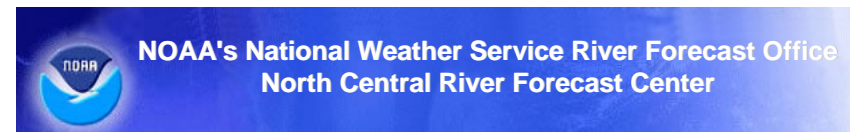
# Participating RFCs

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This effort would not be possible without the support of the following RFCs and their representatives:



***Steve Shumate***



***John Halquist***



***Bill Lawrence***



***Rob Hartman***



***Joe Ostrowski***

# Science-to-Operations Migration Approach

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- Continue with science prototypes at selected sites for now
- Develop strategy for migrating existing prototype software to new architecture
  - Must migrate all prototype software components (HSEB, HSMB)
  - When migration complete, all future prototyping must be conducted using new architecture
- Develop strategy for future continuous migration of R2O

# Science-to-Operations Migration Approach (cont'd)

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Following completion of CHPS-compliant software architecture & design:

- Estimate resources required & schedule → develop Implementation plan (*1<sup>st</sup> draft by end August*)
- Form cross-functional implementation teams
  - Composition to be defined by end August
  - Based on target software architecture
- Begin Implementation (*September 2007*)

# Cross-Functional Implementation Teams

(\*Note: Teams not yet formed)



**TEAM LEAD**



**Software Architect**

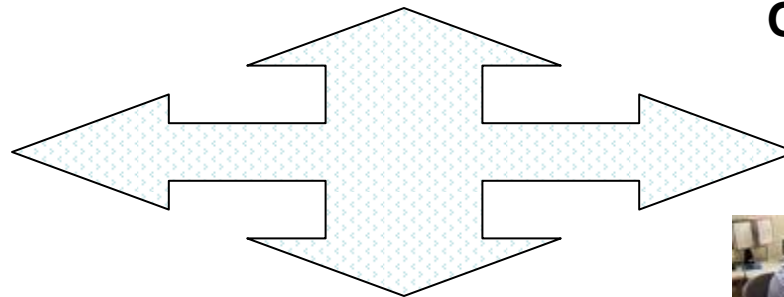
**Sudha Rangan,  
OHD/HSEB**



**Services representative**

**Mary Mullusky,  
OCWWS/HSD**

**Software Engineer**  
**Membership determined  
by Team focus area**



**RFC representative(s)**

**Membership determined  
by Team focus area**

**Source Scientist**  
**Membership determined  
by Team focus area**



# Progress & Status: HSMB

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DJ Seo

OHD HL HSMB

Hydrologic Ensemble Prediction Group

# Progress & Status: HSMB

## Principal and supporting science components

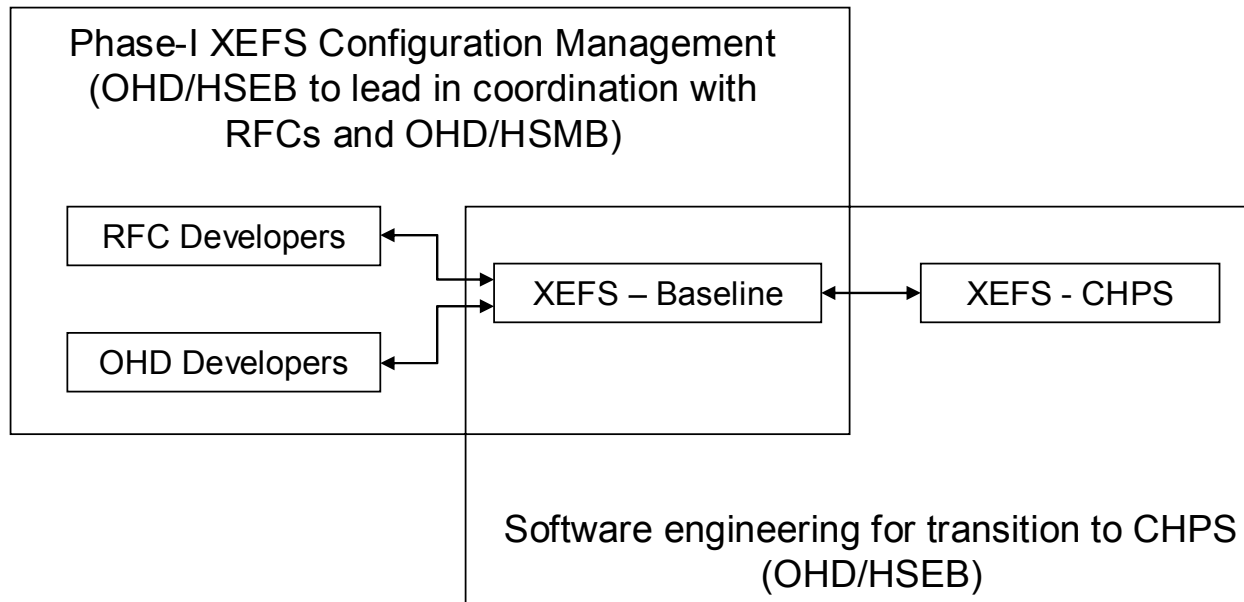
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- Ensemble Pre-Processor (EPP)
  - Latest versions of EPP2 RFC and GFS Subsystems completed (CB-, CN- and MARFCs)
  - Analysis of EPP2 RFC and GFS Subsystems under way for integration into prototype EPP3
- Hydrologic MOS Ensemble Processor (HMOS)
  - Prototype development under way w/ encouraging preliminary results (ABRFC)
- Ensemble Post-Processor (EnsPost)
  - Work resumed this year
  - Enhancement of the current AWIPS version under way
- Ensemble Verification System (EVS)
  - Enhancement of Version 1.0 continuing (CN- and MARFCs)
  - Version 2.0 expected later this year
- Hydrologic Ensemble Hindcaster (HEH)
  - Version 1.0 completed
  - Enhancement continuing (CNRFC)

# Progress & Status: HSMB (cont.)

## Prototype development and science migration strategy

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The Hydrologic Ensemble Prediction (HEP) Group to acquire an additional full-time contractor to support verification and systems management for prototype development

# Progress & Status: HSEB

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Chris Dietz

OHD HL HSEB  
Project Area Leader

# Progress & Status: HSEB

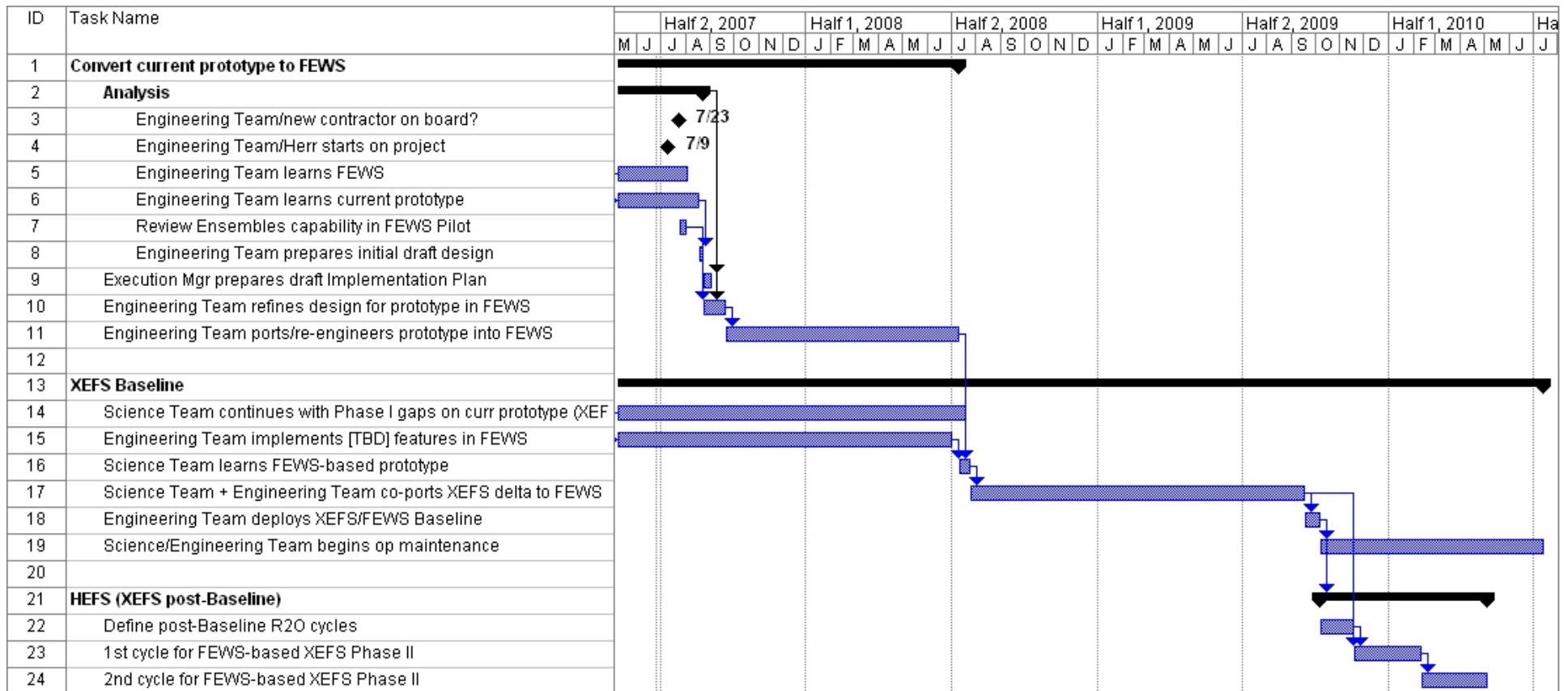
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## Preliminary Planning:

- Analyze/inventory prototype software
  - Identify what exists, where it's deployed
  - Analysis led by HSEB/Sudha Rangan
  - 2 additional full-time Software Engineers as of July 9 (Hank Herr, Freddy Camacho)
  - *Analysis underway; completion expected mid-late August*
- Design CHPS-compatible architecture for XEFS
  - Identify ensembles “services” (re-usable software components)
  - Identify which existing prototype software components should be included for re-use as-is
  - Identify which existing prototype software components should be rewritten to better fit in to the new CHPS environment
  - Identify new software that will need to be developed
  - *Architecture depends on analysis results; initial concepts formed*

# Progress & Status: HSEB (cont'd)

## Preliminary Plan



# Progress & Status: HSEB (cont'd)

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## Key considerations for moving forward:

- GUIs
  - Need to discover the data and capabilities that are required by RFCs
    - Must prototype first – start with EVS GUI?
    - No existing user interfaces meet all of the needs
  - Want consistent “look & feel” across all functional areas of XEFS
  - Need to put energy into this aspect very early in the implementation process
  - Dependency on CHPS-AWIPS II analysis
    - Look and feel of AWIPS II CAVE? Delft-FEWS native GUIs? Other?
- Willingness of RFCs to continue participating

# Questions on this presentation?

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# Open Floor Discussion

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Lead: Tom Graziano

Background: The NWS Uncertainty Requirements for Operations (NURO) team (a sub group of the NWS Forecast Uncertainty Services Evolution (NFUSE) team) is gathering forecaster requirements for uncertainty information.

Discussion Question: Does the XEFS accurately represent RFC forecaster requirements for uncertainty information?