

En Route & Oceanic Program Operations



Federal Aviation
Administration

Perspectives on the NAS Enterprise Architecture

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Agenda

- **Introduction**
- **En Route Automation Modernization (ERAM)**
 - Overview
 - Background - Incremental Deployment Approach
 - Baseline Program
 - Post Release 3 Work Package
- **Enterprise Architecture (EA) from the Service Unit Perspective**
 - Challenges
- **Summary**



Introduction

- **En Route and Oceanic Program Operations**
 - Major Systems
 - En Route Automation Modernization (ERAM)
 - Advanced Technologies and Oceanic Procedures (ATOP)
 - Current focus is on ERAM



ERAM Overview

- Replaces Host Computer system (HCS) and DARC software and hardware, URET, HID NAS LAN, and the communications and support infrastructure
- Upgrades D-POS, R-POS, ECG
- Provides existing functionality and new capabilities to support operational requirements, NAS architecture evolution, and information system security requirements
- Leverages stable developed products resulting in a system of reduced size and complexity, easing future maintenance and upgrades



Incremental Deployment Approach

- 2003 – User Request Evaluation Tool (URET)
 - Provides the basis for ERAM flight data processing (FDP)
 - 90% of URET application software is used in ERAM FDP and Conflict Probe subsystems
- 2004 – En Route Communications Gateway (ECG)
 - Provides connectivity for legacy and new external interfaces and the communications / surveillance LAN infrastructure for ERAM
- 2005 – Enhanced Back Up Surveillance (EBUS)
 - Early deployment of ERAM safety functions on back up channel
 - Utilizes MICRO-EARTS tracker
- 2005 – D-Position Technology Refresh Deployment
 - Provides system management infrastructure and primary channel D-position platform used by ERAM

Build a little, test a little, deploy a little philosophy...



Incremental Deployment Approach (Cont'd)

- 2006 – En Route Information Display System (ERIDS)
 - Offloads non-mission critical functions from core automation
 - Provides electronic access to procedures, approach plates and other reference documents
- 2009 – ERAM Release 1
 - Focuses on HCS replacement to minimize transition risks
 - Adds enhancements to improve safety and efficiency of the NAS
- 2010+ – ERAM Release 2 and Beyond
 - Extensible architecture provides support for NAS modernization, particularly in collaborative decision making, information sharing, integration with traffic flow management (TFM) and incorporation of advanced air traffic management (ATM) applications

Lays the foundation for NextGen capabilities...



ERAM Baseline Program

- **Consistent with the current EA and past EA decision points**
 - Baseline program established in June 2003
- **Currently deploying baseline hardware and SW release R1**
 - Provides upgraded system architecture, new console processors, LAN upgrade/redundancy, etc
 - Replaces legacy HCS hardware
 - *Hardware installation completed at all sites*
 - Applications and support tools ported to new environment
 - *Initial Operating Capability (IOC) achieved at Salt Lake Center Key Site early morning of June 18, 2009*
- **SW release R2 content under review with prime contractor**
 - Candidate release content approved in 2008 (EA DP#118)
 - Key site release expected in 2010
 - Will provide limited new functionality along with maintenance fixes
- **Developing SW release R3 content**
 - Key site release expected in 2011-2012



ERAM Baseline Program (Cont'd)

- **Initial System Enhancements Supporting NextGen**
 - Enterprise services under SWIM Segment 1
 - Spans ERAM releases R2 and R3 with additional in Post R3
 - Flight Data Services: publish/subscribe, create, update, delete
 - Airspace Services: route, sector
 - Integration with Aeronautical Information Management (AIM)
 - ADS-B/Surveillance
 - Initial ADS-B capability for non-radar Gulf of Mexico area (R2)
 - Supports national ADS-B deployment
 - Implements use of ASTERIX data format for surveillance (R3)
 - TFM Reroute
 - Go Button support for pre-departure flights
 - Performance Based Navigation (PBN) Route Processing



ERAM Post R3 Work Package

- **Preparing ERAM Post R3 Work Package**
 - Follow-on to current ERAM baseline program
 - Investment analysis underway
 - Plan to achieve Final Investment Decision (FID) in 2010 (EA DP#31)
 - Developing business case, architecture views, requirements document, and FID artifacts
 - Coordinating work package objectives, establishing cross-domain activities and identifying technical and acquisition dependencies
 - » ***Establishing Service Level Agreements (SLAs) for cross domain coordination***

Collaboration and prioritization are key to success...



ERAM Post R3 Work Package (Cont'd)

- **Projected Post R3 Enhancements**

- Architecture modifications:

- Potential R-side console display monitor and processor technology refresh to support R-side conflict probe
- D-side display, Computer Human Interface (CHI) and processor enhancements to accommodate multiplicity of views/data
 - Supports transformational programs, e.g. Data Comm; NextGen; PBN; ICAO
- Transition to IP interfaces and SWIM where appropriate
 - Retire costly legacy interfaces



ERAM Post R3 Work Package (Cont'd)

- **Projected Post R3 Enhancements**

- Support Separation Management functionality:

- PBN Flight Management Computer (FMC) Offset
- Conflict Probe/Conflict Alert improvements
 - Reduce missed and false alerts
 - Implement conflict probe at R-side position
- Improved D-side CHI for information management
 - Enables management of an increasing amount of information for controllers

- Support Collaborative Air Traffic Management (CATM) functionality:

- Improve flow strategies
 - Share constraint data for flight planning
- Support active aircraft reroute execution

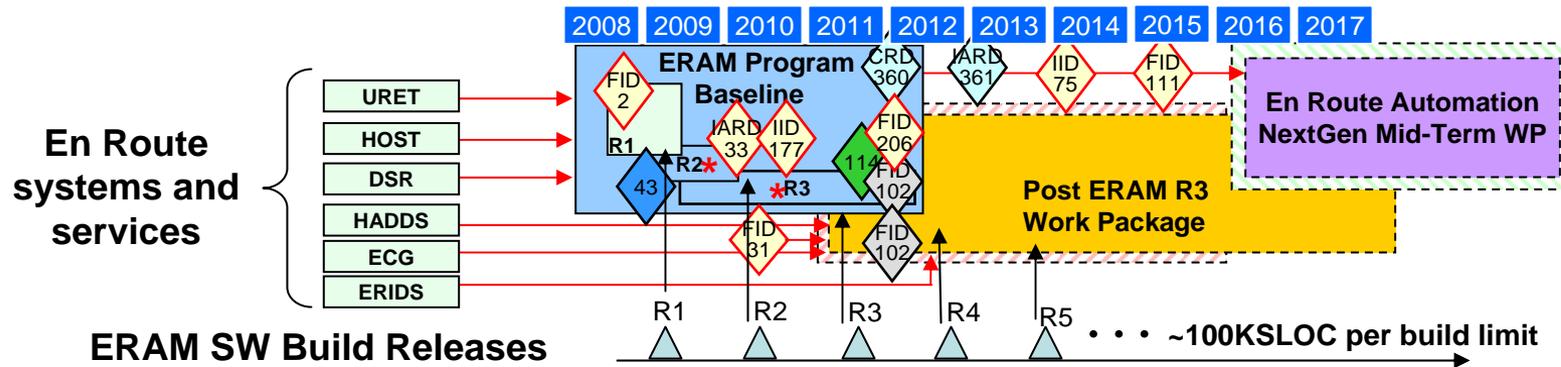
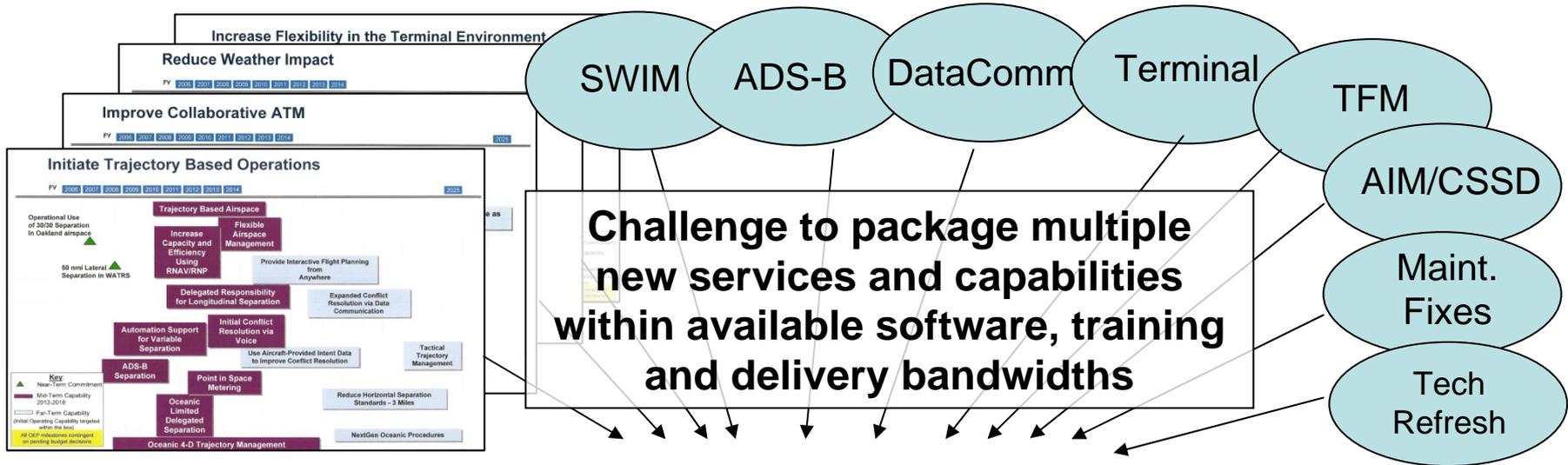


EA from the Service Unit Perspective

- **Enterprise Architecture built on capabilities crossing multiple service units/domains**
- **Planned NextGen improvements require a portfolio management approach to effectively implement capabilities across systems and service units**
 - Full benefits only achieved upon full implementation
- **Service units build incrementally from the bottom up to provide needed capabilities**



Top-Down vs. Bottoms-Up View



Challenges

- **En Route Automation**

- ERAM forms the backbone of desired improvements to the NAS
 - ***SW release content composed of multiple subscribers***
 - Service unit (SW maintenance fixes, technology refresh, basic system improvements)
 - Transformational Programs
 - » SWIM and DataComm are large SW content subscribers
 - NextGen, e.g. separation management
 - SW release bandwidth limitations requires realistic planning and a flexible prioritization scheme
 - Cross-domain synchronization
 - Benefits reliant on timely acquisition and implementation of functionality

Collaboration and agile prioritization planning is paramount



Challenges (Cont'd)

- **Translation of NAS EA concepts into lower level requirements**
 - EA concept development products at varying levels of maturity
 - Concepts of Operation need to be validated prior to handoff to acquisition
 - Benefits analyses need to be complete and requirements well defined
 - Service units left to analyze concepts, develop functional integration methodology, coordinate dependencies with each other, build/plan prototypes and/or demonstrations, and develop build-to requirements
 - NextGen Solution Sets currently not providing multi-domain requirements and benefits data needed to support acquisition
 - AMS better suited for single systems vs. multi-system capabilities



Summary

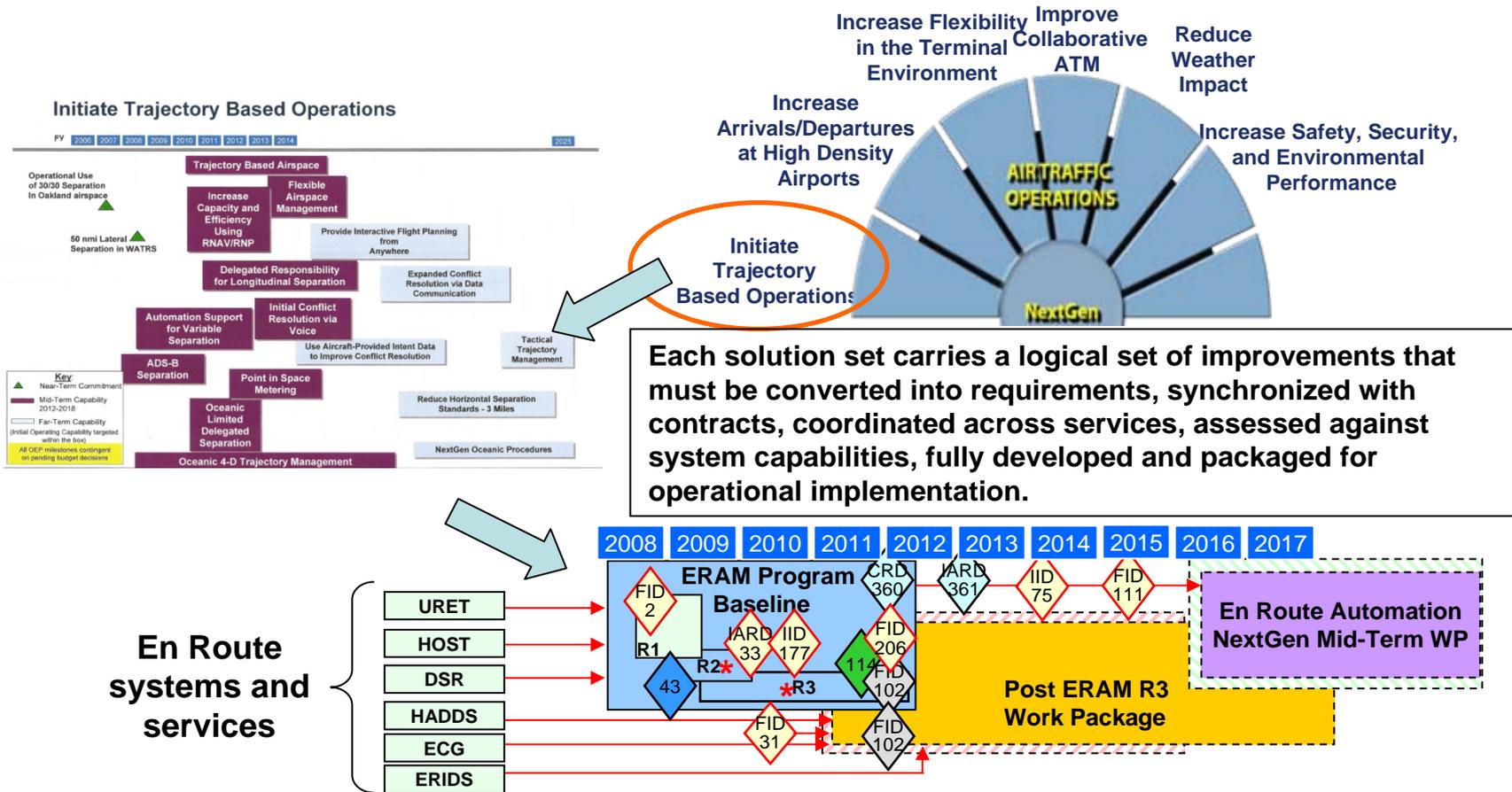
- **EA provides a top level framework for activity coordination**
 - Basis for investment planning and stakeholder involvement
 - Functions as our roadmap to the future
- **Need to ensure acquisition organizations are fully engaged in development of the EA**
 - Prioritization required to address implementation realities
- **Cross-domain coordination and requirements maturity key to effective implementation of capabilities**



Supplemental



Top-Down vs. Bottoms-Up View



Sample of Solution Set Supporting Activities

