Expanding AIMSS High-End IETM Capabilities with *eXpress* and ReasonPro

Logistics Software Development Laboratory
Rob Schwarzberg
Ph: 310-952-4308
E-mail: reschwarzberg@raytheon.com
Web Site: www.raytheonaimss.com

September 22, 2006
Presentation Overview

- IETM Basics
- AIMSS Background
- AIMSS General Authoring Capabilities
- Expanding AIMSS Class 5 Capabilities
IETM Basics

IETM Background

- **IETM Definition by DoD** – “Package of information required for diagnosis and maintenance of a system, optimally arranged and formatted for interactive screen presentation to the end-user.”

- IETM designed for electronic screen display to an end user, and has the following characteristics:
  - Designed and formatted for screen presentation to enhance comprehension
  - Made up of interrelated data that end-user can access in a variety of ways
  - Interactive data provides procedural guidance, navigational directions, and supplemental information
IETM Basics (Cont.)

- **Tri-service IETM Specifications**
  - IETM look and feel requirements (MIL-PRF-87268)
  - IETM content requirements (MIL-PRF-87269b)

- **ETMs and IETMs are classified by their...**
  - **Display:** Presentation of text/graphics to user
  - **Functionality:** User capabilities
  - **Data Format:** Electronic storage of text & graphics

- **There are currently 5 Classes of ETMs/IETMs**
  - Class I through V
  - Or Type I (Class I–III) and Type II (Class IV–V)
Class I through III or Type I

- Static Presentation
- Link Navigation
- Linear Data
- File Management
Class IV and V or Type II

- Dynamic Presentation
- Structured Navigation
- Hierarchical Data
- DBMS

Class IV

Class V

Training

Diagnostics
IETM Basics (Cont.) –
Class 4/5 IETM Benefits

- Allow a user to locate required information faster and more easily than possible with a paper technical manual
- Easier to comprehend since the IETM is specifically configured for the system under diagnosis
- Require less physical storage than paper
- Provide powerful interactive troubleshooting procedures, not possible with paper technical manuals
- Shared data allows for easier update saving time and money
IETM Basics (Cont.) – Class 4/5 IETM Benefits

Proven Value Proposition\(^1\)

– 25-35% less time for maintenance activities
– 50% less time looking for needed maintenance information
– 35% improvement in troubleshooting accuracy
– Minimum 15% improvement in MTTR

\(^1\) Based upon military studies of IETM effectiveness
AIMSS Background

- **Developed in 1992**
  - Presentation system developed under contract to the Navy for the AEGIS Weapon System program
  - Adapted internally-developed expert system tools to support IETM development
  - Applications were integrated in 1993 and sold as a COTS IETM development system

- **Redesigned in 1999**
  - Full MIL-PRF-87269A compliance with partial implementation of draft “b” revision (element-level versioning, XML linking)

- **Today - Market Leader**
  - AIMSS is used on more DoD programs than any other high-end class IV/V IETM development system on the market
AIMSS Programs

- Expeditionary Fighting Vehicle (EFV) – U.S. Marines
- Standard Terminal Automation Replacement System (STARS) – FAA Program
- Landing Platform Dock (LPD) – U.S. Navy
- Rolling Airframe Missile (RAM) – U.S. Navy
- Digital Modular Radio (DMR) – U.S. Navy
- Advanced Synthetic Aperture Radar System (ASARS) – U.S. Air Force
- AN/MPQ-64 Sentinel – U.S. Army
- Wide Area Augmentation System (WAAS) – FAA Program
- AEGIS Weapon System – Various IETMs – U.S. Navy
- Bradley A3 Fighting Vehicle – U.S. Army
- AN/UYQ-70 Advanced Display Systems – U.S. Navy
AIMSS General Capabilities

Integrated Authoring and Runtime Viewer

Structure Editor provides a Hierarchical View of IETM Objects

Built-in IETM Engine keeps track of all Variables and Navigation History

Customizable Tool Bars

WYSIWYG Text Editing

Intuitive Navigational Panel

Fully Integrated Graphics Package
Annotations allow the Authors or End-Users to add comments within the IETM

- Annotations automatically added to the Public Annotation file
- Users can also created individual “private” Annotation files
- Auto Save Session capability allows Users to “Run” an Annotation comment
  - Restores all variable and Navigation History resulting in User Navigating to the Annotation comment location
  - Often used for reviewing IETM content
AIMSS General Capabilities – TOC and Index

- Table of Contents
- Index – includes Author defined Categories
- Index Search Capability
  – Search Performed based on User Preference
AIMSS General Capabilities – In-Line Hyperlinks

- Four kinds of In-Line Hyperlinks:
  - **Holdup**
    - Temporarily display a particular object
  - **Stayup**
    - Displays a particular object in a Window that can be moved around as required
  - **Goto**
    - Used to Navigate to a different location in the IETM and continue IETM flow
  - **Gosub**
    - Used to Navigate to a different location in the IETM then automatically return to the location from which it was launched

- In-Line Hyperlinks can be in Text, Graphics, Tables
AIMSS General Capabilities – Out-of-Line Hyperlinks

- Out-of-Line Hyperlinks are located on the Navigation Panel
- There may be one or more Out-of-Line links on a particular screen
- Similar to an In-Line Hyperlink
  - Supports all four types of links:
    - Holdup
    - Stayup
    - Goto
    - Gosub
- Persistence based on location in Structure where added
AIMSS General Capabilities – Multi-destinational Hyperlinks

- Multi-destinational Hyperlinks are in-line and allow for multiple destinations
- Supports all four types of links:
  - Holdup
  - Stayup
  - Goto
  - Gosub
- Multi-destinational Hyperlinks are supported in Text, Graphics, Tables

- Multi-destinational Hyperlink shown in Graphic with menu activated
AIMSS General Capabilities – Miscellaneous

- **Bookmarks**
  - Used to hold places in the IETM so that they can be returned to at a later time
  - Bookmark file can be saved and restored at a later date

- **Sessions**
  - Each time the IETM is opened and used a session is created
  - Sessions contain all Variable and Navigation History
  - Sessions can be saved and restored at a later date
  - Session files can be shared with other Users or Authors
    - A session file can be restored on another PC using the same IETM database

- **Configuration**
  - Configurations can be saved and restored at a later date
    - Saved file contains all Configuration Variables
  - Configurations can be automatically loaded at start-up
AIMSS General Capabilities – COM Objects

- What is COM? – Component Object Model

- COM objects are like small separate programs or functions that are used inside a larger program or as stand-alone functions

- COM objects allow for embedding or using other objects within the IETM.
  - Calculator
  - Calendar
  - Media player
  - Acrobat Reader

- May also embed function that are never displayed to the User

- COM interface extends AIMSS to provide “true” Class 5 Functionality
COM Interface allows for extending IETM Functionality

AIMSS Author Showing Embedded COM Object

Flash COM Object
Visual Interface

Flash COM Object
shown in Structure
Editor
Expanding AIMSS Class 5 Capabilities

- **DSI International** – Static Test Strategies
  - eXpress

- **Impact Technologies** – Dynamic Test Strategies
  - ReasonPRO
DSI International – Static Test Strategies

- **DSI’s eXpress**
  - Provides capture and diagnostic development with a simple and intuitive graphical design interface
  - Design Capture for both up-front and legacy designs
  - Diagnostics and Testability Analysis
  - Prognostics Design Influence
  - Reliability Engineering Support
  - Maintainability Engineering Support
  - Validation and Verification
  - Sensor Optimization and Trade-off Studies
  - 1553 Bus Modeling
  - Export Diag-ML (XML) Static Fault Trees
    - Currently looking for sponsor to develop this interface
Impact Technologies – Dynamic Test Strategies

Impact’s ReasonPro

- System Perspective Diagnostics
  - Improved fault isolation
  - Enhanced usage of BIT
  - Embedded diagnostic identification
  - Better ambiguity Reduction

- Advanced Reasoning
  - Integration of discrete diagnostics
  - System monitoring
  - At-Wing™ health management
  - Severity assessment and prognostics
  - I-Level enhanced diagnostics
Expanding AIMSS Class 5 Capabilities

Run-Time Operation
Fault Detection and Isolation Reasoning

FD/FI Run-Time
Remediation Reasoning
Fault / Prognostic Knowledge from Operation System

Dynamic Test Strategies
Prognostic Procedure Initialization

Static Test Strategies

Class 5 IETM Fault Isolation Procedures

ReasonPro

Diagnostics
Design Knowledge

X

XML

Diag-ML

ISHM

Raytheon Technical Services Company LLC
Expanding AIMSS Class 5 Capabilities

AIMSS Author Showing Embedded ReasonPro Interface

COM Interface allows for extending IETM Functionality