Joint Warfare System (JWARS)

Update to

DMSO Industry Days

June 4, 1999

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JWARS Office

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Agenda

- Background
- Development Process
- Technical Overview
- Schedule
Background
May 95 - Deputy Secretary of Defense initiated Joint Warfare System (JWARS) development as one component of Joint Analytic Model Improvement Program (JAMIP).

Sep 95 - May 97 - JWARS Office developed prototype to demonstrate feasibility and refine software development process.

Aug 98 - Joint Requirements Oversight Council (JROC) approved JWARS Operational Requirements Document (ORD).
**JWARS Mission**

**Mission:** Develop a state-of-the-art, constructive simulation that will:

- **Provide a multi-sided and balanced representation of joint theater warfare**
- **Be able to assess current and future operational concepts to include JV 2010’s:**
  - Dominant Maneuver, Precision Engagement, Focused Logistics, and Full-Dimension Protection
- **Use C4 and ISR as the foundation for how objects perceive and interact with one another**

<table>
<thead>
<tr>
<th>Users</th>
<th>Applications</th>
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<tbody>
<tr>
<td>• Joint Staff</td>
<td>1. Force assessment</td>
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<tr>
<td>• Services</td>
<td>2. Planning and execution</td>
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<td>• CINCs</td>
<td>– Deliberate planning</td>
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<td>• OSD</td>
<td>– Crisis action planning</td>
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<td>• JTFs</td>
<td>3. System effectiveness and trade off analysis</td>
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<td>• Other DoD org’s</td>
<td>4. Concept and doctrine development and assessment</td>
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<tr>
<td>• Industry</td>
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Warfare Functionality - Summary

- Release 1 (Limited IOC)
  - Include C4, ISR, logistics, and essential functionality in legacy simulations TACWAR and MIDAS.
  - Be capable of replacing TACWAR for force assessment application.

- Release 2 (Full IOC)
  - Provide balanced warfare representation, including C4, ISR, logistics.
  - Be capable of supporting the applications--
    1. Force assessment.
    2. Planning and execution.
  - Be capable of replacing TACWAR and MIDAS.

- Release 3 (FOC)
  - Provide balanced warfare representation, including C4, ISR, logistics.
  - Be capable of supporting the applications--
    1. Force assessment.
    2. Planning and execution.
    4. Concept and doctrine development and assessment.
  - Be capable of replacing legacy simulations CEM, Thunder, ITEM, and SUMMITS.
Software Development Process
**Warfare Functionality Development Process**

*(slide 1 of 2)*

Operational Requirements Document (ORD)

Software Development Threads

### Threads
- Refine warfare functionality
- Functional area-related
- Resource-constrained
- ORD Release 1 threshold: 51 threads
- ORD Release 2 threshold: 72½ threads
- Example thread: “Conduct Defensive Land Operations”

### Thread assignments
- To iterations
  - Release 1: 5 iterations
  - Release 2: 3 additional iterations
- To Problem Domain Integrated Product Teams (IPTs)
  - C4ISR
  - Air and Space
  - Land
  - Maritime
  - Logistics
- Generally 2 threads / IPT / iteration
Warfare Functionality Development Process
(slide 2 of 2)

Operational Requirements Document (ORD)

Software Development Threads

Joint Application Design (JAD)
Developer and Subject Matter Experts
- Refine Thread Intent Statements
- Refine Measures of Effectiveness

FlowCharter CASE tool
- Documents Joint Conceptual Model of Mission Space
- Facilitates knowledge transfer from subject matter experts (SMEs) to object analysts

UML Designer CASE tool
- Supports object-oriented development
- Provides multiple views--object, event trace, dynamic, and data flow.

Flowchart

Start

Development Iteration \( i \)

Mission Space Analysis

Object Model Development

High Level Design

Detailed Design

Data Support, V&V

Implementation

Testing

Fielded Version

JAD

Joint Application Design (JAD)

Smalltalk language
- Object-oriented
- Virtual machine interface
- Just-in-time compilation
- Stop-edit-start capability
- Complete development environment
Collaborative Development Process

• Activities
  – Requirements definition and refinement
  – Design and implementation
  – Data development
  – Verification and validation
  – Test and evaluation -- formal and informal
  – Training and installation

• Participants
  – JWARS Office
  – Joint Data Support
  – Joint Staff
  – OSD
  – Services
  – CINC
Coordination via Internet

- JWARS Primary Web Site
  - Site address: http://www.dtic.mil/jwars/
  - Access control: unlimited
  - Purpose: General information and publications
  - E-mail address for comments: jwars@osd.pentagon.mil

- JWARS Users’ Group Web Site
  - Site address: https://ca.dtic.mil/j-u-g96/
  - Access control: user ID and password
  - Purposes
    - Coordination with users and subject matter experts
    - Help Desk support

- JWARS Working IPT Web Site
  - Site address: https://ca.dtic.mil/vvte.html
  - Access control: user ID and password
  - Purpose: Coordination with V&V and T&E oversight group
Technical Overview
JWARS Architecture
Joint Technical Architecture (JTA) View

### Platform Domain
- Analyst Environment
- Entity Modeler Environment
- Developer Environment

### Problem Domain
- Battle Space Entities (BSEs)
  - Land
  - Air and Space
  - Maritime
  - Mobility & Logistics
  - C4ISR

### Simulation Domain
- Spatial Manager
- Movement Manager
- Interaction Manager
- Environment Manager
- Adjudication Manager
- Event Manager
- Data Repository
- Data Collection Manager
- Simulation Manager

### Application Program Interface

### Application Platform
- ABC Flowcharter
- UML Designer
- VisualAge
- Expert System
- GeoViewer
- Environmental Models
- HLA/RTI
- Oracle
- Global Coord System

### Operating System Services

### External Environment Interface
- Communications
- Information Interchange
- Users
**Distributed System Design**

*(Process View)*

- **JWARS Admin Control System (JACS)**
  - Associates analyst computer to server processors
  - Initiates runs

- **HCI System**
  - Provides interface to analyst, for study set up and postprocessing

- **Simulation System**
  - Performs simulation runs

- **Repository System**
  - Stores and manages data for all runs
Fundamental Problem Domain Component -- Battle Space Entity (BSE)

- BSE -- friendly unit, enemy unit, or major system operating in the battle space

- Top-level decomposition

```
<table>
<thead>
<tr>
<th>Command &amp; Control</th>
<th>Sensor</th>
<th>Resource Manager</th>
<th>Platform</th>
<th>Communications Manager</th>
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</thead>
<tbody>
<tr>
<td>&quot;Thinking,&quot; Planning, Decision Making</td>
<td>Detecting, recognizing, identifying</td>
<td>Controls static data</td>
<td>Location, speed, direction</td>
<td>Communications-based interface to other BSEs</td>
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BSE

Owns or Controls
## Major BSE Types

### Coalition Headquarters

#### Coalition Component Headquarters

<table>
<thead>
<tr>
<th>Operational Headquarters</th>
<th>Operating Forces</th>
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<tbody>
<tr>
<td>- Army Corps, Division, or Brigade</td>
<td>- Land: Maneuver Battalion</td>
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<td>- USMC MEF Forward</td>
<td>- Air: Air Mission Element</td>
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<td>- Air Expeditionary Force</td>
<td>- Space: Sensor Satellite</td>
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<td>- Air Flight Group</td>
<td>- Maritime: Ship, Submarine</td>
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<td>- Carrier Battle Group</td>
<td>Support Forces</td>
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<tr>
<td>- Surface Warfare Commander</td>
<td>- Ground Combat Support and Combat Service Support Organization</td>
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<tr>
<td>- Surface Action Group</td>
<td>- Airbase Support Organization</td>
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<thead>
<tr>
<th>Mobility Forces</th>
<th>Stationary Entities</th>
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<tbody>
<tr>
<td>- Strategic Mobility Aircraft</td>
<td>- Air Installation</td>
</tr>
<tr>
<td>- Strategic Mobility Ship</td>
<td>- Seaport Installation</td>
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...
Schedule
Schedule

<table>
<thead>
<tr>
<th>Year</th>
<th>Prototype</th>
<th>Iterations 1 - 3</th>
<th>Iterations 4 - 5</th>
<th>Iterations 6 - 8</th>
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- **Alpha User Review**
- **Release 1 Testing & Fielding**
- **Release 2 Testing & Fielding**
- **Continued Development toward Release 3**
**Warfare functionality**

- **Strategic Logistics -- MIDAS(-)**
  - Strategic flow from POE to POD
  - Strategic network
  - Simplified APOD and SPOD representations
- **Theater Logistics -- Links strategic logistics to theater operations**
  - Detailed theater network
  - Detailed logistics distribution
- **Perception -- ISR**
  - Provide intelligence information
  - Assess operational situation
- **Operations -- Core TACWAR**
  - Air, land, and sea operations (-)
  - Chemical defensive operations
  - Naval blockade
  - Air, land, and sea C4
  - Detailed Air Tasking Order (ATO)
  - Forcible entry operations (air, land, sea)
  - Theater Missile Defense


**Warfare functionality** (expressed as enhancements to 55 threads)

- **Strategic Logistics -- MIDAS(+)**
  - Improved APOD and SPOD representations
  - Logistics C2
- **Theater Logistics -- Links strategic logistics to theater operations**
  - Restore unit combat capability
  - Allocate sustainment stocks
  - Operational service support
  - Intratheater aerial refueling
- **Perception -- ISR**
  - Completed at 55 threads
- **Operations -- TACWAR(+)**
  - Operational mobility/counter mobility -- land and sea
  - Integrated aerospace defense
  - Raids -- land-based and amphibious
  - Effects of attacks on strategic targets
  - Electronic attack

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* Release 2 Threshold in ORD

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Release 1 Test and Evaluation

Objective

• Ensure that ORD requirements are satisfied

Process

• Beta testing by user test sites, followed by ...
• Operational testing by user test sites, overseen by Services’ Operational Test Agencies (Army lead)

Participating user sites

ODPA&E (SAC)  JS (J-8)  USAF (AFSAA)  USA (CAA)
USN (N81)  USMC (MCCDC)  USCENTCOM  USSOCOM
USTRANSCOM  USPACOM  USFK

Schedule

• September 1999 - March 2000
Summary

- Development process is effective.
- Major contributions are being made by users and subject matter experts.
- Release 1 will begin test and evaluation in September 1999.