MDA is more than tracking an individual ship... it is about understanding the whole maritime environment.

Source: N6 MDA Connectivity, Investment Alternatives for Execution Year and Out, 27 November 06

The MDA DS COI enables the understanding and sharing of data for the “whole maritime environment” Vessels – Cargo – People
The MDA Challenge

Current Tasking: Corresponds with MDA Essential Tasks: Find, ID, track

- Delivery Warehouse
- Data
  - Vessels
  - Cargo
  - People
- Infrastructure
- Receiving Warehouse

Information

Operationally Actionable Intelligence

Gather data from disparate sources:
- Commercial
- Law Enforcement
- Foreign Partners
- Military NTM/ISR

Develop Maritime Domain Awareness:
- Fuse data into information (COP)

Establish Maritime Domain Dominance:
- Exploit anomalies in information to identify operationally actionable intel
Net Centric Data Strategy Goals

- **Visible**: Is an information resource discoverable by most users?
- **Accessible**: Is it connected to the network(s), and are tools readily available to use it?
- **Understandable**: Can it be intelligibly used? Are the semantics well documented?
- **Trusted**: Is the source, accuracy and currency of the resource available to users?
- **Interoperable**: Can it be easily combined or compared with other information or mediated?
- **Responsive**: Is the resource answering user needs? Are robust, direct user feedback mechanisms in place to guide development?
A collaborative group of people that must exchange information in pursuit of its shared goals, interests, missions, or business processes and therefore must have a shared vocabulary for the information it exchanges …

DOD Directive 8320.2

MDA DS COI form
in February 2006
Purpose of the MDA DS COI

• To establish an MDA **information-sharing capability**, employing net-centric applications and services, among the cadre of MDA stakeholders

• The MDA DS COI focuses on creating a data standard supporting the net-centric information sharing across the full spectrum of MDA stakeholders culminating in the visibility, accessibility, and understanding of data on a User Defined Operational Picture (UDOP)

Formed in February 2006
MDA DS COI Approach

MDA Steering Committee

Spiral 1

DMWG
Develop MDA Data Schema & Vocabulary

PWG
Expose MDA data using DMWG schema and vocabulary via web services & NCES

Build Web Services
Test Web Services
Implement Web Services

Fixes for Spiral 1

Spiral 2

DMWG
Develop MDA Data Schema & Vocabulary

PWG
Expose MDA data using DMWG schema and vocabulary via web services & NCES

Build Web Services
Test Web Services
Implement Web Services

Fixes for Spiral 2
What MDA Data First?

- The Automatic Identification System (AIS) is a shipboard broadcast transponder system operating in the Very High Frequency (VHF) maritime band that is capable of sending and receiving ship information, including Navigation (Position, Course, Speed ...), Identification (Name, Call Sign, Length, Beam ...), and Cargo (Draft, Type, Destination ...).
The goal of the DMWG was to produce an MDA community defined vocabulary based on:

- Needs of MDA DS COI stakeholders
  - And the existing schemas within the organizations of the stakeholders
- Initiatives interested in our activities
- International Maritime Organization (IMO) specification for Automatic Identification System (AIS)
- Objectives of the MDA DS COI pilot
- Future plans to accommodate data fusion and aggregation
Vocabulary Development Process

Develop UML Use-Case

Determine Pilot Demonstration

Class Relationship Diagram

Vocabulary Handbook

Auto Generate XSD - XML
Vocabulary Design

UML Use-Case
<xsd:element name="heading">
  <xsd:annotation>
    <xsd:documentation>Heading is measured with respect to true north. Measured in degrees (0 <= heading < 360)</xsd:documentation>
  </xsd:annotation>
  <xsd:simpleType>
    <xsd:restriction base="xsd:decimal">
      <xsd:fracDigits value="1"/>
      <xsd:maxExclusive value="360"/>
      <xsd:minInclusive value="0"/>
    </xsd:restriction>
  </xsd:simpleType>
</xsd:element>
Message

Classification Markings

Collector

Vessel

Time, Location, Vector, Heading, & Rate of Turn

Conveyance

AIS Transponder

Transponder

<?xml version="1.0" encoding="UTF-8"?>
<!-- Sample XML file generated by XMLSpy v2005 U (http://www.xmlspy.com) -->
urn:us:gov:ic:ism:v2"
ism:releasableTo="USA" ism:classification="U" ism:ownerProducer="GBR" ism:disseminationControls="FOUO" ism:releasableToDepartment="DHS">
  <version>0.1</version>
  <timeOrigin>2001-12-17T09:30:47.0Z</timeOrigin>
  <timeReceipt>2001-12-17T09:30:49.0Z</timeReceipt>
  <collector>
    <DataSource>AMRS</DataSource>
    <reportStationID>54a2</reportStationID>
  </collector>
  <conveyance xsi:type="dmwg:Vessel">
    <time>
      <startTime>2001-12-17T09:30:47.0Z</startTime>
      <endTime>2001-12-17T09:30:47.0Z</endTime>
    </time>
    <location locationAttribute="isAtLocation">
      <latitude>26.158</latitude>
      <longitude>80.183</longitude>
      <s-minor>10</s-minor>
      <s-major>10</s-major>
      <orientation>0</orientation>
      <hae>3.1</hae>
      <haeRange>3.1</haeRange>
    </location>
    <vector>
      <courseOverGround>270</courseOverGround>
      <speedOverGround>4.0</speedOverGround>
    </vector>
    <trueHeading>
      <heading>182</heading>
    </trueHeading>
    <rateOfTurn>
      <rate>0.0</rate>
    </rateOfTurn>
    <UID>https://www.notional-amrs.mil/MMSI/304244000</UID>
    <mmsi>304244000</mmsi>
    <transponder xsi:type="dmwg:AIS_Transponder">
      <signal>
        <SignalStrength>3</SignalStrength>
        <navigationalStatus>0</navigationalStatus>
      </signal>
    </transponder>
  </conveyance>
</dmwg:Message>
MDA DS COI Pilot Working Group Charter

- MDA DS COI Pilot Working Group Charter
  - Develop a **repeatable process/capability** to demonstrate MDA COI Services and products (using AIS data), by leveraging Net-Centric Enterprise Services (NCES) within a risk reduction pilot scheduled for Oct 2006.

Defined in
February 2006
MDA DS Pilot Implementation Plan

• MDA DS COI Pilot Implementation Plan
  – Demonstrate a global UNCLAS MDA Data Sharing net-centric capability based initially on multiple Automatic Identification System (AIS) data producers adopting a common (MDA Community) vocabulary and schema.
  – Utilize the DHS Homeland Security Information Network (HSIN) and DOD Net-Centric Enterprise Services (NCES) Early Capability Baseline (ECB) to offer Data Producers and Consumers a single/common seamless methodology for exposing, discovering, publishing and subscribing to UNCLAS MDA data.
MDA DS Pilot Implementation Plan

• MDA DS COI Pilot Implementation Plan
  – Identified four AIS Data Producers:
    • Navy Shipboard Organic
    • Coast Guard Operations System Center (R&D Center Experimental Network – will become NAIS)
    • NMIC/ONI – Automatic Maritime Reporting System (AMRS)
    • DOT / Volpe Center – NAVEUR MSSIS data
  – Business Proposition: Make your data discoverable, understandable and accessible by implementing the MDA Data Sharing Community Vocabulary, NCES Federated Search and Messaging Services, according to the current NCES Early Capabilities Baseline (ECB) standards.
MDA DS Pilot Implementation Plan

- Select a representative cross section of User Defined Operation Picture (UDOP) - visualization tools to view AIS Pilot data
  - iMapData Viewer on HSIN (pre-selected by HSIN)
  - Google Earth on Internet
  - Google Maps on Internet and NIPRNet (NMCI)
  - TV32 on Shipboard ISNS
  - GeoViz and WebCOP as an example of UNCLAS C2 COP

- Visualization demonstration used only to validate the underlying infrastructure

- Implementation methods developed are reusable / sharable (located on the HSIN & DOL MDA Work Spaces)
MDA DS Pilot Implementation Plan

- The Pilot Implementation plan was expressed in two Demonstration Use Cases.
- The ability to:
  - **Discover:** Data made visible and understandable on the GIG by AIS data producers
  - **Access:** Data made accessible on the GIG by AIS data producers

DOD Directive 8320.2
Discovery Use Case

Infrastructure:
- NCES SOA Foundation
- Content Discovery
- DHS Consumers
- DOD Consumers

Data Producers:
- NAIS Aggregation
- ONI - AMRS Aggregation
- MDA DS COI
- Navy Organic AIS Aggregation
- Volpe Aggregation

Data Consumers:
- NCES Federated Search and Messaging Services
- HSIN Portal
- HSIN Identity Store (Portal Authentication)
- Defense Online Portal
- Volpe
- Navy Afloat
- NAIS
- AMRS

SOA Foundation:
- NCES Service Discovery
- NCES Security Service
Global UNCLAS AIS Reporting:
- ~ 135 AIS Receiver Sites reporting
- ~ 1,100,000 “incoming” AIS reports per day (thinned to 5 min reporting by Data Producers)

How do consumers access this data?
Six Demonstration Publishing Channels
Access Use Case

MDA DS COI
Channels
A – NE USA
B – SE USA
C – MED West
D – MED East
E – West USA
F – Other AOI
G – AMRS

NCES Messaging Service

Subscription Request
Messages Received (in COI Vocab)
Subscription Request
Messages Received (in COI Vocab)

Other Apps
Enterprise Application
Other Process

iMapData
Google Maps / Earth

Example

HSIN Enterprise
Unanticipated (authorized) User
MDA DS COI Timeline

Kickoff MDA COI 21-22 Feb 06

Pilot Selected 31 Mar 06

2nd MDA Meeting 13 Jul 06

Pilot UDOP Selection Aug 06

Pilot Demo 17 Oct 06

CNO N6 Demo 14 Dec 06

1st Anniversary 22 Feb 07

WG's Stood up 4 Mar 06

Common COI Vocabulary Delivered 24 May 06

Pilot 3-way NCES "Discovery" Aug 06

Pilot 3-way NCES "Messaging" Sep 06

Define Future Spirals

Funding 5 Jul 06

Spiral 2
DMWG Lessons Learned

• Start small, scale fast
  – Deliver a vocabulary to the Pilot Technical Team in 3-4 months
  – Employ similar techniques to that of eXtreme Programming (XP)

• Develop a use-case-driven vocabulary
  – Not an *uber*-vocabulary
  – Real projects/requirements need to drive schema development

• Identify a core team
  – A “coalition of the willing” that will drive the vocabulary effort

• Leverage existing efforts
  – Don’t reinvent the wheel
PWG Lessons Learned

• Developers can implement net-centric capabilities rapidly
  – Net-Centricity is not difficult and existing resources have the right capabilities
  – Net-Centricity is an extension of existing system development

• Defining smaller increments with clear milestones is imperative
  – Days and weeks, not months and years
  – Identify high-value capabilities and show results early

• Pilot’s are agile endeavors – “be flexible”, but tightly focused on your objectives
Observations

• NCES is “pre-Milestone B”
  – We are early adopters, as defined in the NCES Early Capability Baseline (ECB) program
  – NCES needs to grow and to be scaleable to support the various DOD Enterprises
  – COI Pilots are key in helping NCES mature

• Now is the time for Program of Records to start working their “NCES convergence” strategy
  – Start by making PoR data discoverable….
Successful Completion of Spiral 1

AIS Knowledge Augmentation “Value Added” Service
Feb 07

Historical Archive “Value Added” Service
July 07

Anomaly Detection (proof-of-concept) “Value Added” Service
Aug 07

DECC Hardening, Unified Pub/Thinning Rules
Jan 07

TW07 TRITON & AIS Knowledge Augmentation
Mar 07

Historical Archive Service TBD

Anomaly Detection Service Sept 07

Continue to engage additional data providers / consumers
(vessels – cargo – crew)

Proposed Spiral 2 Tasks – Awaiting Governance Approval
Questions?