Discovery and Reuse of Modeling and Simulation Resources

M&S COI Discovery Metadata Specification & M&S Catalog

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Topics

• Purpose of Discovery
• Need for Consistent Discovery Metadata
• Structure for Describing M&S Resources
• Making Resources Visible
• Summary
Purpose of Discovery

- To find M&S resources (aka, “assets” that can be applied to meet a user requirement
- Reuse is important to M&S users in DoD, industry, and academia (*consider SISO*)
- Discovery is something we try to do everyday (*think of Google*)

"to provide an open forum that promotes the interoperability and reuse of models & simulations"

Discovery of existing M&S resources is critical for effective *reuse* and for reduced duplication
Discovery of Resources

• Discovery the Google way:
  – Web pages crawled / indexed
  – “Associations” (citations, links) interpreted as votes

• Examine / exploit the “metadata within the markup”
  – Web pages have HTML (layout + content + links)
  – What do M&S Resources have?

• Key is to make sense of content vs. keywords

Discovery of M&S resources can best be achieved through a consistent set of relevant metadata
M&S Resources

- **M&S Software** *(implements a model or simulation)*
- **M&S Adjunct Tools** *(data loggers, visualization tools, or interfaces to live systems)*
- **Federations of simulations** *(a named set of interacting federates such as simulations & adjunct tools)*
- **M&S Software Components** *(reusable building blocks used to construct simulations and/or provide functionality)*
- **M&S Services** *(delivers data or interactions in support of M&S)*
- **M&S Data** *(in M&S-useable format / M&S produced data)*
- **M&S Data Models** *(structural metadata for describing M&S data)*
- **Interface Specifications** *(agreement for facilitating communication exchange among M&S Resources)*
- **M&S Software Design Documents** *(plan or specification, which affects / controls function or development of M&S resource)*
Different Views of Metadata

Structural Metadata
- “Rules governing a chunk” - Name, description, data constraints, and relationships of tags used in information resources to delimit one chunk of data from another chunk
- Artifacts where structural metadata is described:
  - XML schemas
  - RDBMS structures
  - taxonomies
- Register in DoD Metadata Registry, use submission package
- About Making things understandable

Discovery Metadata
- Aids in the recall and retrieval of artifacts (M&S resources), such as
  - Adjunct tools (e.g., data loggers)
  - Federations of simulations
  - M&S services
  - M&S data
  - M&S data models
  - Interface specifications
  - M&S software design documents
- Registered in “Metadata Catalogs”
- The Department of Defense Discovery Metadata Specification (DDMS) is the core specification that Communities tailor
- About Making things visible
Consistent Discovery Metadata

- Producers and consumers need a common way to *label* and *describe* M&S resources.

Consistent labeling requires an *agreed upon markup* that is useful for identifying a variety of resources.
Agreed-Upon Markup for Describing Resources

• Need a Markup Syntax -
  – HTML (fixed)
  – XML (flexible)

• Need a Metadata Structure
  – Defines how resources are described
  – Should support variety of resources
  – If XML then XSD (Schema)

Choose the most useful information for describing M&S resources

Some potential XML-based specifications
• Model Id (HLA FOM, BOM)
• DDMS
• M&S tailoring of the DDMS
• Dublin Core
• Roll your own?
M&S COI Discovery Metadata Specification (MSC-DMS)

M&S Resource Types Addressed
1. M&S Software
2. M&S Adjunct Tools
3. Federations of Sims
4. M&S SW Components
5. M&S Services
6. M&S Data
7. M&S Data Models
8. Interface Specifications
9. Design Documents

MSC-DMS is consistent with the DoD Net Centric Data Strategy and represents an M&S COI extension of the DoD Discovery Metadata Specification

M&S Descriptors
- ID
- Title
- Type
- Description
- Dates
- Version
- Security
- Rights
- Releasability
- Associations
- POCs
- Keywords
- Usages
- Media
MSC-DMS Markup (XML Excerpt)

```xml
<?xml version="1.0" encoding="UTF-8"?>
<ms:Resource ms:ID="432">
  <ms:Title ms:value="sim sprocket model"/>
  <ms:Type ms:value="software"/>
  <ms:Description>
    <ms:Text>Software that models space sprockets</ms:Text>
  </ms:Description>
  <ms:Dates>
    <ms:Date ms:type="created" ms:value="2007-08-13"/>
  </ms:Dates>
  <ms:Version ms:value="1.4"/>
  <ms:Releasability ms:value="A: Unlimited distribution"/>
  <ms:POCs>
    <ms:POC>
      <ms:Role ms:value="publisher"/>
      <ms:Person>
        <ms:Name ms:first="Samuel" ms:last="Adams"/>
        <ms:AddressInfo/>
        <ms:Phone ms:type="work" ms:number="555.123.4567"/>
        <ms:Email ms:type="work" ms:address="sadams@sprocket.sims"/>
      </ms:Person>
    </ms:POC>
    </ms:POCs>
  <ms:Keywords>
    <ms:Keyword ddms:value="software"/>
  </ms:Keywords>
</ms:Resource>
```

“only 8 out 15 root elements must be filled in”

Detailed POC structure
Getting Visibility to Resources: 
**The M&S Catalog**

User interested in a resource can learn of availability from multiple repositories w/ single query
How the M&S Catalog Works

Negotiated data exchange agreements with sources determine level of user’s access.
Case #1: General Query - "ITEM"

This is what we want ➔

Army Modeling & Simulation Resource Repository
... Make a Comment Military Item Disposal Instructions and Military Environmental Information Source Data Source - Dataset Initial Submission Date: 03/01/2000. ... www.msrr.army.mil/view_detail.cfm%3FRID%3DDTS_A_1000383 - 18k - - cached

Resource Item Details
Resource Details, Resource Information Domain-Type, DOD/Agency-Model. Template Type, MSRR. Date Registered, 2001-07-05. General Information ... www.msrr.dmso.mil/share/resourceitem/ViewDetails.jsp%3Fresid%3D3391 - 12k - - cached

Resource Item Details
Resource Details, Resource Information Domain-Type, DOD/Agency-Model. Template Type, MSRR. Last Updated By, Msrr Administration. Last Updated, 2008-03-04. ... www.msrr.dmso.mil/share/resourceitem/ViewDetails.jsp%3Fresid%3D3391%26schema%3DMSRR - 13k - - cached

Army Modeling & Simulation Resource Repository
... Army Logistic Support Activity, Major Item Information Center Requisition Validation System REGVAL Data Source - Other Initial Submission Date: 04/23/1998. ... www.msrr.army.mil/view_detail.cfm%3FRID%3DDTS_A_1000010 - 8k - - cached

Integrated Theater Engagement Model (ITEM) (U)
<P>(U) Used to model engagements between platforms in support of analysis, ITEM gives representation sufficient to conduct JMS Assessments and IBR analyses. ... https://jds.paos.osd.mil - 4k - - cached

- Title: Integrated Theater Engagement Model (ITEM) (U)
- Description: <P>(U) Used to model engagements between platforms in support of analysis, ITEM gives
Case #2: Targeted Query: Acronym="ITEM"

Integrated Theater Engagement Model
Used to model engagements between platforms in support of analysis. Model gives representation sufficient to conduct JMS Assessments and IBR Analyses. It is a campaign level model used in the joint arena for strategy assessment and evaluation of force composition and effectiveness.

- Title: Integrated Theater Engagement Model
- Description: Used to model engagements between platforms in support of analysis. Model gives representation sufficient to conduct JMS Assessments and IBR Analyses. It is a campaign-level model used in the joint arena for strategy assessment and evaluation of force composition and effectiveness.
- Sponsor: CNO (N8) Assessment
- Acronym: ITEM
- Releaseability: This resource is UNCLASSIFIED
AFAMS & NMSO: Title Includes “Extended”

Brawler is a Monte Carlo simulation of air combat between multiple...
Brawler is a Monte Carlo simulation of air combat between multiple flights of aircraft. It features detailed, data-driven models of most avionics and weapons systems...
afmsr.afams.af.mil/view_detail.cfm%3FRID%3DMDL_AF_1000009 - 3k - cached

- Title: Extended Air Defense Simulation/Brawler Confederation
- Description: Brawler is a Monte Carlo simulation of air combat between multiple flights of aircraft. It features detailed, data-driven models of most avionics and weapons systems found on modern fighter aircraft. The purpose of confederating EADSIM and Brawler is to capture the effects of the pilot decision process in.
- POC: Resource Coordinator 407-208-5768 afmsrr-rc@afmsrr.afams.af.mil
- Releasability: This resource is available as both Classified and Unclassified.
- Security: NULL

Extended Air Defense Testbed (EADTB) is a stochastic, event...
Extended Air Defense Testbed (EADTB) is a stochastic, event-stepped simulation intended for joint-service, international use. The object-based simulation supports...
afmsr.afams.af.mil/view_detail.cfm%3FRID%3DSMN_AF_1000032 - 5k - cached

- Title: Extended Air Defense Testbed
- Description: Extended Air Defense Testbed (EADTB) is a stochastic, event-stepped simulation intended for joint-service, international use. The object-based simulation supports modeling from the battery/brigade level up to theater-level scope with a high degree of flexibility in detail level and aggregation. It offers a
- POC: Primary Contact Menchaca 505-846-4257 steve.menchaca@kirtland.af.mil
- Releasability: This resource is UNCLASSIFIED
- Security: NULL

Extended Air Defense Simulation
Model Air Defense, Theater Ballistic Missile Defense and limited strike scenario assessment
nmso.navy.mil/index.cfm%3Frid%3DMNS_N_1000021 - 4k - cached

- Title: Extended Air Defense Simulation
- Description: Model Air Defense, Theater Ballistic Missile Defense and limited strike scenario assessment
- Sponsor: Department of the Army
- Acronym: EADSIM
- Releasability: This resource is UNCLASSIFIED
Reach-back from EADSIM to NMSO

Extended Air Defense Simulation

Model/Simulation Submitted: 12/15/1996

Title: Extended Air Defense Simulation
Acronym: EADSIM
Version: 6 Version Date: 8/1/1997
Sponsor: Department of the Army

Narrative: Model Air Defense, Theater Ballistic Missile Defense and limited strike scenario assessment. EADSIM is a workstation-hosted, system-level simulation which is designed to be used by combat developers, material developers, and operational commanders to assess the effectiveness of Theater Missile Defense (TMD) and air defense systems against the full spectrum of extended air defense threats. It provides a many-on-many theater-level simulation of air and missile warfare, an integrated simulation tool to support joint and combined force operations, and a tool to augment exercises with realistic air defense training.

Distribution:
A: Unlimited distribution
**Spiral 1 (FY07/08)**

- **Query / Metadata**

**Spiral 1:** A few source nodes; metadata pushed. Only DoD/CAC.

- Central M&S Catalog
- Stored metadata

**Spiral N**

- **Query / Metadata**
- Web Analysis Tools

**Spiral N:** More nodes; federated search; user analysis capabilities.

- Central M&S Catalog
- Stored metadata
- Federated Search

**M&S Catalog**

**Spiral Development**

**Spiral 2 (FY09)**

- **Query / Metadata**
- Multi-level User
  - Public
  - Non-DoD - Cleared
  - DoD - CAC

**Spiral 2:** More nodes; automated metadata push; multiple user levels.

- Central M&S Catalog
- Stored metadata
- Federated Search
- Remote Users

**Spiral 1:** Low-risk threshold then improve. Plan for future.

Summary

• We explored useful ways to help achieve discovery and reuse of M&S resources

• Enablers
  – MSC-DMS Schema as a way to describe resources
  – M&S Catalog as a way to search across the enterprise

Recommendation:
The M&S Community at large begin taking steps towards cataloging M&S resources in a common way
For More Information

- **MSC-DMS**
  - [www.msco.mil](http://www.msco.mil) (follow link to “Resource Discovery”)
  - Roy Scrudder roy.scrudder@osd.mil
  - Paul Gustavson pgustavson@simventions.com

- **M&S Catalog**
  - Public availability (CAC restricted) planned for mid FY10
    - Kevin Charlow kevin.charlow@navy.mil
    - Dr. Richard Daehler-Wilking r.daehler-wilking@navy.mil

To become a beta tester to integrate your repository with the M&S Catalog contact Dr. Richard Daehler-Wilking