Discovery and Reuse of Modeling and Simulation Assets

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Topics

- Purpose of Discovery
- Need for Consistent Discovery Metadata
- Structure for Describing M&S Resources
- Making Resources Visible
- Understanding Types of Searches
- Summary

MSC-DMS

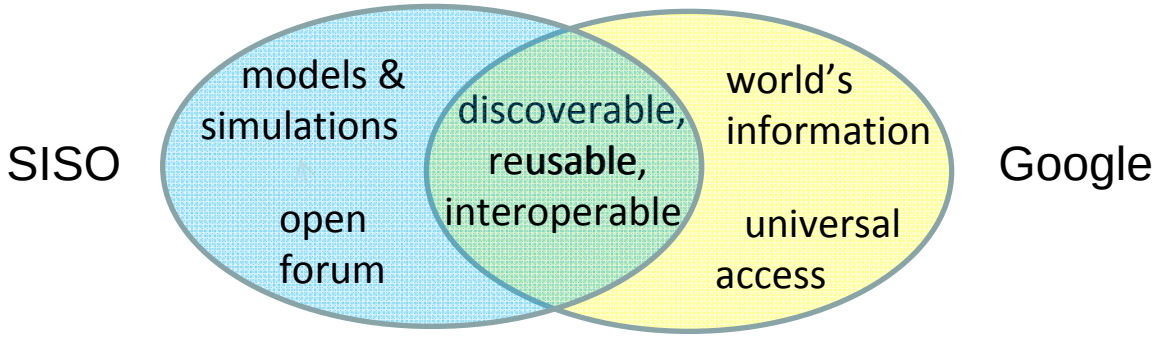
M&S Catalog

Purpose of Discovery

- To find M&S assets (i.e., *resources*) 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)*

= REUSE

"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

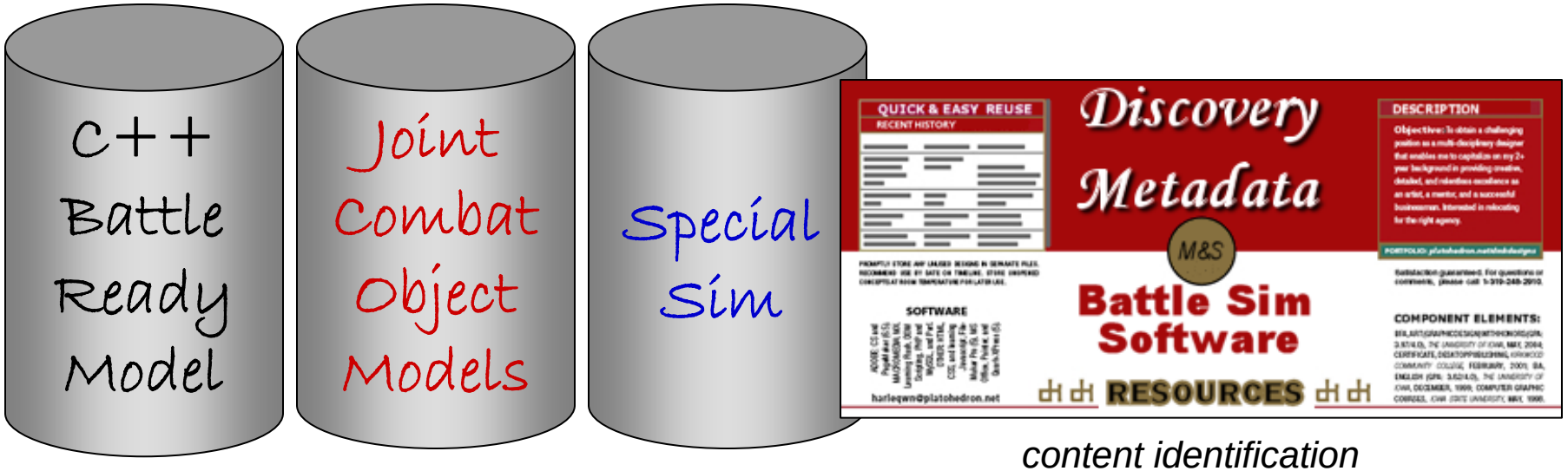
- Discovery the Google way:
  - Web pages crawled / indexed
  - "Associations" (citations, links) interpreted as votes

- 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

Consistent Discovery Metadata

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



content identification

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)*

Some potential XML-based specifications
- Model Id (HLA FOM, BOM)
- DDMS
- MSC-DMS
- Dublin Core
- *Roll your own?*

Choose the most useful information for describing M&S resources

Choosing a Structure:
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

M&S Descriptors

- ID
- Title
- Type
- Description
- Dates
- Version
- Security
- Rights
- Releasability
- Associations
- POCs
- Keywords
- Usages
- Media

MSC-DMS is result of integrating common practices and templates for describing resources

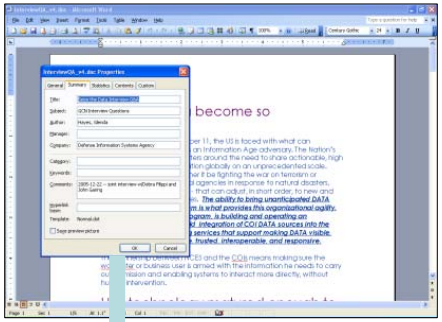
MSC-DMS Markup (XML Excerpt)

```
<?xml version="1.0" encoding="UTF-8"?>
<ms:Resource ms:ID="432”>
  1 <ms:Title ms:value="sim sprocket model"/>
  2 <ms:Type ms:value="software"/>
  3 <ms:Description>
        <ms:Text>Software that models space sprockets</ms:Text>
    </ms:Description>
  4 <ms:Dates>
        <ms:Date ms:type="created" ms:value="2007-08-13"/>
    </ms:Dates>
  5 <ms:Version ms:value="1.4"/>
  6 <ms:Releasability ms:value="A: Unlimited distribution "/>
  7 <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>
  8 <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



consumer

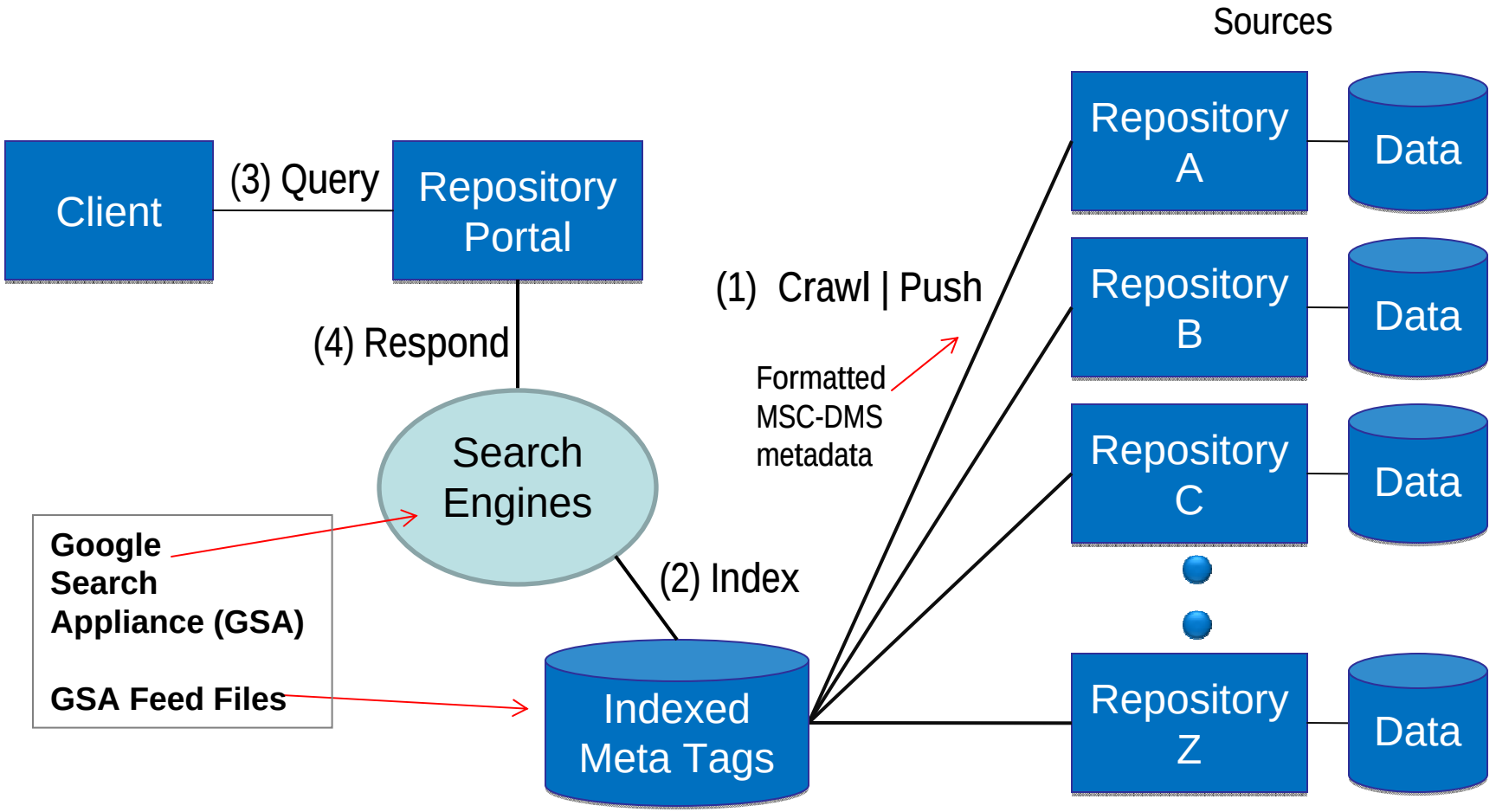
Sources send MSC-DMS formatted records to Catalog

MSC-DMS XML

MSC-DMS XML

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

Example: Adjusting MSC-DMS to Fit GSA* Feed File

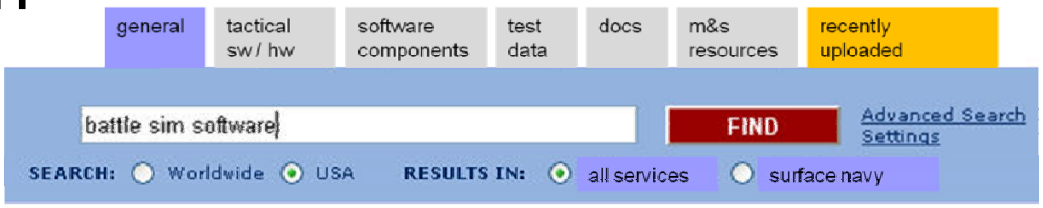
```
<metadata>
   <meta name="title" content="Extended Air Defense
   Simulation - EADSIM"/>
   <meta name="description" content="The Extended Air
   Defense Simulation (EADSIM) is a many-on-many
   simulation of air, missile, and space warfare. It
   is used to support analysis, training, test, and
   operational planning. EADSIM is one of the most
   widely used simulations in the world with over 350
   user agencies worldwide. EADSIM is managed by the
   U.S. Army Space and Missile Defense Command, as the
   Army Forces Strategic Command for the Missile Defense Agency
   (MDA)."/>
   <meta name="POC" content="John Doe (256) 555-1111,
   DSN xxx-1111 E-Mail: john.doe@smdc.army.mil"/>
</metadata>
```

One POC has one tag:

* GSA: Google Search Appliance

Understanding Types of Searches

- Simple Content Search*
- Citation-based Search
  - Points to more material for a search engine to crawl and index
- Weighted-based Search
- Semantic-based Search & others



notional search window

Knowing how searches are performed can help an author/ publisher better describe his/her resources

**Currently supported by M&S Catalog*

What MSC-DMS Elements are most useful by Simple Content Search?

- Required elements
- Optional elements that can also be useful
- M&S Catalog intent on mining these elements

- *Title*
- *Type*
- *Description*
- *Dates*
- *Version*
- *Releasability*
- *POC.Person.Name**, or
- *POC.Organization.Name**
- *Keywords.Keyword*

- *Usage*
- *Media*
- *Security*
- *Rights*

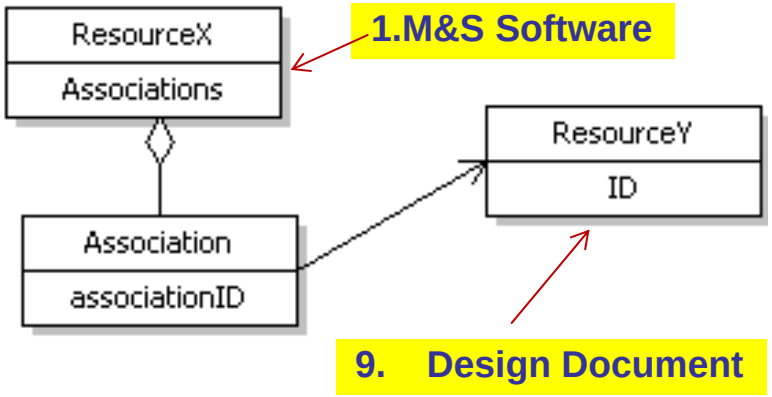
**only one needed (person or organization)*

These are the mine-able MSC-DMS elements that a simple content search can exploit via matching

What MSC-DMS Elements are useful for Citation-based Search?

- Identifies information (such as another M&S resource) related to the M&S resource of interest

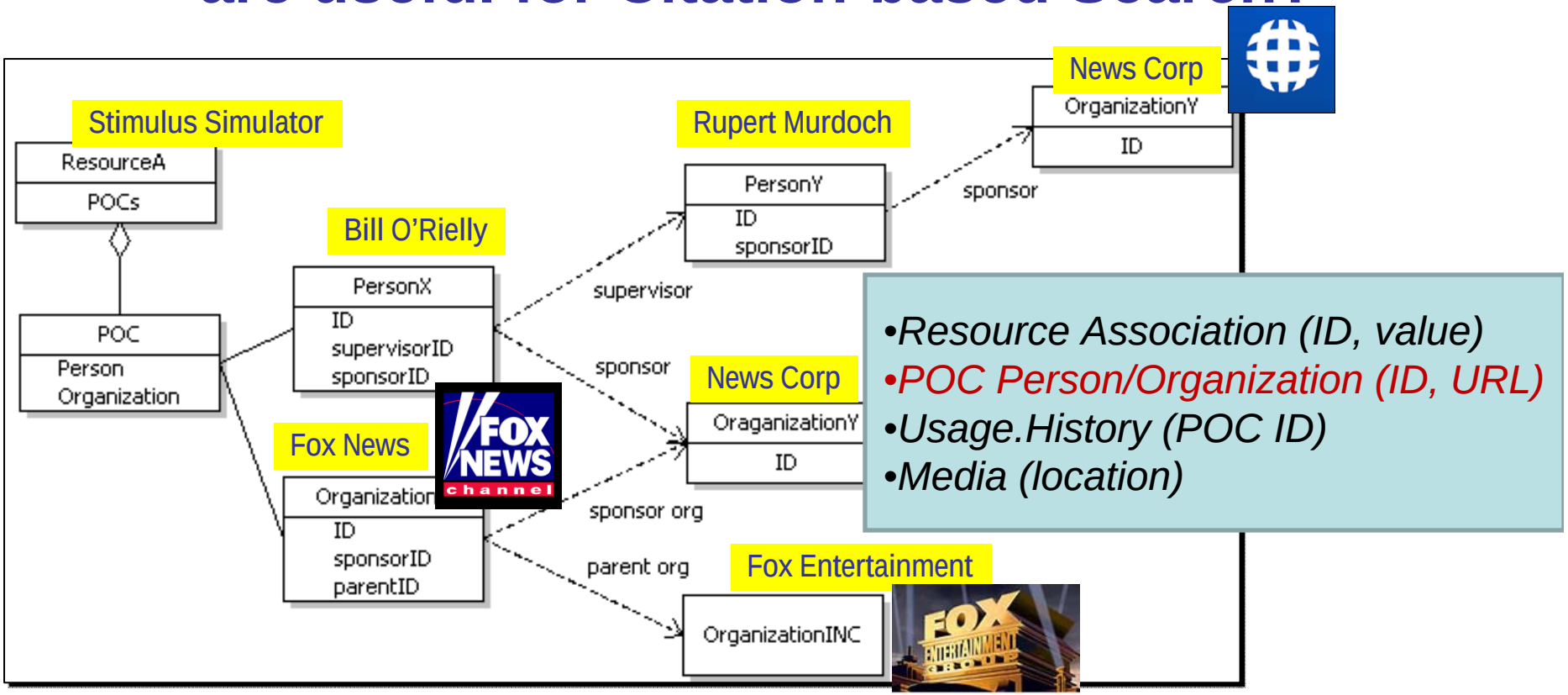
•Resource Association (ID, value)
•POC Person/Organization (ID, URL)
•Usage.History (POC ID)
•Media (location)




```
<Association
   qualifier="URL"
   value="http://www.simsrus.com/BMA1003.xml"
   schemaHref="http://www.simsrus.com/schemas"
   schemaQualifier="na"
   relationship="is-described-by"
   type="related documents"
</Association>
```

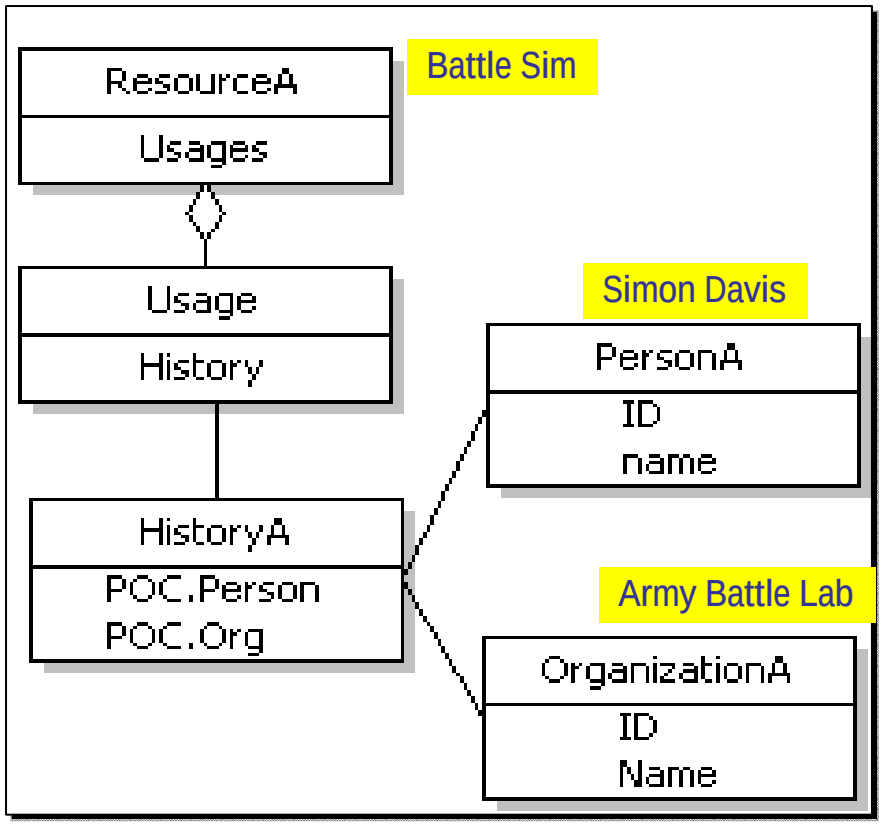
Connections with other *resources* can be identified or referenced within an Association

What MSC-DMS Elements are useful for Citation-based Search?



Connections with other *POCs* (e.g., sponsor, supervisor, parent organization) can be identified within a POC

What MSC-DMS Elements are useful for Citation-based Search?

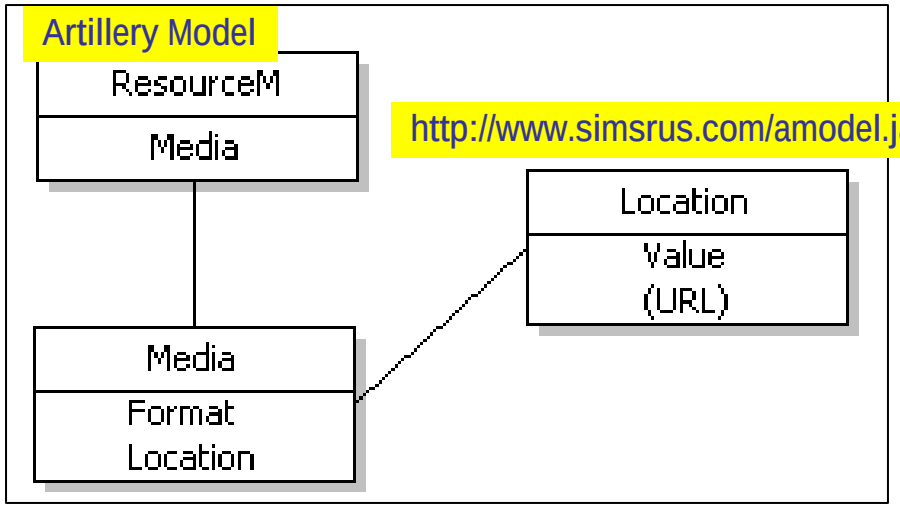


- *Resource Association (ID, value)*
- *POC Person/Organization (ID, URL)*
- *Usage.History (POC ID)*
- *Media (location)*

Connections with other *POCs* that have used the resource can be identified within the Usage History

What MSC-DMS Elements are useful for Citation-based Search?

- *Media* can be used for location and properties of the M&S resource.



- *Resource Association (ID, value)*
- *POC Person/Organization (ID, URL)*
- *Usage.History (POC ID)*
- *Media (location)*

```
<Media>
  <Format>
    <ddms:mimeType/>
    <ddms:extent/>
    <ddms:medium>digital</ddms:medium>
  </Format>
  <Location
value="http://simsrus.com/amodel.jar"/>
</Media>
```

Connections with the *location* of the resource can be identified within the Media content

What MSC-DMS Elements are useful for Weighted-based Search?

- High
  - Title
  - Keywords
  - Usages
- Medium
  - Type
  - Description
  - Dates
  - Associations
  - POCs
  - Media

MSC-DMS Element	Valuation Weight
Title	High
Type	Medium
Description	Medium
Dates	Medium
Version	Low
Security	Low
Rights	Low
Releasability	Low
Associations	Medium
POCs	Medium
Keywords	High
Usages	High
Media	Medium
Glyph	Low

notional weightings

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
  - Various types of searches to lock-in on suitable items

Recommendation: Begin taking steps towards cataloging M&S resources in a common way

For More Information

- MSC-DMS
  - Roy Scrudder roy.scrudder@osd.mil
  - Paul Gustavson pgustavson@simventions.com
- M&S Catalog
  - Dr. Richard Daehler-Wilking r.daehler-wilking@navy.mil
  - Curtis Blais clblais@nps.edu