

Modeling & Simulation Community of Interest Discovery Metadata Specification (MSC-DMS)

Implementation Guide

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Forward

The Modeling and Simulation Coordination Office (M&S CO), which is chartered by the Office for the Secretary of Defense (OSD), is focused on facilitating simulation interoperability across government agencies and communities including testing and evaluation, analysis, and acquisition. There is great interest at the Department of Defense (DoD) and at M&S CO, to support the aid and discovery of M&S assets for these communities and services as directed by the DoD Net-Centric Data Strategy. Discovery is defined as “the ability to locate data assets through a consistent and flexible search.”¹ The DoD Net-Centric Data Strategy (dated May 9, 2003) defines goals and approaches for users and systems to discover and access a wide range of data assets throughout the DoD Enterprise. This document describes the process to document and catalog M&S resources with the necessary discovery metadata to support the net-centric goals of data visibility of M&S assets across the DoD.

Examples are provided using the Extensible Markup Language (XML) which is necessary to create parseable and consistent metacards representing M&S resources.

¹ Deputy Assistant Secretary of Defense, Department of Defense Discovery Metadata Specification (DDMS), Version 1.4.1, August 10, 2007.

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1 Introduction

1.1 Purpose

The purpose of this guide is to familiarize M&S stakeholders with documenting and cataloging M&S resource metacards using the M&S Community of Interest Discovery Metadata Specification (MSC-DMS). Cataloging such resources into MSC-DMS-based metacards provides for greater understanding and reuse of M&S resources and helps fulfill the DoD Net-Centric Data Strategy.

1.2 Scope

The scope of this document is to help producers, consumers, and integrators of M&S resources create and update MSC-DMS metacards pertaining to the following M&S resource types:

1. M&S software (*implements a model or simulation*)
2. Adjunct tools (*e.g., data loggers*)
3. Federations of simulations
4. M&S software components
5. M&S services (*models and simulations implemented as web services*)
6. M&S data (*data in M&S-usable format and data produced by M&S*)
7. M&S data models (*structural metadata for M&S data*)
8. Interface specifications
9. M&S software design documents

1.3 Objective

The objective of this guide is to ensure MSC-DMS schema usage is consistent across the DoD and compatible with various discovery and reuse efforts of producers, consumers, and integrators. Examples are provided using XML syntax, which is required to create MSC-DMS-based metacards.

1.4 Intended Audience

This document is intended for individuals and organizations in the DoD M&S community including government, industry, and academia who support the discovery and reuse of metadata assets used for M&S purposes. Stakeholders in the M&S community can be grouped into three general roles: producers, consumers, and integrators.

Stakeholders	Roles and Responsibilities
PRODUCERS	Develop components tagged and stored in shared space. Metadata is added to a catalog based on registered format.
CONSUMERS	Pull resource of interest, based on producer registered metadata. Share experience.
INTEGRATORS	Understand the data components to build systems and applications.

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2 References

Document	Title
DoD MSC-DMS	Department of Defense (DoD) Modeling and Simulation Coordination Office (M&S CO), "Modeling and Simulation (M&S) Community of Interest (COI) Discovery Metadata Specification (MSC-DMS)," February 18, 2010, Version 1.3
DoDD 8320.2	Department of Defense Directive, Data Sharing in a Net-Centric Department of Defense, 2 December 2004
Task Force on Metadata Final Report	The Final Report of the Association for Library Collections and Technical Services' Task Force on Metadata, 2000
DoD 5000.59-M	"Glossary of Modeling and Simulation Terms," January 15, 1998
Intelligence Community Intelligence Security Marking (IC ISM)	Intelligence Community Intelligence Security Marking (IC ISM), Data Element Dictionary, Version 2.0, 30 April 2004, published by the Intelligence Community Metadata Working Group.
DoD Discovery Metadata Specification	Deputy Assistant Secretary of Defense (Deputy Chief Information Officer), "Department of Defense Discovery Metadata Specification," Version 2.0, 17 July 2008
Glossary of Defense Acquisition Acronyms and Terms	DoD Defense Acquisition University, "Glossary of Defense Acquisition Acronyms and Terms," 12 Edition, July 2005
Net-Centric Environment Joint Functional Concept	DTIC, "Net-Centric Environment Joint Functional Concept," Version 1.0, April 7, 2005, http://www.dtic.mil/futurejointwarfare/concepts/netcentric_jfc.pdf

3 Definitions

Term	Definition
Extensible Markup Language (XML)	A tagging language used to describe and annotate data so it can be consumed by human and system interactions. XML is typically arranged hierarchically using XML elements and attributes. It also uses semantically rich labels to describe elements and attributes to enable meaningful comprehension.
M&S Resource	Services, software, components, federations, adjunct tools, data, interface specifications, design documents, data models, and infrastructures, used in computer-based simulation of operations, or processes which contribute to operations.
Metacard	Holds key information typically in XML format that describes a resource including its purpose and application, and other information including points of contact, creation date, and, if available, usage experience.
Metadata	<p>“Structured, encoded data that describe characteristics of information-bearing entities to aid in the identification, discovery, assessment, and management of the described entities.”²</p> <p>Information describing the characteristics of data; data or information about data; descriptive information about an organization’s data, data activities, systems, and holdings. (DoDD 8320.2)</p>
Net-Centric Environment	<p>A framework for full human and technical connectivity and interoperability that allows all DoD users and mission partners to share the information they need, when they need it, in a form they can understand and act on with confidence, and protects information from those who should not have it.</p> <p>(Net-Centric Environment Joint Functional Concept, Version 1.0, April 7, 2005)</p>

² The Final Report of the Association for Library Collections and Technical Services’ Task Force on Metadata (2000).

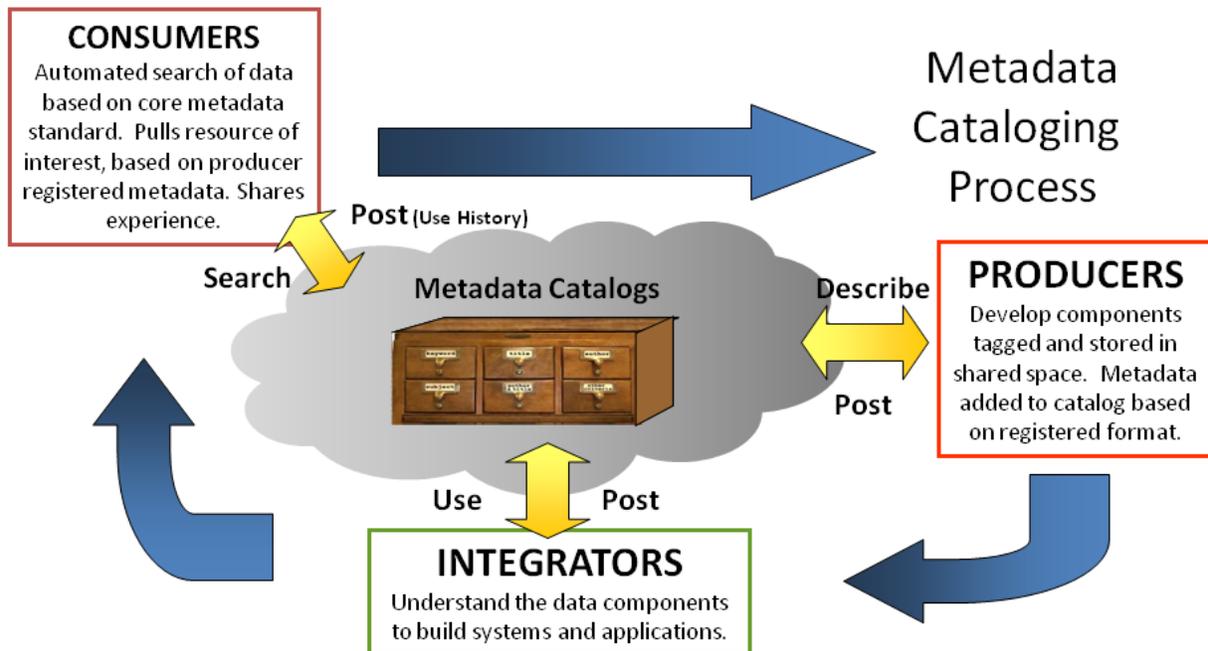
Term	Definition
Schema	<p>A diagrammatic representation, an outline, or a model. In relation to data management, a schema can represent any generic model or structure that deals with the organization, format, structure, or relationship of data. Some examples of schemas are (1) a database table and relationship structure, (2) a document type definition (DTD), (3) a data structure used to pass information between systems, and (4) an XML schema document that represents a data structure and related information encoded as XML. Schemas typically do not contain information specific to a particular instance of data. (DDMS 1.4.1)</p>
Shared Space	<p>A mechanism that provides data storage and access capabilities for users within a given network space. Enterprise shared space refers to a store of data that is accessible by all users within or across security domains on the Global Information Grid (GIG). A shared space provides virtual or physical access to any number of data assets (e.g., catalogs, Web sites, registries, classification networks, document storage, and databases). Any user, system, or application that posts data uses shared space. (DDMS 1.4.1)</p>
Uniform Resource Locator (URL)	<p>A unique identifier used to represent the location of a resource on the Internet.</p>

For additional definitions, see the M&S COI Discovery Metadata Specification.

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4 MSC-DMS Metacard Composition

4.1 Process Overview



A metacard holds key information that describes a resource including its purpose and application, and other information including points of contact, creation date, and, if available, usage experience.

The composition process for developing an MSC-DMS based metacard maps with the DoD Net-Centric Data Strategy. This involves the creation and sharing of M&S resource assets by Producers, the access and integration of M&S resource assets by Integrators, and the utilization and application of M&S resource assets by end-users, known as Consumers. In the sections that follow, this composition process is applied as we walk through a set of robust code samples below using the Extensible Markup Language (XML), which builds upon an example MSC-DMS metacard.

4.2 Understanding and Using Extensible Markup Language (XML)

When a query engine is searching thousands of documents, how does it know where to look for a title, or description? What if there are multiple dates associated to a document? How does the query engine know when it's stumbled upon a creation date or a revision date?

The key is to have a consistent, well-marked metacard. Title, description, dates, points of contact, and even usage history are just a few pre-defined elements laid forth in the MSC-DMS specification. These elements enable a query engine, software program, or an individual to efficiently and effectively discover and catalog M&S resources of interest. M&S metacards, based on the MSC-DMS, are what hold the key information for describing, locating, and using a resource.

Before diving into building metacards, however, it is important to understand that MSC-DMS-based resource metacards are ultimately expressed and captured using the XML. XML uses a set of rules for encoding documents electronically. These rules are marked in a textual data format consisting of XML *declarations*, *elements*, and *attributes* marked by a tag notation that appears in the following example:

```
<?xml version="1.0" encoding="UTF-8"?>
<element attribute="value">
  Content goes here
</element>
```

The first line is an XML *declaration* that provides version and encoding information. The second line identifies both an *element* and *attribute*. Elements are marked by a *start-tag* construct, `<element>`, as shown on line 2, and finished with the *end-tag* construct `</element>`, as shown on line 4. Between these two tags, on line 3, the information to be conveyed is expressed. Additionally, within the *start-tag* element construct *attributes* can be identified, as shown on line 2.

An *empty-element-tag*, `<element/>`, can also be identified if there is no information (either content or sub-elements) provided between a *start-tag* and *end-tag*. Attributes can also be identified within the *empty-element tag* as follows:

```
<element attribute="value"/>
```

Every XML document has exactly one root element. Any additional elements of an XML document are a subordinate to a parent element starting with the root thereby creating a hierarchy of elements.

4.3 Metacard Starting Point

Every MSC-DMS based metacard starts with a single root element called 'Resource'.

```
<Resource/>
```

Resource has multiple attributes and sub-elements that we will explore in a moment. The important matter is to understand what needs to be declared within an XML root element so that it can be properly parsed and used.

The vocabulary and rules for identifying an M&S metacard is defined by the MSC-DMS within an XML Schema. The MSC-DMS XML Schema ensures that an MSC-DMS based metacard meets the rules defined in the specification. The top of the XML metacard must identify the schema within the root element of the document as follows:

```
<Resource
```

```
xsi:schemaLocation=
"http://metadata.dod.mil/mdr/ns/MSCDMS/1.3/MSC-DMS-v1_3.xsd">
```

Additionally, to avoid collisions regarding datatypes and vocabulary, XML applies the use of *namespaces* to clarify elements and attributes. Note the *xsi* label used within the declaration for the schema location above. *xsi* is the namespace prefix attributed to all W3C foundational XML datatypes. In order for *xsi* to be properly recognized in the metacard, the Resource root element needs to identify its namespace as follows:

```
<Resource
xsi:schemaLocation=
"http://metadata.dod.mil/mdr/ns/MSCDMS/1.3/ MSC-DMS-v1_3.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
```

There are other namespaces used as well for MSC-DMS-based metacards including a namespace specifically for the MSC-DMS, identified by the prefix *ms*, a namespace for the DDMS, identified by the prefix *ddms*, and, finally a namespace for recognizing security attributes, identified by the prefix *icism*. These namespaces are identified as follows:

```
<?xml version="1.0" encoding="UTF-8"?>
<ms:Resource
xsi:schemaLocation=
"http://metadata.dod.mil/mdr/ns/MSCDMS/1.3/ MSC-DMS-v1_3.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:ms="http://metadata.dod.mil/mdr/ns/MSCDMS/1.3/"
xmlns:ddms="http://metadata.dod.mil/mdr/ns/DDMS/2.0/"
xmlns:icism="urn:us:gov:ic:ism:v2"/>
```

Note in this example, the root node, *Resource* is now also marked at the beginning with the namespace prefix *ms*. This is so that the XML parser can properly understand and validate the vocabulary and rules for the MSC-DMS metacard starting with the root element.

If you were to take this XML snippet and load it into an XML parser, it would probably not fully validate. The reason is because there are some mandatory sub-elements that need to be identified for every MSC-DMS based metacard. The core elements and attributes defined within the resource element set include the following:

- Resource ID
- Metacard ID
- Taxonomy
- Title*
- Type*
- Description*

- Dates*
- Version*
- Rights
- Releasability*
- Security
- Associations
- POCs (points of contacts)*
- Keywords*
- Usages
- Media
- Glyph
- Taxonomies Cited
- Extensions

Those items marked with an asterisk (*) are mandatory elements and are necessary for every MSC-DMS-based metacard. These core mandatory and optional elements are explored individually in Section 5.

Additionally, the MSC-DMS provides a means to document supplemental items that are not necessarily core, which are provided under the Extensions element identified above. These include things such as the following:

- Virtual Coverage
- Temporal Coverage
- Geospatial Coverage
- HLA (High Level Architecture)Coverage
- VVA (Verification, Validation, and Accreditation) Coverage
- Configuration Management

Each of these supplemental elements is explored in Section 6.

Section 7 describes how metacards may be updated with additional information when they are used by community members.

5 MSC-DMS Core Element Sets

Order is important in an XML document. Each of the Core items identified below, if required, or used, must be provided in the order required by the schema. Otherwise, if the metacard provides these elements out of sequence, the XML metadata may not parse properly resulting in an invalid XML document. Every attempt has been made to show consistency with this order to encourage the proper creation of valid XML metacards.

5.1 Resource ID & Metacard ID attributes (optional)

One of the specific MSC-DMS attributes that can be identified within the Resource root node is an identifier called **resource_ID** as shown in the following listing.

```
<ms:Resource ms:resource_ID="0BFC70E9-02FD-AFB0-1F1A5E8848951FAF"  
ms:metacard_ID="1E238CAA-F1C3-00DE-81BB345A064F27DD"  
xsi:schemaLocation="http://metadata.dod.mil/mdr/ns/MSCDMS/1.3/  
MSC-DMS-v1_3.xsd"  
xmlns:ddms="http://metadata.dod.mil/mdr/ns/DDMS/2.0/"  
xmlns:ms="http://metadata.dod.mil/mdr/ns/MSCDMS/1.3/"  
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  
xmlns:icism="urn:us:gov:ic:ism:v2">
```

A resource record may be marked by a unique identifier to support cross referencing by other resources and for the benefit of organizing data by one or more repositories. This should not be confused with version number, or document number. The ID provides a way to uniquely distinguish a resource allowing it to be referenced and used by community members. As described in Section 5.10, other M&S resources with metacards can define *associations* to other M&S resource assets or support assets. The ID provides a reference point to such associated resources. IDs are also used to identify POC organizations and persons, which are discussed in Sections 5.11.1 and 5.11.2 respectively.

A second MSC-DMS specific attribute that can be identified within the Resource root node is an identifier called **metacard_ID** as shown in the example above. The **metacard_ID** attribute performs the same function as the **resource_ID** attribute except it applies to the metacard itself. This allows associations to be made that involve the metacard rather than the actual resource.

It may be possible for the **resource_ID** and **metacard_ID** to have corresponding IDs. For those creating resources and/or generating metacards, please check with the practices of your organization or the repository/catalog for which you are posting your resource and resource metacard.

One of the tools available to help define a unique ID is a web service known as UUID Generator (<http://www.uuidgenerator.com/>). Neither the MSC-DMS, nor this Implementation Guide, mandates the use of this service or another similar service. It is the responsibility of the individual and their organization to identify by what means ID shall be distributed and received. The policy and practice for

attaining such IDs may be provided and addressed by the repository and repository portals for which an individual and their organization wishes to participate.

5.2 Taxonomy attribute (optional)

Another MSC-DMS specific attribute that can be identified within the Resource root node is called **taxonomy** as shown in the following listing.

```
<ms:Resource ms:resource_ID="0BFC70E9-02FD-AFB0-1F1A5E8848951FAF"  
ms:metacard_ID="1E238CAA-F1C3-00DE-81BB345A064F27DD"  
ms:taxonomy="Missile_Defense"  
xsi:schemaLocation="http://metadata.dod.mil/mdr/ns/MSCDMS/1.3/  
MSC-DMS-v1_3.xsd"  
xmlns:ddms="http://metadata.dod.mil/mdr/ns/DDMS/2.0/"  
xmlns:ms="http://metadata.dod.mil/mdr/ns/MSCDMS/1.3/"  
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  
xmlns:icism="urn:us:gov:ic:ism:v2">
```

Any element within an MSC-DMS based metacard, which describes or reflects unique semantic information, can be marked by a specific taxonomy identifier to increase semantic interoperability. For example, if the taxonomy was specified as 'hydrology' and an element or attribute had a value of 'tank', it would be easier to understand that this was not a military tank but a holding vessel. The value of the taxonomy attribute should match with an identifier value associated within a Taxonomy Cited (see Section 5.17). The MSC-DMS elements that can be marked by a **taxonomy** attribute include **Resource**, **Title**, **Type**, **Description**, **Security**, **Associations**, **Keywords**, **Usage**, and **Media**.

5.3 Title (required)

The first XML core element is '**ms:Title**'. All text following the tag name (**ms:Title**) contained within brackets is an attribute. **ms:value** contains the resource name, which is "REx" in the example resource below.

A name, or names, assigned to the resource, it will be the name or names the resource is known by. The title element itself has four attributes and two elements. The XML portion of a resource with only a title would look like this below. For the sake of clarity, the namespace declarations and other **Resource** attributes have been omitted.

```
<ms:Resource>  
  <ms:Title ms:value="REx" />  
</ms:Resource>
```

In addition to value, the other attributes are subtitle, acronym, document number, and taxonomy. They allow a publisher to enrich resource title information and enhance searchability.

- **Subtitle** is an alternative name for the document, or provides amplifying information about the resource
- **Acronym** is another way in which the document might be known
- **Document Number** is an alpha numeric ID for an information resource assigned by the configuration manager
- **Taxonomy** is a way to specify a context for the Title information

```

<ms:Resource>
  <ms>Title
    ms:value="REx"
    ms:subtitle="RobustExample"
    ms:acronym="REx"
    ms:documentNumber="RE_342.34"
    ms:taxonomy="ExampleContext">
  </ms>Title>
</ms:Resource>

```

There are two additional sub-elements that can be included in the **Title** element as well. They include the following components:

- **Releasability** states the releasability of the title information
- **Security** states the security information of a resource.

These two components will be explained further later in the document but are shown in the following title tag example.

```

<ms:Resource>
  <ms>Title ms:value="REx" ms:subtitle="RobustExample" ms:acronym="REx"
    ms:documentNumber="RE_342.34" ms:taxonomy="ExampleContext">
    <ms:Releasability ms:value="A: Unlimited distribution" />
    <ms:Security />
  </ms>Title>
</ms:Resource>

```

For a more extensive reference, including definitions of attributes, please refer to the MSC-DMS v1.3 specification. The next step is to explore what the code looks like when types are added to the metacard.

5.4 Type (required)

As described within the MSC-DMS, there are nine types of M&S resource assets that can be described by metacards. These include the following enumerations:

```

software,
tool,

```

```
federation,  
software_component,  
services,  
data,  
data_models,  
interface_specification,  
software_design_document.
```

The MSC-DMS schema also allows custom types to be used to identify asset types. These types are captured in the **value** attribute as shown below.

```
<ms:Type ms:value="software_component"
```

If there is an additional type of resource that needs to be identified, the MSC-DMS schema permits “write-in” values instead of being limited to an enumerated list. For example, a custom value attribute identifying an unlisted resource type can be documented as follows:

```
<ms:Type ms:value="custom_widget"
```

Additionally, the **Type** element can capture other attributes including **subtype**, **ads-designation**, and **taxonomy** as shown below:

```
<ms:Type ms:value="software_component"  
ms:subtype="Java"  
ms:ads-designation="Category I" ms:taxonomy="software"/>
```

The **subtype** in this example specifies further the type of resource. It is a free text field. **Ads-designation** indicates if the data source is a product that has undergone producer data verification, validation, and certification activities. The valid enumerations for **ads-designation** include the following:

```
Category I,  
Category II,  
Category III,  
Authoritative – T,  
Approved – T,  
Other – T.
```

Like the **type value** enumerations, if there is a custom **ads-designation** that is required, which is not part of the provided enumerated list, and then it can be “written in.” This pattern of being able to identify custom attribute values is true for all attributes supported by an enumerated list. These **ads-designations** are described as follows:

- Category I - A recognized Service or National data production center with applicable mission statement, industry provider, or source/product that has established and documented production quality control procedures and quality controls the data produced. These organizations or sources/products have a reliable performance history. They have well-defined data metrics and significant metadata information, sufficient to satisfy all priority one Data Quality Template requirements (ADS mandatory metadata fields), available according to a recognized metadata standard.
- Category II - A data producer or source/product designated by a Component. Includes data providers and sources/products that, while not of the Category I stature, have become de facto providers of data or have unique, one-of-a-kind data sets, and employ quality control procedures. This category includes providers of individual data sets that have been accepted or designed as research grade data sets. The category also includes industry providers who establish Component-approved M&S support systems. Their data may or may not have well defined data metrics, and their metadata only partially satisfy the Data Quality Template priority one requirements (ADS mandatory metadata fields).
- Category III - A produce, source, or product that is not Category I or Category II but is available for use as deemed appropriate by the user.

After adding **type** with an **ads-designation**, this is what our metacard example looks like.

```
<ms:Resource>
  <ms>Title ms:value="REx"
    ms:subtitle="RobustExample"
    ms:acronym="REx"
    ms:documentNumber="RE_342.34">
    <ms:Releasability ms:value="A: Unlimited distribution "/>
    <ms:Security />
  </ms>Title>
  <ms>Type ms:value="software_component" ms:subtype="DCMITYPE"
    ms:ads-designation="Category I" />
</ms:Resource>
```

5.5 Description (required)

Description is the text describing the M&S resource. In this entry, the user provides a brief summary description of the resource.. The components associated to a **Description** element include the following:

- Taxonomy
- Text
- Releasability
- Security

An example highlighting how to document a **Description** element using these components is provided below:

```
<ms:Description>
  <ms:Text>used for high fidelity short range attack models</ms:Text>
</ms:Description>
```

Notice how **Text** does not have an attribute for the description text. The text is actually placed between the start (<ms:Text>) and end (</ms:Text>) tag. It should be mentioned that the **Text** element can also be annotated with the **taxonomy** attribute.

If **Releasability** and **Security** need to be included at the **Description** level, then they can be added as follows:

```
<ms:Description>
  <ms:Text>used for high fidelity short range attack models</ms:Text>
  <ms:Releasability ms:value="A: Unlimited distribution" />
  <ms:Security />
</ms:Description>
```

After adding **description**, this is what our example looks like.

```
<ms:Resource>
  <ms:Title ms:value="REx" ms:subtitle="RobustExample" ms:acronym="REx"
    ms:documentNumber="RE_342.34">
    <ms:Releasability ms:value="A: Unlimited distribution" />
    <ms:Security />
  </ms:Title>
  <ms:Type ms:value="software_component" ms:subtype="DCMITYPE"
    ms:ads-designation="Category I" />
  <ms:Description>
    <ms:Text>used for high fidelity short range attack models</ms:Text>
    <ms:Releasability ms:value="A: Unlimited distribution" />
    <ms:Security />
  </ms:Description>
</ms:Resource>
```

You might ask, “Why are there two releasability and security tags?” One is for the **title** element and the other for **description**. There is a possible situation where a title could be released but the description is classified and non-releasable. Or a point of contact might not be available to the general public. The MSC-DMS provides the ability to individually mark asset information releasable or secure. These **Releasability** and **Security** components will be discussed further in sections 5.9 and 5.10 respectively.

5.6 Dates (required)

Date types allow users to better understand the pedigree and usage of resources. The components associated to a **Date** element include the following:

- Type – type of date:
- Value – date value, YYYY,YYY-MM

The enumerated list to select from for the type of date includes the following:

*created (Date of creation of the resource),
posted (The date a product is posted to a shared network or system),
accepted (The date a product was accepted),
modified (The date a product was modified),
validTil (The date that a product should be removed from a registry, index, or catalog),
infoCutOff (The cutoff date of information in a product. It is the date of last input.),
used (The date a product was used),
v & v (The date a product was verified and/or validated),
accreditation (The date a product was accredited),
retired (The date a product was retired),
lastVerified (The most recent date verification of a product occurred).*

An example highlighting how to document a **Date** element using these components is provided below:

```
<ms:Dates>  
  <ms>Date ms:type="created" ms:value="2003-09-14"/>  
  <ms>Date ms:type="modified" ms:value="2007-08-13"/>  
</ms:Dates>
```

The first thing that is shown is a **dates** element, which marks the container for holding at least one specific **date**. For each **date** subelement, the attributes (**type** and **value**) are entered.

After adding **dates**, this is what our example looks like.

```
<ms:Resource>  
  <ms>Title ms:value="REx" ms:subtitle="RobustExample" ms:acronym="REx"  
    ms:documentNumber="RE_342.34">  
    <ms:Releasability ms:value="A: Unlimited distribution "/>  
    <ms:Security />  
  </ms>Title>  
  <ms>Type ms:value="software_component" ms:subtype="DCMITYPE" ms:ads-  
    designation="Category I" />  
  <ms>Description>  
    <ms:Text>used for high fidelity short range  
      attackmodels</ms:Text>  
    <ms:Releasability ms:value="A:Unlimited distribution "/>
```

```

    <ms:Security />"
  </ms:Description>
  <ms:Dates>
    <ms>Date ms:type="created" ms:value="2003-09-14"/>
    <ms>Date ms:type="revised" ms:value="2007-08-13"/>
  </ms:Dates>
</ms:Resource>

```

5.7 Version (required)

The **Version** gives the user revision information for the resource. The value itself will formally identify the M&S resource according to established standard naming conventions. An example of an identifier would be an International Standard Serial Number (ISSN). An example highlighting how to document a **version** element is provided below:

```

<ms:Version ms:value="Baseline 5.1 Rev 8"/>

```

After adding **version**, this is what our metacard example looks like.

```

<ms:Resource>
  <ms>Title ms:value="REx" ms:subtitle="RobustExample" ms:acronym="REx"
    ms:documentNumber="RE_342.34">
    <ms:Releasability ms:value="A: Unlimited distribution "/>
    <ms:Security />
  </ms>Title>
  <ms>Type ms:value="software_component" ms:subtype="DCMITYPE" ms:ads-
    designation="Category I" />
  <ms>Description>"
    <ms:Text>used for high fidelity short range attack
      models</ms:Text>
    <ms:Releasability ms:value="A: Unlimited distribution "/>
    <ms:Security />
  </ms>Description>
  <ms:Dates>
    <ms>Date ms:type="created" ms:value="2003-09-14"/>
    <ms>Date ms:type="revised" ms:value="2007-08-13"/>
  </ms:Dates>
  <ms:Version ms:value="Baseline 5.1 Rev 8" />
</ms:Resource>

```

5.8 Rights (optional)

Rights, when applied solely at the root node, hold information about rights held in and over the resource. The components associated to the **Rights** element include the following:

- Privacy Act
- Intellectual Property

- Copyright
- Taxonomy

Rights can be declared as follows in the metacard:

```
<ms:Rights
  ddms:privacyAct="false"
  ddms:copyright="false"
  ddms:intellectualProperty="false"/>
```

Notice each of the Rights attributes are Boolean expressions. More detailed information can be added to the rights such as the POCs.

```
<ms:Rights
  ddms:privacyAct="false"
  ddms:copyright="false"
  ddms:intellectualProperty="false">
  <ms:POC>
    <ms:Person ms:personID="345">
      <ms:Name ms:first="Samuel" ms:last="Drake"/>
    </ms:Person>
  </ms:POC>
</ms:Rights>
```

5.9 Releasability (optional)

The releasability of a resource may often be restricted in some way. If so, it is important to reflect the releasability information pertaining to an M&S resource. This section describes how to document **Releasability** coverage. An example highlighting how to document a **Releasability** element is provided below:

```
<ms:Releasability ms:value="A: Unlimited distribution "/>
```

In this example the value for the releasability is marked as an attribute. The enumerated choices for releasability include the following:

A: Unlimited distribution,
B: U.S. Govt. agencies only,
C: U.S. Govt. agencies and contractors only,
D: DoD and DoD contractors only,
E: DoD components only,
F: As directed by DoD originator,
X: Those eligible to obtain export-controlled technical data.

Again, if one of these choices is not suitable for describing the *releasability*, a custom, “write-in” value can be declared.

In addition to the root *Resource*, there are other layers of an MSC-DMS-based metacard that can have varying degrees of *releasability*. The MSC-DMS elements that can be marked by a *Releasability* element include *Resource*, *Title*, *Description*, *Association*, *POC*, *Usage*, and *Media*. For example, certain POCs may not be released to the general public while others might be for the same resource. A title might be releasable but not the description of the resource. There are six elements in the MSC-DMS specification that also use the releasability data type as a subelement. They include the following:

- Title (see section 5.2)
- Description (see section 5.4)
- Association (see section 5.10)
- POC (see section 5.11)
- Usage (see section 5.12)
- Media (see section 5.14)

To include *Releasability* to any of these subelements, you must simply identify the *Releasability* component within any of these subelements. This is illustrated below:

```
<ms:Resource>
  <ms>Title ms:value="REx" ms:subtitle="RobustExample" ms:acronym="REx"
    ms:documentNumber="RE_342.34">
    <ms:Releasability ms:value="A: Unlimited distribution" />
    <ms:Security />
  </ms>Title>
  <ms>Type ms:value="software_component" ms:subtype="DCMITYPE" ms:ads-
    designation="Category I" />
  <ms>Description>
    <ms:Text>used for high fidelity short range attack
      models</ms:Text>
    <ms:Releasability ms:value="D: DoD and DoD contractors only" />
    <ms:Security />
  </ms>Description>
  <ms:Dates>
    <ms>Date ms:type="created" ms:value="2003-09-14" />
    <ms>Date ms:type="revised" ms:value="2007-08-13" />
  </ms:Dates>
  <ms:Version ms:value="Baseline 5.1 Rev 8" />
  <ms:Releasability ms:value="A: Unlimited distribution" />
</ms:Resource>
```

In this example *Releasability* is marked at the root node of *Resource*, and also the subelements *Title*, and *Description*. This same pattern for *Releasability* can be applied to any of the other subelements identified above (*association*, *POC*, *usage*, *media*).

5.10 Security (optional)

It is also important to reflect the security information pertaining to an M&S resource. This section describes how to document security information pertaining to the resource and also other aspects of metacard information.

The attributes associated to the **Security** element include the following:

- classification
- ownerProducer
- SCI Controls
- SARIdentifier
- disseminationControls
- FGIsourceOpen
- FGIsourceProtected
- releasableTo
- nonICmarking
- classifiedBy
- classificationReason
- derivedFrom
- declassDate
- declassEvent
- declassException
- typeOfExemptedSource
- dateOfExemptedSource
- declassManualReview
- taxonomy

These attributes are identified by the IC-ISM security specification, which is also used by the DDMS. An example highlighting how to document a **Security** element using these components is provided below:

```
<ms:Security
  icism:classificationReason="Nonclassified"
  icism:releasableTo="USA"
  icism:typeOfExemptedSource="AUS"
  icism:declassEvent=""
  icism:classifiedBy="DoD"
  icism:SCIcontrols="ST"
  icism:SARIdentifier="SAR-ID"
  icism:declassManualReview="false"
  icism:declassException="NONE"
  icism:disseminationControls="REL"
  icism:dateOfExemptedSource="2007-08-13"
  icism:ownerProducer="USA"
```

```
icism:nonICmarkings="NMTOKEN"  
icism:derivedFrom="fundamentaldocument.doc"  
icism:FGISourceProtected="AUS NATO"  
icism:classification="U"  
icism:FGISourceOpen="AUS NATO"  
icism:declassDate="2008-08-13"/>
```

In addition to the root Resource, there are other layers of an MSC-DMS-based metacard that can have varying degrees of security. The MSC-DMS elements that can be marked by a **Security** element include **Resource, Title, Description, Association, POC, Usage, and Media**. For example, certain POCs may not be released to the general public while others might be for the same resource. A title might be unclassified but not the description of the resource. There are six elements in the MSC-DMS specification that uses the security data type as a sub-element. They include the following:

- Title (see section 5.2)
- Description (see section 5.4)
- Association (see section 5.10)
- POC (see section 5.11)
- Usage (see section 5.12)
- Media (see section 5.14)

To include Security to any of these sub-elements, you must simply identify the Security component within any of these sub-elements. This is illustrated below:

```

<ms:Resource>
  <ms>Title ms:value="REx" ms:subtitle="RobustExample" ms:acronym="REx"
    ms:documentNumber="RE_342.34">
    <ms:Releasability ms:value="A: Unlimited distribution" />
    <ms:Security
      icism:classificationReason="Classified"
      icism:releasableTo="USA"
      icism:typeOfExemptedSource="AUS"
      icism:declassEvent=""
      icism:classifiedBy="DoD"
      icism:SCIcontrols="ST"
      icism:SARIdentifier="SAR-ID"
      icism:declassManualReview="false"
      icism:declassException="NONE"
      icism:disseminationControls="REL"
      icism:dateOfExemptedSource="2007-08-13"
      icism:ownerProducer="USA"
      icism:nonICmarkings="NMTOKEN"
      icism:derivedFrom="fundamentaldocument.doc"
      icism:FGISourceProtected="AUS NATO"
      icism:classification="U"
      icism:FGISourceOpen="AUS NATO"
      icism:declassDate="2008-08-13"/>
    </ms>Title>
    <ms>Type ms:value="software_component" ms:subtype="DCMITYPE" ms:ads-
      designation="Category I" />
    <ms>Description>
      <ms:Text>used for high fidelity short range attack
        models</ms:Text>
      <ms:Releasability ms:value=" D: DoD and DoD contractors only"/>
      <ms:Security />
    </ms>Description>
    <ms:Dates>
      <ms>Date ms:type="created" ms:value="2003-09-14"/>
      <ms>Date ms:type="revised" ms:value="2007-08-13"/>
    </ms:Dates>
    <ms:Version ms:value="Baseline 5.1 Rev 8" />
    <ms:Releasability ms:value="A: Unlimited distribution" />
    <ms:Security
      icism:classificationReason="Nonclassified"
      icism:releasableTo="USA"
      icism:typeOfExemptedSource="AUS"
      icism:declassEvent=""
      icism:classifiedBy="DoD"
      icism:SCIcontrols="ST"
      icism:SARIdentifier="SAR-ID"
      icism:declassManualReview="false"
      icism:declassException="NONE"
      icism:disseminationControls="REL"
      icism:dateOfExemptedSource="2007-08-13"
      icism:ownerProducer="USA"
      icism:nonICmarkings="NMTOKEN"
      icism:derivedFrom="fundamentaldocument.doc"
      icism:FGISourceProtected="AUS NATO"
      icism:classification="U"
      icism:FGISourceOpen="AUS NATO"

```

```
icism:declassDate="2008-08-13"/>
</ms:Resource>
```

In this example **Security** is marked at the root node of **Resource**, and also the sub-element **Title**. This same pattern for **Security** can be applied to any of the other sub-elements identified above (**association, POC, usage, media**).

Some classifications will require a combination of values to be entered. For example, to mark a resource as FOUO (For Official Use Only), the **classification** attribute must be 'U' (unclassified) and the **disseminationControls** attribute must be 'FOUO'.

5.11 Associations (optional)

No matter what type of M&S resource may be cataloged, invariably there are many other materials that may be associated with the resource. Therefore it is important to capture the essential associations pertaining to such related materials. This section describes how to document one or more *Associations*.

The components associated to an **Association** element include the following:

- qualifier
- value
- schema Qualifier
- schema Href
- relationship (e)
- type (e)
- constraints
- ADS Designation (e)
- Association ID
- Taxonomy
- Description
- Releasability
- Security

Of these components, the ones marked with an (e) are supported via an enumerated list. The enumerated list for the relationship values includes the following:

```
has-a,
is-part-of,
is-type-of,
is-described-by.
```

The enumerated list for the type values includes the following:

<i>software,</i> <i>tool,</i> <i>federation,</i> <i>software_component,</i> <i>services,</i> <i>data,</i> <i>data_models,</i> <i>interface_specification,</i> <i>software_design_document,</i>	<i>infrastructure,</i> <i>supported_events,</i> <i>future_capabilities_requirements,</i> <i>related_documents,</i> <i>environment,</i> <i>subject_matter_expert.</i>
--	---

It should be noted that this enumerated list of associated types maps with the type values described in section 5.3, but augments with other “support asset” types.

An example highlighting how to document an **Association** element using these components and enumerations is provided below:

```
<ms:Associations>
  <ms:Association
    ddms:qualifier="URL"
    ddms:value="http://www.shortrangealgos.com/BMA1003.xml"
    ddms:schemaHref="http://www.shortrangeschemas.com" ms:relationship="is-
described-by"
    ms:type="related documents"
    ms:constraints="exclude section 4.6"
    ms:ads-designation="Category I"
    ms:associationID="4352"
    ddms:schemaQualifier="na">
    <ms:Releasability ms:value="A: Unlimited distribution "/>
  </ms:Security/>
  </ms:Association>
</ms:Associations>
```

The first thing that is shown is an **Associations** element, which marks the container for holding at least one specific singular **Association**. For each **Association** sub-element, the attributes are entered. Notice how some of the attributes are components of the **ddms** namespace, where others are specific to the **ms** namespace, which signifies the MSC-DMS. The MSC-DMS extends upon the capabilities provided by the **ddms** by providing a means to identify the type of **relationship**, the **type** of the associated asset, any **constraints**, the **ads-designation** if known, and a reference to the **id** of the external asset identified by the association.

5.12 POCs (required)

There may be many individuals or organizations that are responsible for the development, management, and/or use of a resource asset. Therefore, it is important to capture the essential metadata elements

pertaining to such individuals and organizations that are responsible for an M&S resource. This section describes how to catalog details about a point of contact. The components associated to a **POC** element include the following:

- Role
- Person
- Organization
- Description
- Releasability
- Security

The enumerated list to select from for the type of **Role** includes the following:

*primary author,
contributor,
publisher,
proponent,
sponsor,
release authority,
IP holder,
copyright holder,
technical POC,
ADS-Designator*

The example below contains two POC elements-- one for a person and one for an organization. The basic structure is shown directly below without any of the sub-elements under person or organization.

```
<ms:POCs>  
  <ms:POC>  
    <ms:Role ms:value="publisher"/>  
    <ms:Person></ms:Person>  
  </ms:POC>  
  <ms:POC>  
    <ms:Organization></ms:Organization>  
  </ms:POC>  
</ms:POCs>
```

The 'POCs' element houses the actual point of contact information. It contains at least one POC. In the subsections that follow, we will explore how to document a POC that is a **Person**, and a POC that is an **Organization**. Additionally, it should be mentioned that each POC can also have a **Releasability** or **Security** declaration as describe by section 5.8 and 5.9 respectively.

5.12.1 POC Person

This section describes how to document a POC that is a person. There are several tiers of elements in a POCs element. The parent element, POCs, has a child element, POC, which has title, name, and position as child or sub elements. Position has org and org has name. Six levels of descriptive information

describing the person or organization involved will be very useful when resource support is needed by a consumer.

The components associated to a **POC Person** element include the following:

- ID
- Supervisor ID
- Sponsor ID
- Title
- Name (First, Middle, and Last)
- Position
- Address
- Phone (e)
- Email (e)
- URL
- Contact Instruction

Of these components, the ones marked with an (e) are supported via an enumerated list. The enumerated list to select from for the type of **phone** includes the following:

Work,
Home,
DSN,
Mobile,
Fax.

Whereas, the enumerated list to select from for the type of **email** includes the following:

Work,
Home,
NIPRNET,
SIPRNET,
JWICS,
DKO,
AKO.

An example highlighting how to document a **POC Person** element using these components is provided below:

```
<ms:POCs>
  <ms:POC>
    <ms:Role ms:value="technical POC"/>
    <ms:Person>
      <ms>Title ms:value="Technical Reviewer"/>
      <ms>Name ms:first="Lindsey" ms:middle="Amanda"
ms:last="Piddleton"/>
```

```

        <ms:Position ms:value="Writer">
            <ms:Org ms:organizationID="331">
                <ms:Name ms:value="SpyFlight
Industries"/>
            </ms:Org>
        </ms:Position>
        <ms:AddressInfo>
            <ms:AddressLine1 ms:value="1402 Liason Dr."/>
            <!-- office address-->
            <ms:AddressLine2 ms:value="Suite 745"/>
            <ms:AddressLine3 ms:value="Design Studio"/>
            <ms:City ms:value="Fredericksburg"/>
            <ms:State ms:value="VA"/>
            <ms:Country ms:value="USA"/>
            <ms:PostcalCode ms:value="22401"/>
        </ms:AddressInfo>
        <ms:Phone ms:type="work" ms:number="540-234-3457"
ms:extension="351"/>
        <ms:Phone ms:type="mobile" ms:number="540-755-5555"
ms:extension="N/A"/>
        <ms:Email ms:type="work"
ms:address="writer1@spyflight.com"/>
        <ms:Email ms:type="home"
ms:address="amanda@hotmail.com"/>
        <ms:URL ms:value="http://www.theWritersBlock.com"/>
        <ms:ContactInstruction ms:value="Leave a message with
personal assistant if not available."/>
    </ms:Person>
</ms:POC>
</ms:POCs>

```

In this example, the technical contact information is a person who works for SpyFlight Industries. Her title is “Technical Reviewer” and her position is a “Writer” for her firm. Her office address and personal contact information are available as well. It is possible to place as many addresses, phone numbers, emails, or even persons as needed. The publisher is not limited to one.

Later, this POCs person example will be integrated into our overall example; however, it is first important to understand how to document a POC organization.

5.12.2 POC Organization

The POC Organization documents the contact information for any organization responsible for the development or use of the resource being described. The components associated to a **POC Organization** element include the following:

- ID
- SponsorID
- Parent ID
- Name
- Type (e)
- Address info

- Phone (e)
- Email (e)
- URL
- Contact Instruction

Of these components, the ones marked with an (e) are supported via an enumerated list. The enumerated list for **Phone** and **Email** is the same as described in section 5.11.1 for **POC People**. The enumerated list to select from for the type of **organization** includes the following:

*Government,
Academia,
Industry.*

An example highlighting how to document a **POC Organization** element using these components is provided below:

```

<ms:POC>
  <ms:Role ms:value="publisher"/>
  <ms:Organization ms:ID="330" ms:parentID="331">
    <ms>Name ms:value="SpyFlight IT"/>
    <ms>Type ms:value="government"/>
    <ms:AddressInfo>
      <ms:AddressLine1 ms:value="1402 Liason Dr."/>
      <ms:AddressLine2 ms:value="Suite 854"/>
      <ms:AddressLine3 ms:value="Operations Department"/>
      <ms:City ms:value="Fredericksburg"/>
      <ms:State ms:value="VA"/>
      <ms:Country ms:value="USA"/>
      <ms:PostcalCode ms:value="22401"/>
    </ms:AddressInfo>
    <ms:AddressInfo>
      <ms:AddressLine1 ms:value="1402 Liason Dr."/>
      <ms:AddressLine2 ms:value="Suite 745"/>
      <ms:AddressLine3 ms:value="Design Studio"/>
      <ms:City ms:value="Fredericksburg"/>
      <ms:State ms:value="VA"/>
      <ms:Country ms:value="USA"/>
      <ms:PostcalCode ms:value="22401"/>
    </ms:AddressInfo>
    <ms:Phone ms:type="fax" ms:number="540-324-2208"
ms:extension="N/A"/>
    <ms:Phone ms:type="work" ms:number="540-234-3457"
ms:extension="353"/>
    <ms>Email ms:type="work" ms:address="info@spyflight.com"/>
    <ms:URL ms:value="http://www.spyflightindu.com"/>
    <ms>ContactInstruction ms:value="For general assistance,
dial 0 for an operator"/>
  </ms:Organization>
</ms:POC>

```

After adding **POC**, this is what our metacard example looks like.

```
<ms:Resource>
<ms>Title ms:value="REx" ms:subtitle="RobustExample" ms:acronym="REx"
  ms:documentNumber="RE_342.34">
  <ms:Releasability ms:value="A: Unlimited distribution" />
  <ms:Security />
</ms>Title>
<ms>Type ms:value="software_component" ms:subtype="DCMITYPE" ms:ads-
designation="Category I" />
<ms>Description>
  <ms:Text>used for high fidelity short range attack models.
  (This could be several paragraphs in length)</ms:Text>
  <ms:Releasability ms:value="A: Unlimited distribution" />
<ms:Security />
</ms>Description>
<ms:Dates>
  <ms>Date ms:type="created" ms:value="2003-09-14"/>
  <ms>Date ms:type="revised" ms:value="2007-08-13"/>
</ms:Dates>
<ms:Version ms:value="String" />

<ms:POCs>
  <ms:POC>
    <ms:Role />
    <ms:Person>
      <ms>Title ms:value="Technical Reviewer"/>
      <ms>Name ms:first="Lindsey" ms:middle="Amanda" ms:last="Piddleton"/>
      <ms:Position ms:value="Writer">
        <ms:Org ms:organizationID="331">
          <ms>Name ms:value="SpyFlight Industries"/>
        </ms:Org>
      </ms:Position>
      <ms:AddressInfo>
        <ms:AddressLine1 ms:value="1402 Liason Dr." />
        <!-- office address-->
        <ms:AddressLine2 ms:value="Suite 745"/>
        <ms:AddressLine3 ms:value="Design Studio"/>
        <ms:City ms:value="Fredericksburg"/>
        <ms:State ms:value="VA"/>
        <ms:Country ms:value="USA"/>
        <ms:PostcalCode ms:value="22401"/>
      </ms:AddressInfo>
      <ms:Phone ms:type="work" ms:number="540-234-3457"
ms:extension="351"/>
      <ms:Phone ms:type="mobile" ms:number="540-755-5555"
ms:extension="N/A"/>
      <ms:Email ms:type="work" ms:address="writer1@spyflight.com"/>
      <ms:Email ms:type="home" ms:address="amanda@hotmail.com"/>
      <ms:URL ms:value="http://www.theWritersBlock.com"/>
      <ms>ContactInstruction ms:value="Leave message w/ personal assistant
if not available."/>
    </ms:Person>
  </ms:POC>
</ms:POCs>
```

```

<ms:POC>
  <ms:Role ms:value="publisher"/>
  <ms:Organization ms:ID="330" ms:parentID="331">
    <ms:Name ms:value="SpyFlight IT"/>
    <ms:Type ms:value="government"/>
    <ms:AddressInfo>
      <ms:AddressLine1 ms:value="1402 Liason Dr."/>
      <ms:AddressLine2 ms:value="Suite 854"/>
      <ms:AddressLine3 ms:value="Operations Department"/>
      <ms:City ms:value="Fredericksburg"/>
      <ms:State ms:value="VA"/>
      <ms:Country ms:value="USA"/>
      <ms:PostcalCode ms:value="22401"/>
    </ms:AddressInfo>
    <ms:AddressInfo>
      <ms:AddressLine1 ms:value="1402 Liason Dr."/>
      <ms:AddressLine2 ms:value="Suite 745"/>
      <ms:AddressLine3 ms:value="Design Studio"/>
      <ms:City ms:value="Fredericksburg"/>
      <ms:State ms:value="VA"/>
      <ms:Country ms:value="USA"/>
      <ms:PostcalCode ms:value="22401"/>
    </ms:AddressInfo>
    <ms:Phone ms:type="fax" ms:number="540-324-2208"
ms:extension="N/A"/>
    <ms:Phone ms:type="work" ms:number="540-234-3457"
ms:extension="353"/>
    <ms:Email ms:type="work" ms:address="info@spyflight.com"/>
    <ms:URL ms:value="http://www.spyflightindu.com"/>
    <ms>ContactInstruction ms:value="For general assistance, dial 0
for an operator"/>
  </ms:Organization>
</ms:POC>
</ms:POCs>
</ms:Resource>

```

Notice in the example that two POC elements were encased in the POCs element. There are instances where POC information is captured in another parent element.

Hopefully, the process of adding different elements into the XML document should now be clear. The rest of the document will not have the incremental additions to the example but will show the elements with their sub-elements and attributes singularly. It is important to keep sub-elements or child elements and attributes with the parent element. If a child element is without its parent it will be considered a parent and possibly not recognized by tools created to convert or search the metacards.

5.13 Keywords (required)

Keywords refer to taxonomy, or the domain vocabulary in which the keyword value is a member. The components associated to a **Keyword** element include the following:

- Taxonomy
- Value

- Other

An example highlighting how to document a **Keyword** element using these components is provided below:

```
<ms:Keywords>
  <ms:Keyword
    ddms:value="simulation" ms:taxonomy="Military_Training"/>
  <ms:Keyword
    ddms:value="flight technologies"
    ms:taxonomy="Aerospace_Engineering"/>
</ms:Keywords>
```

In this example, there are two keywords identified. For each keyword, the optional taxonomy field was employed to identify the context for the keyword.

5.14 Usages (optional)

It is often important to recognize and understand the intended and actual usage of an M&S resource. The *Usage* component provides a means to reflect this information. This section describes how to document *Usage*. The *Usage* component also includes the ability to describe *History* metadata; since resources are intended to be used, it is important to reflect the experiences of how a resource may have been used. It is also recognized that an M&S resource may not always be developed within the United States. Some models, for example, may be developed overseas and yet, still be a viable model for sharing within the COI. The *Usage* component also includes the ability to identify the primary language of the intellectual content of the M&S resource. This section describes how to document *Language*. This is considered a feedback loop for consumers. It is populated after the resource has been put to use.

The components associated to a **Usage** element include the following:

- Taxonomy
- Purpose
- Application Domain (e)
- Limitations
- History
 - Date
 - Description
 - POC
 - other
- Language
- Capabilities
- Releasability
- Security

Of these components, the ones marked with an (e) are supported via an enumerated list. The enumerated list to select from for the type of **application domain** includes the following:

*analysis, training,
t&e,
engineering,
acquisition,
planning,
doctrine,
logistics,
support to ops,
intelligence*

An example highlighting how to document a **Usage** element using these components is provided below:

```
<ms:Usages>
  <ms:Usage>
    <ms:Purpose ms:value="To test short range projectile accuracy"/>
    <ms:ApplicationDomain ms:value="t&e"/>
    <ms:Limitations ms:value="Not intended for elevations above 3K ft."/>
    <ms:History>
      <ms>Date ms:value="2007-10-01" ms:type="used"/>
      <ms:Description>
        <ms:Text>Successful in supporting joint and coalition littoral warfare
          exercises October 2007</ms:Text>
      </ms:Description>
    <ms:POC>
      <ms:Person ms:personID="345">
        <ms>Name ms:first="Samuel"
          ms:middle="Albert"
          ms:last="Drake"/>
      </ms:Person>
    </ms:POC>
  </ms:History>
  <ms:Language ddms:qualifier="ISO 639-1" ddms:value="fr"/>
  <ms:Capabilities ms:value="capable for use in shipboard experiments"/>
  <ms:Releasability/>
  <ms:Security/>
</ms:Usage>
</ms:Usage>
```

5.15 Media (optional)

Often media properties may be associated with an M&S resource. This section describes how to document *Media* properties. The components associated to a **Media** element include the following:

- Taxonomy
- Format

- Taxonomy
- MIME type
- extent
- medium
- Location
- Description
- Releasability
- Security

The *Media* properties include **Format** and **Location**. This allows the physical or digital manifestation of an M&S resource to be known. The Media **Format** component provides a means to reflect this information. The Media **Location**, on the other hand, provides a means to identify the location of the media.

An example highlighting how to document a **Media** element using these components is provided below:

```
<ms:Media>
  <ms:Format>
    <ddms:mimeType>Text/XML/HTML</ddms:mimeType>
    <ddms:extent ddms:qualifier="http://www.dms.gov/id=3245342343"
      ddms:value="byte size"/>
    <ddms:medium>digital</ddms:medium>
  </ms:Format>
  <ms:Format>
    <ddms:mimeType>String</ddms:mimeType>
    <ddms:extent ddms:qualifier="http://www.dms.gov/id=2348923498732"
      " ddms:value="String"/>
    <ddms:medium>digital</ddms:medium>
  </ms:Format>
  <ms:Location ms:value="http://simmodelsrus.com/software"/>
  <ms:Location ms:value="http://www.simdeliverance.com"/>
</ms:Media>
```

5.16 Glyph (optional)

It is often helpful to visually tag resources so that they can be more easily identified. The *Glyph* component provides a means to visually associate an image with an M&S resource. This section describes how to document a *Glyph*. The components associated to a **Glyph** element include the following:

- Source
- Type
- Height
- Width
- Alt

The enumerated list to select from for the type of ***Glyph*** includes the following:

```
BITMAP,  
JPG,  
GIF,  
PNG,  
TIFF.
```

An example highlighting how to document a ***Glyph*** element using these components is provided below:

```
<ms:Glyph  
  ms:height="4096"  
  ms:type="BITMAP"  
  ms:alt="String"  
  ms:width="4096"  
  ms:src=" http://www.simpictures.com/id=3249u03"/>
```

In this example, the ***src*** of the image is provided, and, if accessible, can be used as a means to visually represent a resource.

5.17 TaxonomiesCited (optional)

The ***TaxonomiesCited*** element allows any referenced taxonomies to be further identified. Users can specify a version, descriptive text, and a location for each taxonomy that has been marked in the metacard. Section 5.2 provide the context for marking a taxonomy attribute, and which elements support it. The value that was identified with a taxonomy attribute marking should match the ***value*** of a ***TaxonomyCited***.

The components associated to a ***TaxonomyCited*** element include the following:

- Value
- Version
- Description
- Location

An example highlighting how to document a ***TaxonomyCited*** element using these components is provided below:

```
<ms:TaxonomiesCited>  
  <ms:TaxonomyCited ms:value="Missile_Defense" ms:version="1.0">  
    <ms:Location ms:value="http://en.wikimodels.org/wiki/mdefense"/>  
  </ms:TaxonomyCited>  
  <ms:TaxonomyCited ms:value="Aerospace_Engineering" ms:version="1.3">  
    <ms:Location  
      ms:value="http://aerospace_knowledge/feacd.xml"/>  
  </ms:TaxonomyCited>  
</ms:TaxonomiesCited>
```

```
</ms:TaxonomyCited>  
</ms:TaxonomiesCited>
```

6 MSC-DMS Supplemental Element Sets

The following subsections build on the XML samples we started with in section 5. These components, however, are supplemental. That means that they aren't always necessary for cataloging every M&S resource. These extensions should only be used as required to support project and program objectives.

6.1 Virtual Coverage

Virtual Coverage: identifies subject matter coverage of an M&S resource in terms of one or more virtual addresses. For this purpose, a "virtual" address is a computer network address, expressed as a set of Internet Protocol (IP) octets, a uniform resource locator (URL), or some other network-addressing scheme, such as a network name or locale. An example highlighting how to document a **Virtual Coverage** element using these components is provided below:

```
<ms:VirtualCoverage ddms:address="www.sims.com/missile3"  
ddms:protocol="protocoltype1"/>
```

6.2 Temporal Coverage

TemporalCoverage identifies periods of time associated to a resource. For example, a data set such as weather, which may be used in a simulation, pertaining to a certain period of time must be stipulated. An example highlighting how to document a **TemporalCoverage** element using these components is provided below:

```
<ms:TemporalCoverage>  
  <ddms:TimePeriod>  
    <ddms:name>Exercise Time Span</ddms:name>  
    <ddms:start>2001-12-17T08:30:46.0Z</ddms:start>  
    <ddms:end>2004-09-17T08:36:56.0Z</ddms:end>  
  </ddms:TimePeriod>  
</ms:TemporalCoverage>
```

6.3 Geospatial Coverage

M&S resources may also need to be tagged with geographic place names or coordinates that relate to the resource, such as a jurisdiction, point, area, or volume on land, in space, or at sea. An example of this is a weather dataset or a terrain database used for the purposes of M&S exercises.

An example highlighting how to document a **GeospatialCoverage** element using these components is provided below:

```

<ms:GeospatialCoverage>
  <ddms:GeospatialExtent>
    <ddms:geographicIdentifier>
      <ddms:name>US Region 1</ddms:name>
      <ddms:name>US Region 8</ddms:name>
    </ddms:geographicIdentifier>
    <ddms:geographicIdentifier>
      <ddms:name>AUS Region 27B</ddms:name>
      <ddms:name>AUS Region 2</ddms:name>
    </ddms:geographicIdentifier>
  </ddms:GeospatialExtent>
</ms:GeospatialCoverage>

```

6.4 HLA Coverage

Many resources that are developed and intended for reuse are simulations and simulation models. For resources that are HLA compliant, it is important to understand what HLA capabilities a resource may have. An example highlighting how to document a **HLACoverage** element is provided below:

```

<ms:HLACoverage>
  <ms:CertificationLevel ms:value="1"/>
  <ms>Date ms:value="2001-12-17"></ms>Date>
  <ms:FomSomUsed>
    <ms>Name ms:value="www.simvarations.com/ghh"/>
  </ms:FomSomUsed>
</ms:HLACoverage>

```

6.5 VV&A Coverage

Resources often go through a process of verification, validation, and accreditation (VV&A) to provide evidence and confidence in the use of that resource for some intended purpose. Therefore, it is important to reflect the VV&A information pertaining to a resource. A particular M&S resource may undergo a variety of VV&A activities related to various intended uses. These activities can result in numerous VV&A documents, including such items as an Accreditation Plan, Verification and Validation (V&V) Plan, V&V Report, and Accreditation Report. The VV&A Coverage Metadata Set supports description of a VV&A documentation project as well as individual VV&A documents that are produced by a project. An example highlighting how to document a **VVACoverage** element is provided below:

```

        <ms:VVACoverage>
            <ms:Type ms:value="VV&A Documentation"
ms:subtype="Accreditation Report"/>
            <ms:IntendedUse ms:value="testing"/>
            <ms:POC>
                <ms:Person ms:personID="345">
                    <ms:Name ms:first="Samuel" ms:middle="Albert"
ms:last="Drake"/>
                </ms:Person>
            </ms:POC>
        </ms:VVACoverage>

```

6.6 Configuration Management

Resources often go through a process of configuration management as updates and revisions are made. It is often important to track and maintain an account of such updates. The Configuration Management element set supports description of the configuration management documentation project as well as individual VV&A documents produced by a project. An example highlighting how to document a **ConfigurationManagement** element is provided below:

```

<ms:ConfigurationManagement ms:type="Configuration Control Board
(CCB) ">
    <ms:POC>
        <ms:Person ms:personID="345">
            <ms:Name ms:first="John" ms:last="Dillon"/>
        </ms:Person>
    </ms:POC>
</ms:ConfigurationManagement>

```

This page left intentionally blank

7 Updating and Maintaining MSC-DMS Metacards

All the elements described in this guide identify information to help document the resource, people or organizations involved, and other related items. Some elements of the MSC-DMS are mandatory, some optional, and others are supplemental. These elements used properly will result in a higher probability of M&S discovery and reuse, which is the purpose for the MSC-DMS and the Net-Centric Data Strategy. Creating a metacard might seem tedious at first, but the long term benefits of producing and maintaining well described metadata, especially that which is indexed among M&S catalogs and repositories, will prove to be highly effective. Additionally, time spent up front developing a good metacard will mean less time expended by others searching for candidate M&S resources.

Once a metacard is created for a resource, maintaining it by updating it when the resource has been changed, used, or if a point of contact record has changed is important. When a resource integrator revises a software component or adds information to a data model, the metacard should reflect the change. If the functionality has improved or changed, then the metacard should reflect the revision and description change.

The producer is understood as a person or organization that has responsibility for the resource. Once a metacard has been created and the resource exists in the catalog, it is the producer's responsibility to update the information regarding changes made to the resource. Likewise, it is up to the consumer (including integrators) to provide feedback on the resource by adding usage history.

7.1 Adding Usage History

How a resource was used to support a program objective or need can be added to an MSC-DMS based metacard. POC and date information can be recorded as well. The history reference provided in the example below describes how the resource was used successfully to support joint and coalition littoral warfare. The MSC-DMS provides a means to add user experience to a metacard.

```
<ms:Usage>
  <ms:Purpose ms:value="To test short range projectile accuracy"/>
  <ms:ApplicationDomain
    ms:value="test and evaluation"/>
  <ms:Limitations
    ms:value=
      "Not intended for elevations above 3K ft."/>

  <ms:History>
    <ms>Date
      ms:value="2007-10-01"
      ms:type="used"/>
    <ms:Description>
      <ms:Text> Successful in supporting joint and coalition
        littoral warfare exercises October 2007</ms:Text>
    </ms:Description>
    <ms:POC>
      <ms:Person ms:personID="345">
```

```

        <ms:Name ms:first="Samuel"
              ms:middle="Albert"
              ms:last="Drake"/>
      </ms:Person>
    </ms:POC>
  </ms:History>

  <ms:Language
    ddms:qualifier="ISO 639-1"
    ddms:value="fr"/>
  <ms:Capabilities
    ms:value="capable for use in seaboard experiments"/>
  <ms:Releasability/>
  <ms:Security/>
</ms:Usage>

```

7.2 Updating Media Reference

Below is the original media reference that was created in section 5.14. When the location pertaining to a media-related resource changes, then the value attribute(s) change can be reflected in the **Location** sub-element.

```

<ms:Media>
  <ms:Format>
    <ddms:mimeType>Text/XML/HTML</ddms:mimeType>
    <ddms:extent ddms:qualifier="http://www.dms.gov/id=3245342343"
      ddms:value="byte size"/>
    <ddms:medium>digital</ddms:medium>
  </ms:Format>
  <ms:Format>
    <ddms:mimeType>String</ddms:mimeType>
    <ddms:extent ddms:qualifier="http://www.dms.gov/id=2348923498732"
      ddms:value="String"/>
    <ddms:medium>digital</ddms:medium>
  </ms:Format>
  <ms:Location ms:value="http://simmodelsrus.com/software"/>
  <ms:Location ms:value="http://www.simdeliverance.com"/>
</ms:Media>

```

If the location changes, it is important to update the **Media** element of the metacard with the new **Location**.

7.3 Identifying Associations

Associations provide a way to link related resources together. This can be used to increase visibility during search efforts and broadens the user's ability to locate resources of interest based on the value of associative metadata discovered during a search. The **type** for the associated resource may strengthen the value of associative reference. For example, a document describing the functionality

provided by a simulation software component, can be very valuable in isolating candidate resources that map with the search query criteria. The example below shows the association type of 'related_documents'.

```
<ms:Association
  ddms:qualifier="URL"
  ddms:value="http://www.shortrangealgos.com/BMA1003.xml"
  ddms:schemaHref="http://www.shorrangeschemas.com"
  ms:relationship="is-described-by"
  ms:type="related_documents"
  ms:constraints="exclude section 4.6"
  ms:ads-designation="Category I"
  ms:associationID="4352"
  ddms:schemaQualifier="na"
  <ms:Releasability/>
  <ms:Security/>
</ms:Association>
```

It is also possible that new documents, software components, and tools will appear after the initial creation of a metacard. Whether it's within the organization in which the original resource was created or a third party, this information pertaining to how it connects with other assets can be documented through the **associations** component.

The **associationID** attribute of the Association element creates a reference in which the ID from associated resources can be identified and later retrieved. Consider the following example:

```
<ms:Association
  ddms:qualifier="URL"
  ddms:value="http://www.shortrangealgos.com/BMA1003.xml"
  ddms:schemaHref="http://www.shorrangeschemas.com"
  ms:relationship="is-described-by"
  ms:type="related documents"
  ms:constraints="exclude section 4.6"
  ms:ads-designation="Category I"
  ms:associationID="4352"
  ddms:schemaQualifier="na"
  <ms:Releasability/>
  <ms:Security/>
</ms:Association>
```

The associated asset is designated using the **associationID** value. Wherever the metacard exists for this associated resource, it would be marked with this same ID value.

7.4 Maintaining Dates

Dates, as stated in section 5.6, can help a user determine the history of a resource. Each metacard has a creation date, but there are other types of dates as well, which are important to understanding information pertinent to a resource.

When a second date is added it will look like the example below.

```
<ms:Dates>
  <ms>Date ms:type="created" ms:value="2003-09-14"/>
  <ms>Date ms:type="modified" ms:value="2007-08-13"/>
</ms:Dates>
```

In this example, there was a resource revision that needed to be documented. If this was returned in a search query result in 2009, the resource would show an updated state from 2007. If the revised state was not documented the user would not know that the resource had been updated.

7.5 Updating Versions

Version values should be updated as the resource evolves. Consider the following example.

```
<ms:Version ms:value="1.0"/>
```

If the version of the resource changes, then the metacard reflecting the resource should also change.

```
<ms:Version ms:value="1.1"/>
```

It is also a good opportunity to update the Date value with a type revised as described previously in section 7.4.

Appendix A Supporting Other Metadata Standards

A.1 Porting MSC-DMS 1.3 Metacards to DDMS 2.0

While the MSC-DMS is based on the DDMS, it has been customized for supporting the M&S community. As a result, it provides slightly more focused characteristics to describe M&S assets than the current DDMS standard, which is version 2.0. Differences between the two schemas are discussed below.

An MSC-DMS point of contact excerpt for a person is provided in the listing below.

```
<ms:POC>
  <ms:Role ms:value="publisher"/>
  <ms:Person ms:supervisorID="231" ms:ID="230" ms:sponsorID="332">
    <ms>Title ms:value="Technical Reviewer"/>
    <ms>Name ms:first="Lindsey" ms:middle="Amanda"
ms:last="Piddleton"/>
    <ms:Position ms:value="Writer">
      <ms:Org ms:organizationID="331">
        <ms>Name ms:value="SpyFlight Industries"/>
      </ms:Org>
      <ms:Org ms:organizationID="331">
        <ms>Name ms:value="SpyFlight Industries"/>
      </ms:Org>
    </ms:Position>
    <ms:AddressInfo>
      <ms:AddressLine1 ms:value="888 Liberty Lane"/>
      <!-- Home address -->
      <ms:AddressLine2 ms:value=""/>
      <ms:AddressLine3 ms:value=""/>
      <ms:City ms:value="Fredericksburg"/>
      <ms:State ms:value="VA"/>
      <ms:Country ms:value="USA"/>
      <ms:PostcalCode ms:value="22407"/>
    </ms:AddressInfo>
    <ms:AddressInfo>
      <ms:AddressLine1 ms:value="1402 Liason Dr."/>
      <!-- office address-->
      <ms:AddressLine2 ms:value="Suite 745"/>
      <ms:AddressLine3 ms:value="Design Studio"/>
      <ms:City ms:value="Fredericksburg"/>
      <ms:State ms:value="VA"/>
      <ms:Country ms:value="USA"/>
      <ms:PostcalCode ms:value="22401"/>
    </ms:AddressInfo>
    <ms:Phone ms:type="work" ms:number="540-234-3457"
ms:extension="351"/>
    <ms:Phone ms:type="mobile" ms:number="540-755-5555"
ms:extension="N/A"/>
    <ms:Email ms:type="work" ms:address="writer1@spyflight.com"/>
    <ms:Email ms:type="home" ms:address="amanda@hotmail.com"/>
    <ms:URL ms:value="http://www.theWritersBlock.com"/>
    <ms>ContactInstruction ms:value="Leave a message with personal
```

```

assistant if gone"/>
</ms:Person>
<ms:Releasability ms:value="A: Unlimited distribution "/>
</ms:POC>

```

In this example XML snippet, the POC holds the role of publisher. The MSC-DMS provides a means to identify multiple roles for a POC. In comparison, if a POC is identified as a publisher, creator, or contributor, the DDMS version 2.0 provides unique element types that are defined independently. For instance, the element for the role of publisher is **ddms:publisher**; the element for the role of creator is **ddms:creator**; and the element for the role of contributor is **ddms:contributor**. If a POC is not one of these three types, DDMS also offers a POC type but no role is identified. The POC component of the MSC-DMS, on the other hand, provides a **ms:Role** attribute, allowing a role to be identified for a POC such as primary author, contributor, publisher, proponent, sponsor, release authority, IP holder, copyright holder, technical POC, or ADS-Designator.

Also, MSC-DMS attempts to maintain some consistency with the use of attributes, as does the IC-ISM, which is the security schema used by both the MSC-DMS and DDMS. The **ms:Name** tag in MSC-DMS, for example, uses an attribute, **ms:value**, to capture the text of the name, where as the **ddms:name** tag in the DDMS uses the element to capture the text of the name between brackets.

```
<ms:Name ms:value="ModelXYZ" />
```

```
<ddms:name>ModelXYZ</ddms:name>
```

When writing XSL code for automatic transformation of metacards between XML schema styles, understanding this difference matters. A well formed XSLT program will automatically translate an XML document from one schema to another.

Let's take a look at the DDMS equivalent example for the MSC-DMS POC we listed earlier.

```

<ddms:publisher ICISM:classification="U" ICISM:ownerProducer="AUS GBR
USA">
  <ddms:Organization>
    <ddms:name>SpyFlightIT</ddms:name>
    <ddms:phone> 540-234-3457</ddms:phone>
    <ddms:email > info@spyflight.com </ddms:email>
  </ddms:Organization>
  <ddms:Person>
    <ddms:name>Lindsey Amanda</ddms:name>
    <ddms:surname>Piddleton</ddms:surname>
    <ddms:userID>Amanda@hotmail.com</ddms:userID>
    <ddms:affiliation>SpyFlight Industries</ddms:affiliation>
    <ddms:phone>540-755-7555</ddms:phone>
    <ddms:email>Amanda@hotmail.com</ddms:email>
  </ddms:Person>
</ddms:publisher>

```

Seemingly the DDMS structure looks easier, however it is important to recognize there is a potential loss of data that could occur when transforming an MSC-DMS based metacard to a DDMS based metacard. For example, the DDMS does not provide a way to support multiple phone numbers, multiple emails, or contact information. Additionally, missing from the DDMS that a MSC-DMS metacard would provide is the address. The DDMS schema does not provide an address element, where as the MSC-DMS schema does. However, there is a tag named '*postalAddress*' in *ddms:geospatialCoverage*. But this refers to a location the resource itself could be referencing and not a point of contact address pertaining to a person or organization.

Coming back to the differences between the schemas, notice how much information is used in the MSC-DMS that cannot be accounted for directly by the DDMS. This needs to be accounted for when transforming an MSC-DMS based metacard to a DDMS based metacard.

A.2 Extending MSC-DMS Metacards with Additional Data

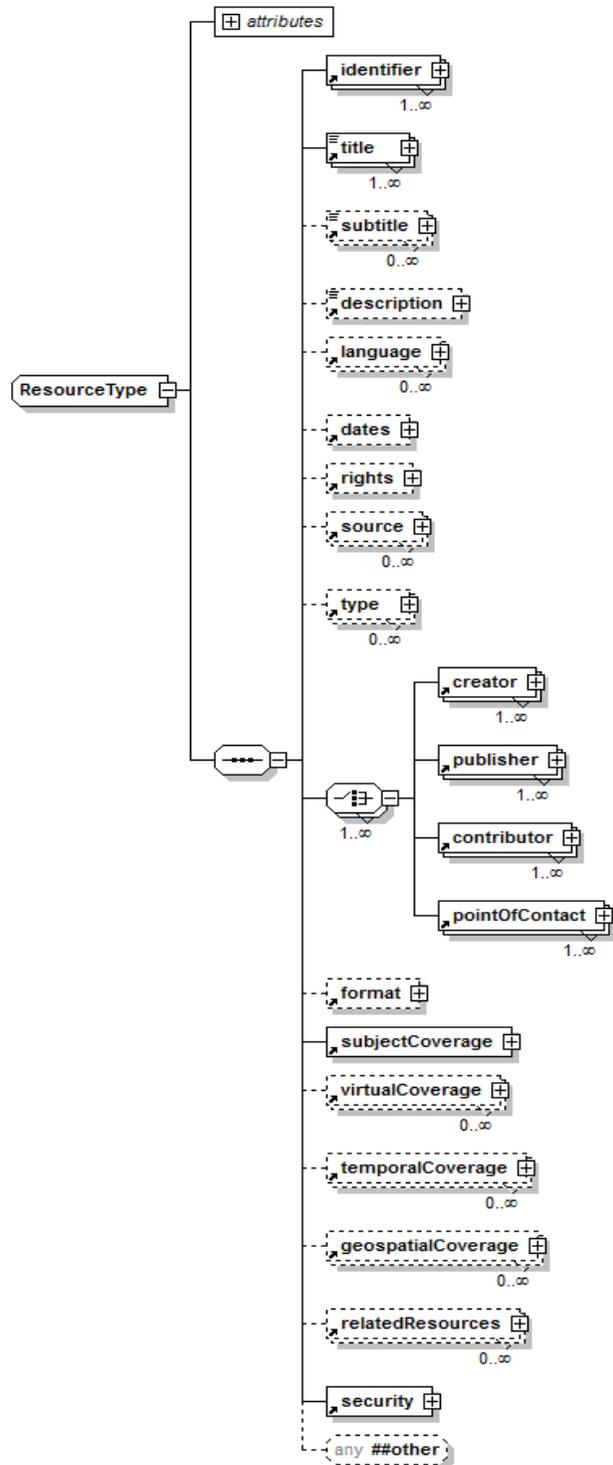
Section A.1 leads us to a good question. Where does the MSC-DMS information go that DDMS does not require? It needs to be saved, but where? There is no “set” tag for it.

A screen capture of the *ddms:resource* hierarchy is provided at the right hand column. The “any ##other” component found at the very bottom of the image has been incorporated into the DDMS; providing a means to add additional information that the DDMS specification did not define. The MSC-DMS provides this same capability.

The *xs:any* is defined as extensibility point for DDMS. It allows a COI-defined wrapper element to be placed after the *ddms:security* element. The wrapper element can contain any information that the COI wishes to include in DDMS instance documents. Information intended to supplement or extend existing ddms elements must also leverage this mechanism.

Theoretically it is possible to port the entire Resource tag from the MSC-DMS file and into the DDMS XML document legally without breaking DDMS schema syntax. This means copying the entire *ms:Resource* element, namespace attributes and all and placing it at the bottom after the security element.

However it is better to port equivalent tags provided by the MSC-DMS, which have been based on the DDMS into their rightful component element of the DDMS. For those elements that don’t map to the DDMS, they can be captured and contained in the ##other component.



A.3 Using MSC-DMS for supporting the M&S Catalog

The MSC-DMS metacard provides a descriptive tool used for discovering relevant M&S resources indexed by the M&S Catalog, thereby making them available to interested consumers. Below is an example of a tagged resource describing a fictional spectral database. The database has a description, a creation date, and contact information. The contact information is a person holding an email address*:

- abcdefg-registrar@abcdefg.xfbms.af.mil.

There is one resource that is associated to the database and it's a URL located:

- https://abcdefg.xfbms.af.mil/view_detail.cfm?RID=DTS_AF_1000017.

Note: this is a fictional email and web address, which is used only for the purpose of an example.

The MSC-DMS mark-up used to capture this metacard is provided in following listing.

```
<?xml version="1.0" encoding="UTF-8"?>
<ms:Resource ms:resource_ID="DTS_AF_1000017" ms:metacard_ID="1E238CAA-F1C3-
00DE-81BB345A064F27DD"
xsi:schemaLocation="http://metadata.dod.mil/mdr/ns/MSCDMS/1.3/
MSC-DMS-v1_3.xsd"
xmlns:ddms="http://metadata.dod.mil/mdr/ns/DDMS/2.0/"
xmlns:ms="http://metadata.dod.mil/mdr/ns/MSCDMS/1.3/"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:icism="urn:us:gov:ic:ism:v2">
<ms>Title ms:value="XRAY spectral database"/>
  <ms>Description>
    <ms:Text>The data contained in this database consists of infrared spectra
of atmospheric and pollutant species as well as software tools for file
format conversion and manipulation. The work reported herein describes
efforts conducted at the Air Force's Arnold Engineering Development Center
(AEDC) to establish high temperature reference spectra for some of the low
vapor pressure compounds identified in Title III of the Clean Air Act (CCA)
of 1990. To date, a high temperature infrared absorption cell has been
designed and fabricated for this purpose. The cell has been incorporated into
a high resolution FTIR spectrometer system and is currently being used to
acquire absorption spectra of selected compounds at elevated temperatures.
The measurement system provides spectral coverage from 500-4,000 wavenumbers
(cm-1) in the temperature range of 70- 500 F. Details of the sample cell and
preliminary spectral data of selected compounds are presented in this report.
A program to establish test methods for the 189 Hazardous Air Pollutants
(HAPs) identified in the Clean Air Act (CAA) of 1990 has been undertaken by
the U.S. Environmental Protection Agency (EPA). Fourier Transform Infrared
(FTIR) spectroscopy is a technique with the capability to detect many of
these compounds. Using suitable reference spectra this technique may be used
to determine path integrated concentrations of many species. Currently EPA's
Office of Air Quality Planning and Standards is using FTIR to collect data
for Maximum Achievable Control Technology (MACT).
  </ms:Text>
  </ms>Description>
</ms:Resource>
```

```
</ms:Description>
<ms:Dates>
  <ms>Date ms:type="created" ms:value="2000-01-11"/>
</ms:Dates>
<ms:Releasability ms:value="33"/>
<ms:Associations>
  <ms:Association ms:qualifier="URL"
n1:value="https://abcdefg.xfbms.af.mil/view_detail.cfm?RID=DTS_AF_1000017"/>
</ms:Associations>
<ms:POCs>
  <ms:POC>
    <ms:Person>
      <ms>Name ms:first="ABCDEFGH" ms:last="Registrar"/>
      <ms:Phone ms:type="work" ms:number="555-555-5555"/>
      <ms>Email ms:type="work" ms:address="abcdefg-
registrar@abcdefg.xfbms.af.mil"/>
    </ms:Person>
  </ms:POC>
</ms:POCs>
</ms:Resource>
```

Through the information provided on this metacard, any recipient of the metacard is provided directions to follow, contacts to call, and a basic tool description, which collectively help facilitate the reuse of an M&S resources.

Appendix B Tips for Improving Search and Discovery of Metacards

Improving discovery of tagged resources requires a deeper understanding of search mechanisms. The following content is based on a paper presented at the Simulation Interoperability Standards Organization (SISO) Spring 2009 Simulation Interoperability Workshop (SIW), 09S-SIW-076.

B.1 Understanding Types of Searches

There are three types of searches discussed in this guide:

- Simple content search
- Citation-based semantic search
- Weight-based search

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

B.2 Simple Content Search

This type of search specifically looks for items directly associated with the resource of interest. Author, title, keywords are examples of items to be searched by. Correctly populating certain elements with key search words will produce better search results. There are key elements in a metacard that when populated correctly, provide the most opportunity for capture using the content based method.

Required elements that would be examined include the following:

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

Optional elements that can also be useful for a simple search query include the following:

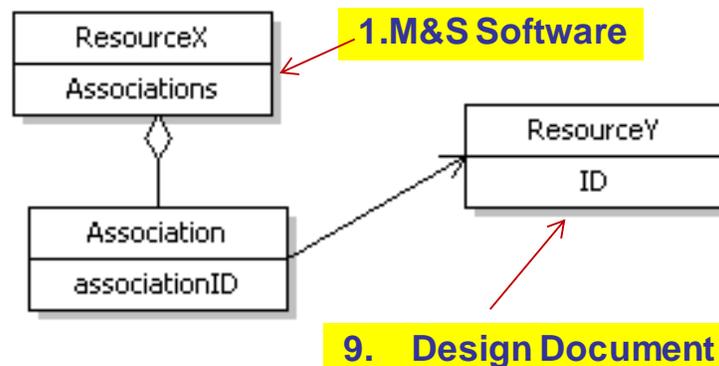
- *Usage*
- *Media*
- *Security*
- *Rights*

B.3 Citation-Based Semantic Search

Citation-based semantic searching will mine material that has been linked or cited by the resource of interest. This type of search allows more material for a search engine to crawl and index thereby increasing the likelihood of discovering assets that meet the search query criteria. There are five elements of interest regarding citation based semantic searching for the MSC-DMS. They are described in the subsections that follow:

B.3.1 Association (ID, value)

Connections with other resources can be identified or referenced within an association.



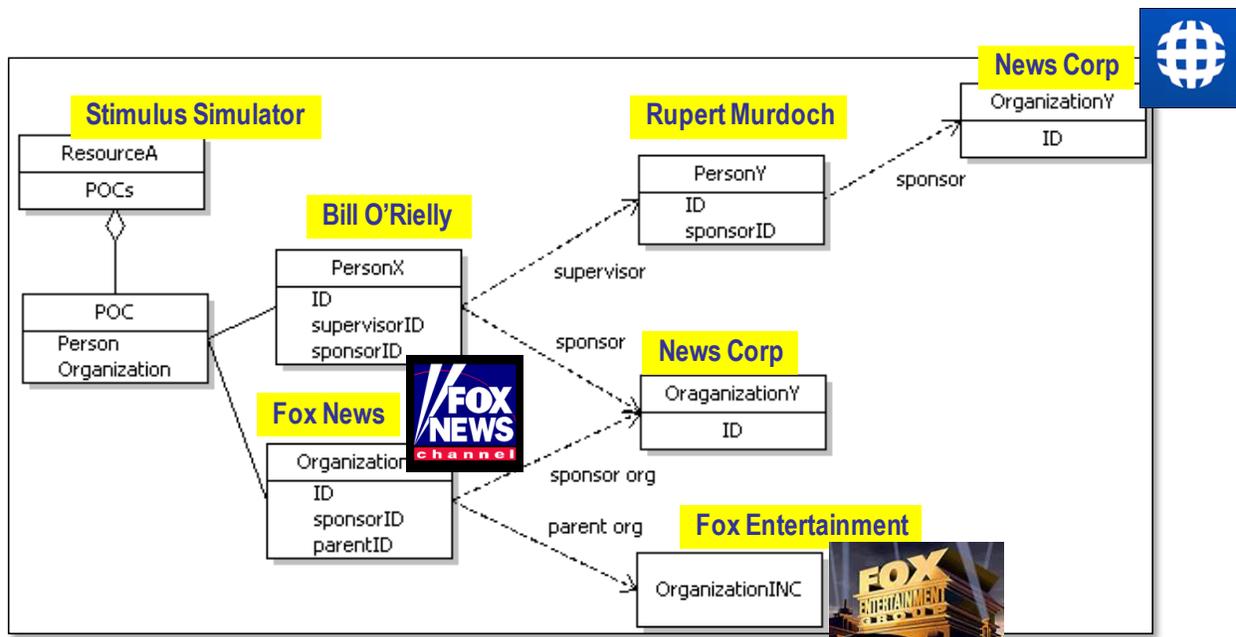
The example below shows how a citation-based association can be made using the MSC-DMS.

```
<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>
```

In this example, there is a reference to an entirely new resource. As a result, the possibility of a consumer identifying an asset that fulfills their requirements is increased.

B.3.2 POC.person or POC.organization (ID,URL)

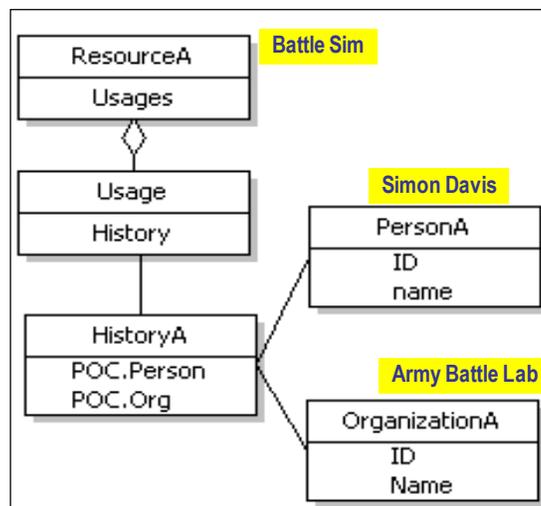
The relationships of POCs (e.g., sponsor, supervisor, parent organization) can be made as well. For example, consider the following illustration



Through this type of search, affiliated contacts and organizations can be crawled. The relationships of POCs (persons and organizations) matched against the search query criteria elevates the discovery potential.

B.3.3 Usage.History (POC ID)

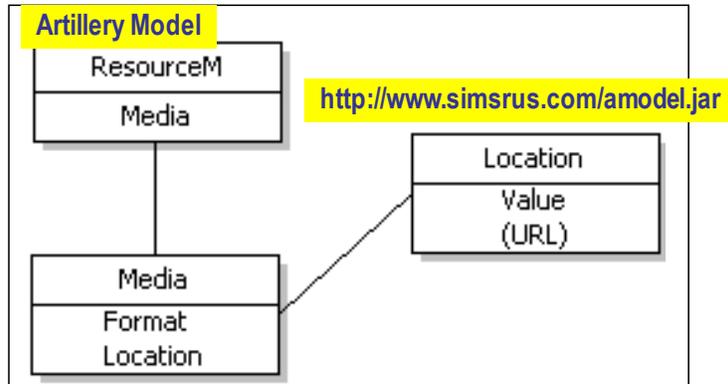
Usage History also provides a viable citation source. By examining the history of a resource, including how it was used and the connections with other POCs that have used the resource, helps to elevate the discovery potential.



A contact with experience regarding a resource of interest could be invaluable in determining the reuse potential of that resource. Consider that the related contacts may be considered an authority or a recognized individual or organization, and thereby would elevate the reuse value.

B.3.4 Media (location)

Media can be used for location and properties of the M&S resource. Citation connections with the physical location of the resource can be identified within the media content.



The ability to crawl these locations helps elevate the discovery potential. The following listing provides an example of how a media location would be captured in an MSC-DMS metacard.

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

B.3.5 Taxonomy Cited

An M&S Taxonomy represents a designation of controlled vocabulary terms pertaining to an M&S body of interest. Connections with specific taxonomies related to how the metadata is documented, can be extremely beneficial in supporting semantic search. For instance, if the taxonomy could be associated to the keywords entered for a search query, then the available metacards, which are mined and indexed, could be elevated and better targeted. The key is for the query engine to match the keyword search criteria taxonomy with taxonomy identified within the metacard. In addition, taxonomy mappings, if they existed within a repository, could be used to help orchestrate matches among metacards described by different but equivalent taxonomies.

The example below shows how a taxonomy citation is made using the MSC-DMS.

```
<ms:TaxonomiesCited>
  <ms:TaxonomyCited ms:value="Missile_Defense" ms:version="1.0">
    <ms:Location ms:value="http://en.wikimodels.org/wiki/mdefense"/>
  </ms:TaxonomyCited>
  <ms:TaxonomyCited ms:value="Aerospace_Engineering" ms:version="1.3">
    <ms:Location
      ms:value="http://aerospace_knowledge/feacd.xml"/>
  </ms:TaxonomyCited>
</ms:TaxonomiesCited>
```

The example below shows how a cited taxonomy is then identified within a subcomponent of the MSC-DMS metacard.

```
<ms:Resource ms:taxonomy="Missile_Defense">
```

The MSC-DMS elements that can be marked by a **taxonomy** attribute include **Resource**, **Title**, **Type**, **Description**, **Security**, **Associations**, **Keywords**, **Usage**, and **Media**.

B.4 Weight-Based Search

Weight-based search is essentially a matter of ranking results in order of relevance to the query. A weighted search will look for a specific term, its location, and its frequency pertaining to a resource. Once the term and its frequency are determined, it is assigned a value that weights a metacard's potential for interest. A list is returned with highest search value, or rather, most term matches with the highest number of instances in pertinent areas appearing in the resource. The table below lists MSC-DMS elements and shows a proposed valuation for an element in a weight-based search.

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
Taxonomies Cited	Medium

If a term used in a search is found in a title or the keyword portion of a metacard, there is a very 'High' probability that the resource will meet the need at hand. The valuation weight of these elements is High because, in good practice, it is populated specifically to be found by a search mechanism based on relative descriptive terms that accurately describe the resource. The producer is responsible to properly populate keywords with terms that are relevant to the resource.

The title is a brief description of the resource like the name of a piece of software or program component. Description has less weight because an author might make a small reference using a term or name relative to a search but not to the main point of the resource.

An element like Security has information independent of the subject matter of a resource, but the likelihood of a term matched here of being relevant to the search is small.