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

Resource Metacard Implementation Guide

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Modeling and Simulation Coordination Office (M&S CO)

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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 Resource Metacards documenting 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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22 March 2013 – Update to synchronize with MSC-DMS specification Version 1.5

24 December 2010 – Update to synchronize with MSC-DMS specification Version 1.4

25 February 2010 – Incorporation of comments based on draft Version 0.95 and synchronization with MSC-DMS specification Version 1.3

9 October 2009 – Preliminary Draft
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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 resources with MSC-DMS Resource 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 Resource Metacards pertaining to the following M&S resource types:

1. M&S software (*implies a model or simulation*)
2. Adjunct tools (*e.g., data loggers*)
3. Federations
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 model specifications
9. M&S support 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 Resource Metacards.

1.4 Intended Audience

This document is intended for individuals and organizations in the DoD M&S community including government, industry, and academia that support the development, 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.

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Roles and Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRODUCERS</strong></td>
<td>Develop components tagged and stored in shared space. Metadata is added to a catalog based on registered format.</td>
</tr>
<tr>
<td><strong>CONSUMERS</strong></td>
<td>Pull resource of interest, based on producer-registered metadata. Share experience.</td>
</tr>
<tr>
<td><strong>INTEGRATORS</strong></td>
<td>Understand the data components to build systems and applications.</td>
</tr>
</tbody>
</table>
# References

<table>
<thead>
<tr>
<th>Document</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>DoD Directive 8320.2</td>
<td>Department of Defense Directive, Data Sharing in a Net-Centric Department of Defense, 2 December 2004</td>
</tr>
</tbody>
</table>
# 3 Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensible Markup Language (XML)</td>
<td>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.</td>
</tr>
<tr>
<td>M&amp;S Resource</td>
<td>An asset that contributes to the composition or operation of an M&amp;S event, environment or infrastructure. Includes services, software, components, federations, adjunct tools, data, data models, interface model specifications, and resource specific documents.</td>
</tr>
<tr>
<td>Metacard</td>
<td>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.</td>
</tr>
</tbody>
</table>
| Metadata                                  | “Structured, encoded data that describe characteristics of information-bearing entities to aid in the identification, discovery, assessment, and management of the described entities.”

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)                                                                 |
| Net-Centric Environment                   | 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.                                                                 |

(Net-Centric Environment Joint Functional Concept, Version 1.0, April 7, 2005)                                                                                     |

---

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schema</td>
<td>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)</td>
</tr>
<tr>
<td>Shared Space</td>
<td>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)</td>
</tr>
<tr>
<td>Uniform Resource Locator (URL)</td>
<td>A unique identifier used to represent the location of a resource on the Internet.</td>
</tr>
</tbody>
</table>

For additional definitions, see the M&S COI Discovery Metadata Specification.
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4 MSC-DMS Resource Metacard Composition

4.1 Process Overview

A Resource 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 Resource 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 Resource 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, POCs, and even Usage History are just a few pre-defined resource metadata components laid forth in the MSC-DMS specification. These components enable a query engine, software program, or an individual to efficiently and effectively discover and catalog M&S resources of interest. M&S Resource Metacards,
based on the MSC-DMS, are what hold the key information for describing, locating, and using a resource.

Before diving into building Resource Metacards, however, it is important to understand that MSC-DMS 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
<?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:

```xml
<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 Resource Metacard Starting Point

Every MSC-DMS Resource Metacard starts with a single root element called **Resource**.

```xml
<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 Resource Metacard is defined by the MSC-DMS within an XML Schema. The MSC-DMS XML Schema ensures that an MSC-DMS Resource 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:
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 Resource Metacard, the *Resource* root element needs to identify its namespace as follows:

```xml
<Resource
  xsi:schemaLocation=
  "http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/MSC-DMS-Resource-v1_5.xsd">
</Resource>
```

There are other namespaces used as well for MSC-DMS Resource 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
<?xml version="1.0" encoding="UTF-8"?>
<ms:Resource
  xsi:schemaLocation=
  "http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/ MSC-DMS-Resource-v1_5.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:ms="http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/"
  xmlns:ddms="urn:us:mil:ces:metadata:ddms:4"
  xmlns:icism="urn:us:gov:ic:ism"/>
```

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 Resource Metacard staring 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 Resource Metacard. The core elements and attributes defined within the resource element set include the following:

- *resourceID*
- taxonomy
- MetacardInfo
- Title*
- Version*
- Description*
- Usages
- Dates*
- Rights
- Source
- Type*
- POCs (points of contacts)
- Keywords*
- Image
- Extensions
- RelatedResources
- RelatedTaxonomies
- Releasability*
- Security

Those items marked with an asterisk (*) are mandatory components and are necessary for every MSC-DMS Resource Metacard. These core mandatory and optional components 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 component 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 components is explored in Section 6.

Section 7 describes how Resource Metacards may be updated with additional information when they are used by community members.
5 MSC-DMS Resource Core Metadata

Order is important in an XML document. Each of the Core items identified below, if required, or used, must be provided in the order specified by the schema. Otherwise, if the Resource Metacard provides these XML 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 metadata.

5.1 Resource ID attributes

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

```xml
<ms:Resource
  ms:resourceID="0BFC70E9-02FD-AFB0-1F1A5E8848951FAF"
  xsi:schemaLocation="http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/MSC-DMS-Resource-v1_5.xsd"
  xmlns:ddms="urn:us:mil:ces:metadata:ddms:4"
  xmlns:ms="http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:icism="urn:us:gov:ic:ism">
  ms:metacardID="1E238CAA-F1C3-00DE-81BB345A064F27DD"
</ms:Resource>
```

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 supporting Resource Metacards can define relatedResources to other M&S resource assets, contact info 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 metacardID as shown in the example above. The metacardID attribute performs the same function as the resourceID attribute except it applies to the Resource Metacard itself. This allows relatedResources and other connections to be made that identify a Resource Metacard rather than an actual resource.
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.

```xml
<ms:Resource
    ms:resourceID="0BFC70E9-02FD-AFB0-1F1A5E8848951FAF"
    ms:taxonomy="Missile_Defense"
    xsi:schemaLocation="http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/
                        MSC-DMS-Resource-v1_5.xsd"
    xmlns:ddms="urn:us:mil:ces:metadata:ddms:4"
    xmlns:ms="http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:icism="urn:us:gov:ic:ism">
</ms:Resource>
```

Any component within an MSC-DMS Resource 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 Resource Core components that can be marked by a taxonomy attribute include Resource, MetacardInfo, Title, Description, Usage, Source, Type, Keywords, ResourceManagement, and RelatedResources. Also for MSC-DMS Resource Extension components that can be marked by a taxonomy attribute include VirtualCoverage, TemporalCoverage, GeospatialCoverage, HLACoverage, and VVACoverage. MSC-DMS Resource Extension are described in section 6, MSC-DMS Resource Supplemental Metadata.

5.3 Metacard Info (required)

The first XML core component is ‘ms:MetacardInfo’. This component is used to describe the information related to the metacard itself, as opposed to the resource it is describing. The principle attribute required for this component is the metcardID, which follows the same pattern as the resourceID.
It may be possible for the `resourceID` and `metacardID` to have corresponding IDs. For those creating resources and/or generating Resource Metacards, please check with the practices of your organization or the repository/catalog for which you are posting your resource and supporting resource metacard.

The XML portion of a resource MetacardInfo component with only a metacardID would look like this below. For the sake of clarity, the namespace declarations and other `Resource` attributes have been omitted.

```
<ms:Resource>
  <ms:MetacardInfo ms:metacardID="1E238CAA"/>
</ms:Resource>
```

In addition to the ID, the other attributes and subelements include taxonomy, Dates, POCs, Description, Releasability, and Security. They allow a publisher to enrich the metacard information and enhance searchability.

- **taxonomy** is a way to specify a context for understanding the `Metacard` information
- **Dates** specifies organizations and/or persons who have a particular role with respect to the M&S metacard.
- **POCs** specifies organizations and/or persons who have a particular role with respect to the M&S metacard
- **Description** is a description of the metacard

```
<ms:Resource>
  <ms:MetacardInfo ms:metacardID="1E238CAA">
    <ms:Dates>
      <ms:Date ms:type="created" ms:value="2012-07-12"/>
    </ms:Dates>
    <ms:POCs>
      <ms:POC>
        <ms:Person>
          <ms:Name ms:first="Sam" ms:last="Smith"/>
        </ms:Person>
      </ms:POC>
    </ms:POCs>
  </ms:MetacardInfo>
</ms:Resource>
```

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

- **Releasability** states the releasability of the metacard information
• **Security** states the security information of a metacard.

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

```xml
<ms:Resource>
  <ms:MetacardInfo ms:metacardID="1E238CAA">
    <ms:Dates>
      <ms:Date ms:type="created"
        ms:value="2012-07-12"/>
    </ms:Dates>
    <ms:POCs>
      <ms:POC>
        <ms:Person>
          <ms:Name
            ms:first="Sam"
            ms:last="Smith"/>
        </ms:Person>
      </ms:POC>
    </ms:POCs>
    <ms:Releasability ms:value="A: Unlimited distribution "/>
    <ms:Security />
  </ms:MetacardInfo>
</ms:Resource>
```

For a more extensive reference, including definitions of attributes, please refer to the MSC-DMS v1.5 specification. The next step is to explore what the code looks like when types are added to the Resource Metacard.

### 5.4 Title (required)

The first XML core component 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 component 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.

```xml
<ms:Resource>
  <ms:MetacardInfo/>
  <ms:Title ms:title="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
- **documentNumber** is an alpha numeric ID for an information resource assigned by the configuration manager
- **taxonomy** is a way to specify a context for understanding the **Title** information

```
<ms:Resource>
  <ms:MetacardInfo/>
  <ms:Title
      ms:title="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:MetacardInfo/>
  <ms:Title  
    ms:title="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 v1.5 specification. The next step is to explore what the code looks like when types are added to the Resource Metacard.
5.5 Version (required)

The **Version** gives the user revision information regarding the resource. The value itself will formally identify the M&S resource according to established standard versioning conventions. An example highlighting how to document a **Version** element is provided below:

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

After adding **Version**, this is what our Resource Metacard example looks like.

```xml
<ms:Resource>
  <ms:MetacardInfo/>
  <ms:Title ms:title="REx" ms:subtitle="RobustExample" ms:acronym="REx"
            ms:documentNumber="RE_342.34">
    <ms:Releasability ms:value="A: Unlimited distribution "/>
    <ms:Security />
  </ms:Title>
  <ms:Version ms:value="Baseline 5.1 Rev 8"/>
</ms:Resource>
```

5.6 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:

```xml
<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.
Additionally, the Description element can be annotated with a taxonomy attribute, which is used to identify a specific glossary that provides more insight into understanding the terminology used for the description. (See section 5.2).

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

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

After adding the Description Metadata Set, this is what our example looks like.

```xml
<ms:Resource>
  <ms:MetacardInfo/>
  <ms:Title ms:title="REx" ms:subtitle="RobustExample" ms:acronym="REx"
            ms:documentNumber="RE_342.34">
    <ms:Releasability ms:value="A: Unlimited distribution ">
    </ms:Releasability>
    <ms:Security />
  </ms:Title>
  <ms:Version ms:value="Baseline 5.1 Rev 8" />
  <ms:Description>
    <ms:Text>used for high fidelity short range attack models</ms:Text>
    <ms:Releasability ms:value="A: Unlimited distribution ">
    </ms:Releasability>
    <ms:Security />
  </ms:Description>
</ms:Resource>
```

You might ask, “Why are there now two releasability and security tags identified in the metacard?” 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 documented within the Resource Metacard 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.

### 5.7 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. This is considered a feedback loop for consumers. It is populated after the resource has been put to use.

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. To accommodate this, the Usage component also includes the ability to identify the primary language of the intellectual content of the M&S resource. The Language component is shown in the example below.

The components associated to a Usage element include the following:

- **taxonomy**
- **Purpose**
- **Application Domain**
- **Limitations**
- **History**
  - **Date**
  - **Description**
  - **POC**
- **Language**
- **Capabilities**
- **Releasability**
- **Security**

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:

```xml
<ms:Usages>
  <ms:Usage>
    <ms:Purpose>To test short range projectile accuracy</ms:Purpose>
    <ms:ApplicationDomain ms:value="t&e"/>
    <ms:Limitations>Not intended for elevations above 3K ft.</ms:Limitations>
    <ms:Experience>
      <ms:Date ms:value="2007-10-01" ms:type="used"/>
      <ms:Review>
```

24
Successful in supporting joint and coalition littoral warfare exercises October 2007
</ms:Review>
<ms:POC>
<ms:Person ms:personID="345" ms:name="Samuel Drake"/>
</ms:POC>
</ms:Review>
<ms:Language ddms:qualifier="ISO 639-1" ddms:value="fr"/>
<ms:Capability>capable for use in shipboard experiments</ms:Capability>
<ms:Releasability/>
</ms:Usage>

5.8 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.

```xml
<ms:Resource>
  <ms:MetacardInfo/>
  <ms:Title ms:title="REx" ms:subtitle="RobustExample" ms:acronym="REx" ms:documentNumber="RE_342.34">
    <ms:Releasability ms:value="A: Unlimited distribution "/>
    <ms:Security />
  </ms:Title>
  <ms:Version ms:value="Baseline 5.1 Rev 8"/>
  <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:Usages/>
  <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>
```

### 5.9 Rights (optional)

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

- `privacyAct`
- `intellectualProperty`
- `copyright`
- `POC`

The *Rights* attributes can be declared as follows in the Resource Metacard:

```xml
<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 a *POC*. 
5.10 Source (optional)

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

- **Taxonomy**
- **Format**
  - MIME type
  - extent
  - medium
- **CodeLanguage**
- **Location**
- **Description**
- **Releasability**
- **Security**

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

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

```xml
<ms:Source>
  <ms:Format>
    <ddms:mimeType>Text/XML/HTML</ddms:mimeType>
    <ddms:medium>digital</ddms:medium>
  </ms:Format>
  <ms:Format>
    <ddms:mimeType>String</ddms:mimeType>
    <ddms:medium>digital</ddms:medium>
  </ms:Format>
  <ms:CodeLanguage>Ada</ms:CodeLanguage>
  <ms:Location>http://simmodelsrus.com/software</ms:Location>
  <ms:Location>http://www.simdeliverance.com</ms:Location>
</ms:Source>
```
5.11 Type (required)

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

software, tool, federation, software_component, service, data, data_model, interface_model_specification, support_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:type="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:type="custom_widget"

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

<ms:Type ms:type="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:
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 they 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 producer, 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 Resource Metacard example looks like.
5.12 POCs (optional)

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 XML attributes and elements:

- **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="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 5.9 and 5.10 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 includes Name, Affiliation, JobTitle, Address, Phone, Email, WebAddress, and ContactInstructions as sub elements. Affiliation refers to the organization and includes as attributes organizationID, value, and position. These levels of descriptive information describing a person or organization can be very useful when support is needed by a consumer or integrator of the respective resource.

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

- personID
- sponsorID
- supervisorID
- Name (First, Middle, and Last)
- Affiliation
- JobTitle
- Address
- Phone
- Email
- WebAddress
- ContactInstruction

The enumerated list to select from for a **Phone.type** includes the following:

- Work,
- Home,
- DSN,
- Mobile,
The enumerated list to select from for an Email type includes the following:

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

An example highlighting how to document a POC Person is provided below:

```xml
<ms:POCs>
  <ms:POC ms:role="technical POC">
    <ms:Person>
      <ms:Name ms:first="Lindsey" ms:middle="Amanda" ms:last="Piddleton"/>
      <ms:Affiliation ms:value="SpyFlight Industries" ms:organizationID="331" ms:value="Writer"/>
      <ms:JobTitle ms:value="Technical Reviewer"/>
      <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="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:WebAddress 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 *JobTitle* is “Technical Reviewer” and her *Affiliation.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:

- *organizationID*
- *sponsorID*
- *parent ID*
- *Name*
- *Type*
- *AddressInfo*
- *Phone*
- *Email*
- *WebAddress*
- *ContactInstruction*

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, Academy, Industry.*

An example highlighting how to document a *POC.Organization* is provided below:
After adding POC, this is what our Resource Metacard example looks like.

<ms:POC>
  <ms:Role ms:value="publisher"/>
  <ms:Organization ms:organizationID="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:Resource>
  <ms:Title ms:title="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:type="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:Description>
  <ms:Security/>
  <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>
Notice in the example that two POC Metadata Sets are encased within the `POCs` element, which is a container.

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 Metadata Sets with their underlying elements and attributes singularly.

It is important to keep 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 Resource 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:

```xml
<ms:Keywords>
  <ms:Keyword ms:value="simulation" ms:taxonomy="Military_Training"/>
  <ms:Keyword ms: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 Image (optional)

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

- source
- type
- height
- width
- alt

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

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

An example highlighting how to document an Image using these components is provided below:

```
<ms:Image
  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.

5.15 RelatedResources (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 RelatedResources.

The components associated to a Resource element include the following:
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 associated type values includes the following:

- resource_asset,
- contact_asset,
- taxonomy_asset,
- support_asset,

An example highlighting how to document a Resource element using these components and enumerations is provided below:

```xml
<ms:RelatedResources>
  <ms:Resource
    ms:resourceID="4352"
    ms:title="http://www.shortrangealgos.com/BMA1003.xml"
    ms:relationship="is-described-by"
    ms:type="resource_asset">
    <ms:Releasability ms:value="A: Unlimited distribution "/>
    <ms:Security/>
  </ms:Resource>
</ms:RelatedResources>
```

The first thing that is shown is a RelatedResources element, which marks the container for holding at least one specific singular Resource. For each Resource 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 associated resource.

5.16 RelatedTaxonomies (optional)

The RelatedTaxonomies 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 Resource Metacard. Section 5.2 provided 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 RelatedTaxonomy.

The components associated to a RelatedTaxonomy element include the following:

- value
- version
- Description
- Location

An example highlighting a RelatedTaxonomy component is provided below:

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

5.17 Releasability (required)

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:

```xml
<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.value** 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 the **value** attribute.

In addition to the root **Resource**, there are other components of an MSC-DMS Resource Metacard that can have varying degrees of **Releasability**. The MSC-DMS components that can be marked by a **Releasability** element include **MetacardInfo, Title, Description, Usage, POC, Resource**, and media **Source**. 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 Metadata Set as a subelement. They include the following:

- **MetacardInfo** (see section 5.3)
- **Title** (see section 5.4)
- **Description** (see section 5.6)
- **Usage** (see section 5.7 under **Usages**)
- **POC** (see section 5.12 under **POCs**)
- **Resource** (see section 5.15 under **RelatedResources**)
- **Source** (see section 5.17 under **Sources**)

To include **Releasability** to any of these components, you must simply identify **Releasability** as a sub element. This is illustrated below:
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 MetacardInfo, Title, Description, Usage, POC, Resource, and media Source or any of the Extension Metadata Sets.

5.18 Security (required)

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 metadata information.

There are three types of Security Metadata Sets as used by the DDMS and incorporated within the MSC-DMS:

- Top Level
- Sub Level – Required
- Sub Level - Optional

The attributes associated to the Security element include the following:  // I need to update this

- excludeFromRollup
- classification
- ownerProducer
- SCI Controls
- SARIdentifier
These attributes are identified by the IC-ISIM security specification, which is also used by the DDMS. An example highlighting how to document a Security element using these components is provided below:

```xml
<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 elements of an MSC-DMS Resource Metacard that can have varying degrees of security. The MSC-DMS elements that can be marked by a Security element include MetacardInfo, Title, Description, Usage, POC, Resource, and all of the Supplemental Elements Sets described in Section 6.

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 core
Metadata Sets in the MSC-DMS specification that uses the *Security* metadata Set as a sub-element. They include the following:

- *MetacardInfo* (see section 5.3)
- *Title* (see section 5.4)
- *Description* (see section 5.6)
- *Usage* (see section 5.7 under *Usages*)
- *POC* (see section 5.12 under *POCs*)
- *Resource* (see section 5.15 under *RelatedResources*)
- *Source* (see section 5.17 under *Sources*)

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:MetacardInfo/>
<ms:Title ms:title="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:declassifyDate="2008-08-13"/>
</ms:Title>
<ms:Type ms:type="software_component" ms:subtype="DCMITYPE" ms:ads-designation="Category I" />
<ms:Description>
<ms:Text>used for high fidelity short range attack</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"
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 (Resource, POC, Usage, Source).

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’.
6 MSC-DMS Resource Supplemental Metadata

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

6.1 Virtual Coverage

*VirtualCoverage* 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 *VirtualCoverage* element using these components is provided below:

```xml
<ms:VirtualCoverage ms:address="www.sims.com/missile3"
ms: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:

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

```xml
<ms:HLACoverage>
   <ms:Certification ms:value="1"/>
   <ms:Date ms:value="2001-12-17"/>
   <ms:FomSomUsed>
      <ms:Name ms:value="SimVar FOM"/>
      <ms:FomSomURL 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:

```xml
<ms:VVCoverage>
   <ms:Certification ms:value="1"/>
   <ms:Date ms:value="2001-12-17"/>
   <ms:FomSomUsed>
      <ms:Name ms:value="SimVar FOM"/>
      <ms:FomSomURL ms:value="www.simvarations.com/ghh"/>
   </ms:FomSomUsed>
</ms:VVCoverage>
```
6.6 ResourceManagement (optional)

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 Resource Management Metadata Set supports description of the Resource Management documentation project as well as individual VV&A documents that are produced by a project. This section describes how to document the ResourceManagement component.

The components associated to an ResourceManagement element include the following:

- type
- taxonomy
- RecordsManagementInfo
- RevisionRecall
- TaskingInfo
- ProcessingInfo
- Description
- POCref
- Releasability
- Security

The enumerated list for the type values includes the following:

User Group, CCB, Executive Steering Committee None Other

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

Resources often go through a process of configuration management (CM) 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 of the project as well as individual CM documents produced by a project. An example highlighting how to document a ResourceManagement element is provided below:

```xml
<ms:ResourceManagement
    ms:type="Configuration Control Board (CCB)"
    ms:taxonomy="a">
  <ms:RecordsManagementInfo>
    <ddms:vitalRecordIndicator="false">
      <ddms:recordKeeper>
        <ddms:recordKeeperID>String</ddms:recordKeeperID>
        <ddms:organization>
          <ddms:name>String</ddms:name>
          <ddms:phone>String</ddms:phone>
          <ddms:email>String</ddms:email>
          <ddms:subOrganization/>
        </ddms:organization>
      </ddms:recordKeeper>
      <ddms:applicationSoftware/>
    </ddms:RecordsManagementInfo>
  </ms:RecordsManagementInfo>
  <ms:RevisionRecall>
    <ddms:revisionType="ADMINISTRATIVE RECALL">
      <ddms:link/>
      <ddms:details/>
    </ms:RevisionRecall>
  </ms:RevisionRecall>
  <ms:TaskingInfo>
    <ddms:requesterInfo>
      <ddms:person>
        <ddms:name>String</ddms:name>
        <ddms:surname>String</ddms:surname>
        <ddms:phone>String</ddms:phone>
        <ddms:email>String</ddms:email>
        <ddms:userID>String</ddms:userID>
        <ddms:affiliation>String</ddms:affiliation>
      </ddms:person>
    </ddms:requesterInfo>
    <ddms:addressee>
      <ddms:person>
        <ddms:name>String</ddms:name>
        <ddms:surname>String</ddms:surname>
        <ddms:phone>String</ddms:phone>
        <ddms:email>String</ddms:email>
        <ddms:userID>String</ddms:userID>
        <ddms:affiliation>String</ddms:affiliation>
      </ddms:person>
    </ddms:addressee>
    <ddms:description>String</ddms:description>
  </ms:TaskingInfo>
</ms:ResourceManagement>
```
<ddms:taskID xlink:show="new" xlink:actuate="onLoad" xlink:arcrole="a">String</ddms:taskID>
</ms:TaskingInfo>
<ms:ProcessingInfo>String</ms:ProcessingInfo>
<ms:Description>String</ms:Description>
<ms:POCref>
  <ms:Person ms:personID="345" ms:name="John Dillon">
  </ms:Person>
  <ms:Text ms:taxonomy="a">String</ms:Text>
</ms:POCref>
<ms:Releasability ms:value="A: Unlimited distribution "/>
<ms:Security/>
</ms:ResourceManagement>
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7 Updating and Maintaining MSC-DMS Resource Metacards

All the elements described in this guide identify information to help document an M&S resource. Some components of the MSC-DMS are mandatory, some optional, and others are supplemental. These components 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 Resource 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 Resource Metacard will mean less time expended by others searching for candidate M&S resources.

Once a Resource 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 corresponding Resource Metacard should reflect the change. If the functionality has improved or changed, then the corresponding Resource 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 Resource 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 Resource 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 Resource Metacard.

```xml
<ms:Usage>
  <ms:Purpose>To test short range projectile accuracy</ms:Purpose>
  <ms:ApplicationDomain ms:value="test and evaluation"/>
  <ms:Limitations>Not intended for elevations above 3K ft.</ms:Limitations>
  <ms:Experience>
    <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:POCref>
      <ms:Person ms:personID="345" ms:name="Samuel Drake"></ms:Person>
    </ms:POCref>
  </ms:Experience>
</ms:History>
```
7.2 Updating Source Media Reference

Below is the original media reference that was created in section 5.15. 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:Source>
  <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>http://simmodelsrus.com/software"</ms:Location>
  <ms:Location>http://www.simdeliverance.com"</ms:Location>
</ms:Source>
```

If the location changes, it is important to update the Source element of the Resource Metacard with the new Location.

7.3 Identifying Related Resources

Related Resources provide a way to associate 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:Resource
  ms:title="http://www.shortrangealgos.com/BMA1003.xml"
  ms:relationship="is-described-by"
  ms:type="related_documents"
>
It is also possible that new documents, software components, and tools will appear after the initial creation of a Resource 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 Resources component.

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

```xml
<ms:Resource
    ms:title="http://www.shortrangealgos.com/BMA1003.xml"
    ms:relationship="is-described-by"
    ms:type="related documents"
    ms:resourceID="4352"
    <ms:Releasability/>
    <ms:Security/>
</ms:Resource>
```

The associated asset is designated using the resourceID value. Wherever the Resource 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 Resource 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.

```xml
<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.
If the version of the resource changes, then the Resource Metacard reflecting the resource should also change.

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

It’s quite common to produce more than one metacard that needs to be shared with others or submitted to a repository or catalog. Rather than having to send each metacard individually, the MSC-DMS provides a mechanism to capture multiple sets of metacards into a single file called a Multicard.

The snippet of XML below shows how a Multicard can be defined

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!--Sample XML file generated by XMLSpy v2008 rel. 2 sp2
(http://www.altova.com)-->
<ms:Multicard
xmlns:ddms="urn:us:mil:ces:metadata:ddms:4"
xmlns:ms="http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:icism="urn:us:gov:ic:ism">
  <ms:Title ms:value="Example Multicard"/>
  <ms:Description>
    <ms:Text>This XML document contains multiple MSC-DMS based metacards</ms:Text>
  </ms:Description>
  <ms:Metacards>
    <ms:Resource/>
    <ms:Contact/>
    <ms:Taxonomy/>
  </ms:Metacards>
</ms:Multicard>
```

The same namespace, ms, is used as before, in this case though we can create a complete document that has one or more Resource Metacards, Contact Metacards, or Taxonomy Metacards.

The manual process for building a Multicard, is to use the example XML code block above, and then copy and paste each metacard within the Metacards element section. Whereas the process for extracting each Metacard from a Multicard is to parse and pull out the XML content from the Metacard document. Both these manual processes can also be supported using tools and scripts.
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Appendix A  Supporting Other Metadata Standards

A.1  Porting MSC-DMS Resource Metacards to DDMS

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. Differences between the two schemas are discussed below.

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

```xml
<ms:POC ms:role="publisher"/>
  <ms:Person ms:supervisorID="231" ms:personID="230" ms:sponsorID="332">
    <ms:Name ms:first="Lindsey" ms:middle="Amanda" ms:last="Piddleton"/>
    <ms:Affiliation ms:organizationID="331" ms:position="Writer" ms:value="SpyFlight Industries"/>
    <ms:Title ms:value="Technical Reviewer"/>
    <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:PostalCode 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="writerl@spyflight.com"/>
    <ms:Email ms:type="home" ms:address="amanda@hotmail.com"/>
    <ms:WebAddress 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 of an MSC-DMSM v1.5 Resource Metacard, the POC holds the role of publisher. The MSC-DMS provides a means to identify a role for a POC. In comparison, if a POC is identified as a publisher, creator, or contributor, the DDMS version 4.0 provides unique element types that are defined independently. For instance, the element for the role of publisher is \textit{ddms:publisher}; the element for the role of creator is \textit{ddms:creator}; and the element for the role of contributor is \textit{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 \textit{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" /></ms:Name>  <ddms:name>ModelXYZ</ddms:name>
```

When writing XSL code for automatic transformation of Resource Metacards between XML schema styles, understanding this difference matters. A well-designed XSLT program will automatically translate an XML document from one schema to another without any loss of meaning.

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>230</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 Resource Metacard to a DDMS Metacard. For example, the DDMS does not provide a way to support addresses or multiple phone numbers, multiple emails, or contact information. Additionally, missing from the DDMS that a MSC-DMS Resource 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 is 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 Resource Metacard to a DDMS Metacard.
A.2  Mash-Up Support -
Extending MSC-DMS Resource 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” component 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 a 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 components that don’t map to the DDMS, they can be captured and contained in the ##other
Because of the way the MSC-DMS was defined using the \#other attributes and elements, one can create or modify an MSC-DMS metacard in XML with elements that have an additional attributes and elements. The trick is to import any additional new schemas and namespaces into the XML MSC-DMS-based metacard that you are building. In this way the MSC-DMS metacard can be host for reflecting other additional information that may be useful in facilitating understanding.

For example, suppose we want to augment some of the MSC-DMS metacard elements with unique attribute called weight. The idea of the weight attribute is to identify a query weighting value for any MSC-DMS elements so that we can mark portions of the metacard where the metadata content may be more valuable or less valuable. In other words, if we assign a weight value of "Low" to the Resource.Rights element of a Resource Metacard, and a weight value of "High" to the Resource.Keywords element of a Resource Metacard, we may be doing so to identify to a query engine or an analyst the importance of a specific metadata set.

```xml
<ms:Rights
    ddms:privacyAct="false"
    ddms:copyright="false"
    ddms:intellectualProperty="false"
    weight:value="Low">
</ms:Rights>

<ms:Keywords>
    <ms:Keyword
        ms:value="simulation"
        ms:taxonomy="Military_Training"
        weight:value="High">
</ms:Keywords>
```

In this mash-up example, we are saying that the keyword is more valuable than rights.

Additionally, as an example, let's suppose we want to extend an MSC-DMS element with not only this new "weight" attribute, but we also want to be able to extend any MSC-DMS Resource Metacard Data Set with a subelement called "Comments" (from a namespace identified as feedback). An integrator could use a mash-up such as this or user of a resource to mark parts of the metacard with further amplifying notes (i.e., comments). For example, let's suppose the rights element within an MSC-DMS Resource Metacard is augmented with some additional feedback metadata to indicate that new POC may be needed. It might look something like what's listed below.

```xml
<feedback:comment id="32" commenter="plg">
    <feedback:value>"This POC was very helpful regarding understanding the rights for this resource, but this metacardlet may need to be updated with another POC
```
because the person identified is retiring."</feedback:value>

The markup for the comment was the commenter’s initials, an associated id and the value of the comment itself. Next we will show you how that information can be added to metadata set of the MSC-DMS as a mash-up.

A.3 Identifying the additional supporting schemas to support a Mash-Up

First it’s important to understand how to identify the additional supporting schemas. Typically, the header of the MSC-DMS metacard looks something like this:

```xml
<ms:Resource ms:resourceID="2345.2 tag"
xsi:schemaLocation="http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/ MSC-DMS-Resource-v1_5.xsd"
xmlns:ddms="urn:us:mil:ces:metadata:ddms:4"
xmlns:ms="http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:icism="urn:us:gov:ic:ism">  
```

A slight modification to the header will allow an attribute be added to any MSC-DMS element within the metacard. For example, if you want to "mash-up" the metacard with the "weighting" or "commenting" capability discussed previously, the header should look something like this:

```xml
<ms:Resource ms:metacardID="2345.2 tag"
xsi:schemaLocation="http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/ MSC-DMS-Resource-v1_5.xsd
http://metadata.dod.mil/mdr/ns/SupportSchema ss_Weight.xsd
http://metadata.dod.mil/mdr/ns/SupportSchema ss_Comment.xsd"
xmlns:ddms="urn:us:mil:ces:metadata:ddms:4"
xmlns:ms="http://metadata.dod.mil/mdr/ns/MSCDMS/1.5/
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:icism="urn:us:gov:ic:ism"
```

Notice, that two schemas and two name spaces identified as weight and feedback have been added to the XML document. Just cut and paste this type of XML syntax into the header of your MSC-DMS Resource Metacards. However, be sure that the schema being used for the mash-up is located within the same folder as the other MSC-DMS schemas. Or, if it is in a different location, you can define the absolute or regular path of their location in the schemaLocation attribute.
With this added in, we can now markup the Resource Metacard with additional metadata as illustrated below.

```xml
<ms:Rights ddms:privacyAct="false" ddms:copyright="false" ddms:intellectualProperty="false" weight:value="Low">
  <ms:POCref>
    <ms:Person ms:personID="345" ms:name="Samuel Drake">
      </ms:Person>
  </ms:POCref>
  <ms:POCref>
    <ms:Person ms:personID="346" ms:name="William Gilbert">
      </ms:Person>
  </ms:POCref>
  <weight:WeightRankInfo>The Low weighting is based on the strength of value that Rights may have this type of resource. Rights are not critical for ordering search results.</weight:WeightRankInfo>
  <feedback:comment id="32" commenter="plg">
    <feedback:value>"This POC was very helpful regarding understanding the rights for this resource, but this metacardlet may need to be updated with another POC because the person identified is retiring."</feedback:value>
  </feedback:comment>
</ms:Rights>
```

Notice the namespace `weight` and `feedback` are different than the namespace `ms` used for other elements and attributes. This is the pattern of a mash-up. It is still a valid MSC-DMS Resource Metacard, but it has been augmented with additional information that can be validated by the other schemas via the namespaces.

As a result, the supporting schemas used for the mash-up don’t break the MSC-DMS. They simply provide a way to add more content (e.g., comments and weights).

Keep in mind that future versions of the MSC-DMS may offer what is provided by these additional supporting schemas, and may not be necessary. This is only provided as an example for those that want to create these types of mash-ups to add more metadata information to a Resource Metacard.

### A.4 Using MSC-DMS for Supporting the M&S Catalog

The MSC-DMS Resource 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:


*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 Resource Metacard is provided in following listing:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<ms:Resource ms:resourceID="DTS_AF_1000017" ms:metacardID="1E238CAA-F1C3-00DE-81BB345A064F27DD"
  xsi:schemaLocation="http://metadata.dod.mil/mdr/ns/MSDMS/1.5/
MSC-DSMS-Resource-v1_5.xsd"
xmlns:ddms="urn:us:mil:ces:metadata:ddms:4"
xmlns:xms="http://metadata.dod.mil/mdr/ns/MSDMS/1.5/
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:icism="urn:us:gov:ic:ism">
<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:Dates>
  <ms:Date ms:type="created" ms:value="2000-01-11"/>
</ms:Dates>
<ms:Releasability ms:value="33"/>
<ms:RelatedResources>
</ms:RelatedResources>
<ms:POCs>
  <ms:POC>
    <ms:Person>
      <ms:Name ms:first="ABCDEFG" ms:last="Registrar"/>
      <ms:Phone ms:type="work" ms:number="555-555-5555"/>
    </ms:Person>
  </ms:POC>
</ms:POCs>
</ms:Resource>
```
Through the information provided on this Resource Metacard, any recipient of the Resource Metacard is provided directions to follow, contacts to call, and a basic tool description, which collectively help facilitate the reuse of an M&S resource.

A.5 Supporting M&S Catalog Dimensions

There are a number of “dimensions” provided by the current implementation of the M&S Catalog that are not defined as unique elements or attributes within the MSC-DMS. These dimensions include the following:

- Functionality
- Mission Space
- Products
- Physical Domain
- Battlespace
- Maturity
- Service
- Aggregation

This document describes how to markup an MSC-DMS Resource Metacard with these dimensions so that they can be used for the M&S Catalog.

The recommendation is to utilize the MSC-DMS’ Keywords Metadata Set, which has been part of the specification since its origination. The Keywords component provided by the MSC-DMS is illustrated in the figure below.
Note that more than one keyword can be provided within an MSC-DMS Resource Metacard. For any keyword, a **taxonomy** can be provided along with a **value** representing the keyword. The **taxonomy** is optional, but it should be used to help clarify the underlying meaning of the **keyword.value**. Thus, it is recommended that the M&S Catalog dimensions that are not explicitly defined as an MSC-DMS Resource Component be reflected as a **keyword.taxonomy**, and the enumerated values for these M&S Catalog dimensions can be reflected as the **keyword.value**.

An MSC-DMS based excerpt in XML representing an example with these M&S Catalog dimensions filled in as **keywords** is provided below:

```xml
<ms:Keywords>
  <ms:Keyword ms:taxonomy="Functionality" ms:value="LVC Environment" />
  <ms:Keyword ms:taxonomy="Mission Space" ms:value="Air Warfare" />
  <ms:Keyword ms:taxonomy="Products" ms:value="Force Allocation" />
  <ms:Keyword ms:taxonomy="Battlespace" ms:value="Mission" />
  <ms:Keyword ms:taxonomy="Maturity" ms:value="Mature - cyclical improvement" />
  <ms:Keyword ms:taxonomy="Service" ms:value="JCS" />
  <ms:Keyword ms:taxonomy="Aggregation" ms:value="Squadron" />
</ms:Keywords>
```

The table below identifies the specific M&S Catalog dimensions and how they can be included in the building of an MSC-DMS Resource Metacard.

<table>
<thead>
<tr>
<th>M&amp;S Catalog Dimension</th>
<th>Keyword Taxonomy</th>
<th>Keyword Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functionality</td>
<td>DoD Functionality</td>
<td>• Agent-Based</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Algorithmic Tool</td>
</tr>
<tr>
<td>Mission Space</td>
<td>DoD Mission Space</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------</td>
<td></td>
</tr>
</tbody>
</table>
| • Constructive  
  • Deterministic  
  • Gaming  
  • Federation  
  • Human-in-the-Loop  
  • Linear Program  
  • Live (new)  
  • LVC Environment  
  • Model (new)  
  • Object Oriented  
  • Optimization  
  • Parametric Tool  
  • Simulation  
  • Spreadsheet  
  • Stochastic  
  • Systems Dynamic  
  • Tool Kit (new)  
  • Virtual (new)  
  • Wargaming  
  • Web-Based | • Adaptive Planning  
  • Air Base Operations  
  • Air Power  
  • Air Refueling  
  • Air To Air  
  • Air To Ground  
  • Air Warfare  
  • Amphibious Warfare  
  • Anti-Mine (Maritime) Warfare  
  • Anti-Submarine (Maritime) Warfare  
  • Anti-Surface (Maritime) Warfare  
  • Battlespace Management  
  • Behavior  
  • CAS  
  • CBRN  
  • Combat SAR  
  • Command and Control  
  • Communications  
  • Cyber  
  • DCA  
  • Electronic Warfare  
  • Forward Presence  
  • Ground Warfare  
  • Information Operations  
  • Intelligence Operations  
  • Inter-theater lift  
  • Intra-theater lift |
<table>
<thead>
<tr>
<th>Products</th>
<th>DoD Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irregular Warfare</td>
<td>Battlespace Management</td>
</tr>
<tr>
<td>ISR</td>
<td>COA Analysis</td>
</tr>
<tr>
<td>Littoral Warfare</td>
<td>Comparative Analysis</td>
</tr>
<tr>
<td>Logistics</td>
<td>Course of Action Analysis</td>
</tr>
<tr>
<td>Maritime Warfare</td>
<td>Data mining</td>
</tr>
<tr>
<td>Missile Warning/Defense</td>
<td>Distribution Projection</td>
</tr>
<tr>
<td>Mine Warfare</td>
<td>Effects Based Operations</td>
</tr>
<tr>
<td>Nuclear Planning</td>
<td>Force Allocation</td>
</tr>
<tr>
<td>OCA</td>
<td>Force Management</td>
</tr>
<tr>
<td>Position Navigation and</td>
<td>Force Mix</td>
</tr>
<tr>
<td>Timing</td>
<td>Operational Support Analysis</td>
</tr>
<tr>
<td>SATCOM</td>
<td>Risk Analysis</td>
</tr>
<tr>
<td>SEAD</td>
<td>Survivability Assessment</td>
</tr>
<tr>
<td>Sensors</td>
<td>System Performance</td>
</tr>
<tr>
<td>Space Launch</td>
<td>TPFDD Development</td>
</tr>
<tr>
<td>Space Situation Awareness</td>
<td>Wargaming</td>
</tr>
<tr>
<td>(NEW)</td>
<td></td>
</tr>
<tr>
<td>Space Warfare</td>
<td></td>
</tr>
<tr>
<td>Special Operations</td>
<td></td>
</tr>
<tr>
<td>Strategic Attack</td>
<td></td>
</tr>
<tr>
<td>Strategic Deterrence</td>
<td></td>
</tr>
<tr>
<td>Strategic Mobility</td>
<td></td>
</tr>
<tr>
<td>Support of Land</td>
<td></td>
</tr>
<tr>
<td>Surface-to-Surface</td>
<td></td>
</tr>
<tr>
<td>TBMD</td>
<td></td>
</tr>
<tr>
<td>Time-Critical Targeting</td>
<td></td>
</tr>
<tr>
<td>Weather (Environmental</td>
<td></td>
</tr>
<tr>
<td>Monitoring)</td>
<td></td>
</tr>
<tr>
<td>Products</td>
<td></td>
</tr>
<tr>
<td>Physical Domain</td>
<td>Physical Domain</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air</td>
</tr>
<tr>
<td></td>
<td>Ground</td>
</tr>
<tr>
<td></td>
<td>Maritime</td>
</tr>
<tr>
<td></td>
<td>Space</td>
</tr>
<tr>
<td></td>
<td>Cyberspace</td>
</tr>
<tr>
<td>Battlespace</td>
<td>Battlespace</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>• Environment</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Maturity</th>
<th>Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Initial development</td>
<td></td>
</tr>
<tr>
<td>• Beta</td>
<td></td>
</tr>
<tr>
<td>• Mature - cyclical improvements</td>
<td></td>
</tr>
<tr>
<td>• Mature - tailored improvements</td>
<td></td>
</tr>
<tr>
<td>• Mature - help desk only</td>
<td></td>
</tr>
<tr>
<td>• Mature - no support</td>
<td></td>
</tr>
<tr>
<td>• Phased out</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>• USAF</td>
<td></td>
</tr>
<tr>
<td>• USN</td>
<td></td>
</tr>
<tr>
<td>• USA</td>
<td></td>
</tr>
<tr>
<td>• USMC</td>
<td></td>
</tr>
<tr>
<td>• Coast Guard</td>
<td></td>
</tr>
<tr>
<td>• OSD</td>
<td></td>
</tr>
<tr>
<td>• DIA</td>
<td></td>
</tr>
<tr>
<td>• COCOM</td>
<td></td>
</tr>
<tr>
<td>• JCS</td>
<td></td>
</tr>
<tr>
<td>• NASA (new)</td>
<td></td>
</tr>
<tr>
<td>• NATO</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aggregation</th>
<th>Aggregation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Equipment</td>
<td></td>
</tr>
<tr>
<td>• Platform</td>
<td></td>
</tr>
<tr>
<td>• Squadron</td>
<td></td>
</tr>
<tr>
<td>• Wing</td>
<td></td>
</tr>
<tr>
<td>• Platoon</td>
<td></td>
</tr>
<tr>
<td>• Company</td>
<td></td>
</tr>
<tr>
<td>• Battalion</td>
<td></td>
</tr>
<tr>
<td>• Brigade/Regiment</td>
<td></td>
</tr>
<tr>
<td>• Division</td>
<td></td>
</tr>
<tr>
<td>• Ship</td>
<td></td>
</tr>
<tr>
<td>• Battle Group</td>
<td></td>
</tr>
<tr>
<td>• Fleet</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B  Tips for Improving Search and Discovery of Resource 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 Resource 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
- Source
- 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 a Resource association.

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

```xml
<ms:Resource
  ms:title="http://www.simsrus.com/BMA1003.xml"
  ms:relationship="is-described-by"
  ms:type="related documents"
  ms:resourceID="4182"
</ms:Resource>
```

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 Source (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 Source content.

![Diagram showing source and location](http://www.simsrus.com/amodel.jar)

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

```xml
<ms:Source>
  <ms:Format>
    <ddms:mimeType/>
    <ddms:extent/>
    <ddms:medium>digital</ddms:medium>
  </ms:Format>
  <ms:Location>http://www.simsrus.com/amodel.jar</ms:Location>
</ms:Source>
```

**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 Resource 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 Resource Metacard. In addition, taxonomy mappings, if they existed within a repository, could be used to help orchestrate matches among Resource Metacards described by different but equivalent taxonomies.
The example below shows how a taxonomy citation is made using the MSC-DMS.

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

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

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

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

<table>
<thead>
<tr>
<th>MSC-DMS Element</th>
<th>Valuation Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>High</td>
</tr>
<tr>
<td>Type</td>
<td>Medium</td>
</tr>
<tr>
<td>Description</td>
<td>Medium</td>
</tr>
<tr>
<td>Dates</td>
<td>Medium</td>
</tr>
<tr>
<td>Version</td>
<td>Low</td>
</tr>
<tr>
<td>Security</td>
<td>Low</td>
</tr>
<tr>
<td>Rights</td>
<td>Low</td>
</tr>
<tr>
<td>Releasability</td>
<td>Low</td>
</tr>
<tr>
<td>Associations</td>
<td>Medium</td>
</tr>
<tr>
<td>POCs</td>
<td>Medium</td>
</tr>
<tr>
<td>Keywords</td>
<td>High</td>
</tr>
<tr>
<td>Usages</td>
<td>High</td>
</tr>
<tr>
<td>Media</td>
<td>Medium</td>
</tr>
<tr>
<td>Glyph</td>
<td>Low</td>
</tr>
<tr>
<td>Taxonomies Cited</td>
<td>Medium</td>
</tr>
</tbody>
</table>

If a term used in a search is found in a Title or the Keyword portion of a Resource 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 this information 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.