



# Competency Object Specifications

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## Version History

<b>Version No.</b>	<b>Date</b>	<b>Changed By</b>	<b>Changes Made</b>
0.1	11 Feb 2010	Valerie Smothers	Initial draft
0.2	24 Mar 2010	Valerie Smothers	URI's required for identifier, eliminated overlap with lom, required certain lom elements. Added sample xml.
0.3	20 May 2010	Valerie Smothers	Changed structure of category element to be similar to Atom category element.
0.4	14 Sep 2010	Valerie Smothers	Added Supporting Information element. Filled out Data Elements section.
0.51	15 November 2011	Valerie Smothers	Revised graphics and template; Added Status, replaces, isReplacedBy, updated list of recommended and required elements of lom. (to be completed)

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This specification would not be possible without the previous work of Claude Ostyn, in particular the Proposal for a Simple Reusable Competency Map. Claude paved the way for this specification and others related to advanced uses of learning technologies. For access to Claude's work, visit:

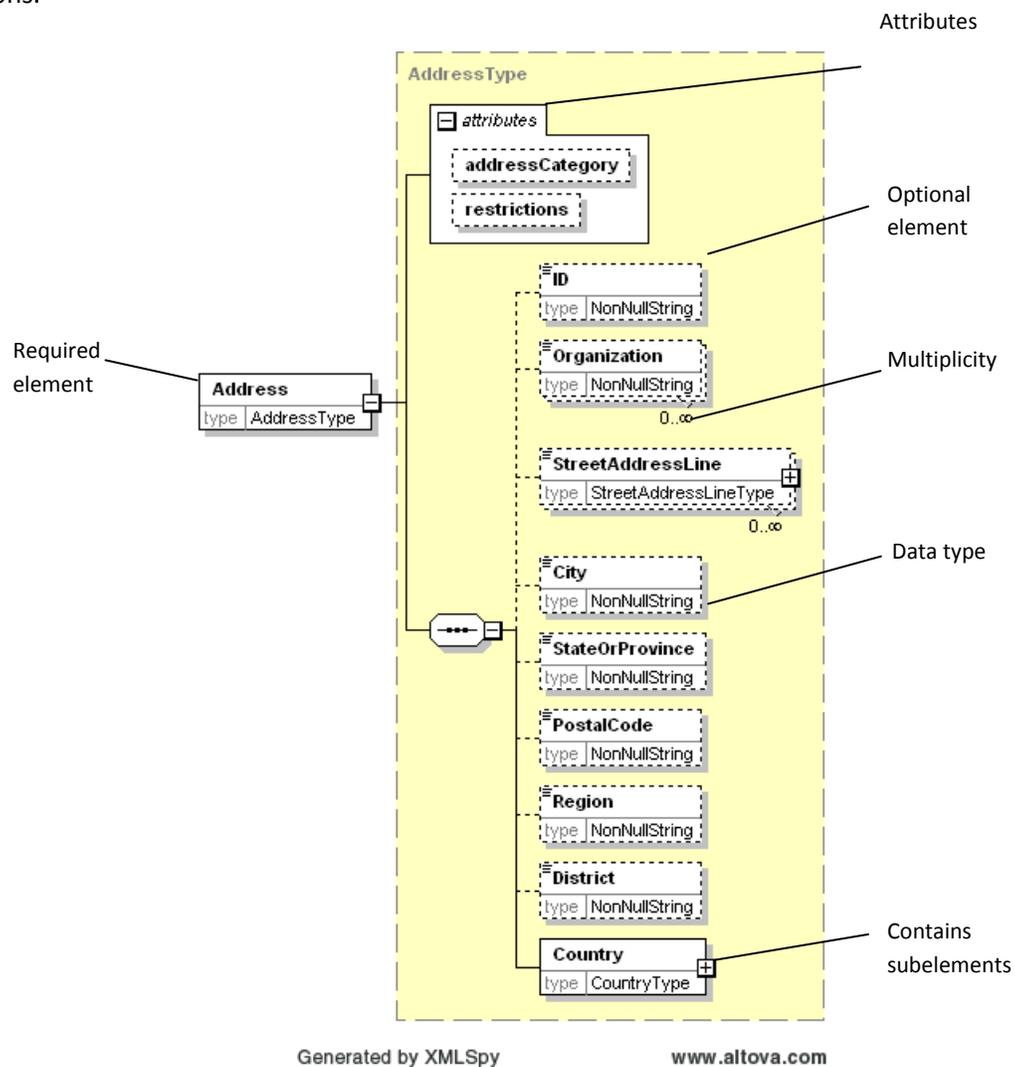
<http://www.ostyn.com/resources.htm>

## 2 Documentation Conventions

This document uses the following conventions:

Convention	Description
<b>Bold Text</b>	When used with an XML element name, indicates that the element contains sub-elements.
<i>Italics</i>	When used in an XML element description, an attribute of the XML element.
<b>Monospaced type</b>	Sample XML tags, code, schema, or portion thereof.

The document uses graphics generated by Altova XML Spy® software, which uses the following graphical conventions.



### 3 Conformance

To be a conformant instance of the MedBiquitous Competency Object specification, an XML document shall:

- Shall validate against the Competency Object XML Schema available at:  
<http://ns.medbig.org/competencyobject/v1/competencyobject.xsd>
- Shall conform to any additional requirements stated in this specification.
- May include elements not defined in this document only in permitted areas and only if those elements are namespace qualified.

This document uses the following conventions:

Convention	Description
<b>Bold Text</b>	When used with an XML element name, indicates that the element contains sub-elements.
<i>Italics</i>	When used in an XML element description, an attribute of the XML element.
<b>Monospaced type</b>	Sample XML tags, code, schema, or portion thereof.

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## 4 Introduction

This document describes MedBiquitous Competency Objects specification in detail. It is intended for use by anyone who wants to develop tools or implement electronic systems for defining and uniquely identifying competencies. The status of the document is indicated at the bottom of the page; draft documents are subject to review and approval through the MedBiquitous and ANSI standards development processes (see [http://www.medbig.org/working\\_groups/consortium\\_process/MedBiquitousANSIProcess.pdf](http://www.medbig.org/working_groups/consortium_process/MedBiquitousANSIProcess.pdf)).

The use of outcome and competency frameworks is a growing part of healthcare education and maintenance of certification. Many nations or states have accreditation frameworks for health professions schools and programs as well as requirements to demonstrate lifelong learning and competency in medical specialties/subspecialties. Currently, there is no standard way to represent these competencies in healthcare, and therefore no easy way to import/export competencies across systems. Once competencies are expressed in a common format, they can be used as the backbone of education and performance management systems, enabling the following:

- Learners and educators able to search for learning resources addressing a particular competency
- Educators able to determine where specific competencies are addressed in a curriculum
- Boards and hospitals able to track and manage competency data for the professional.
- Administrators are able to map one competency framework to another.

The objective of the specification is to provide a consistent format and data structure for defining a competency a competency object. This specification is meant to be used in concert with complementary specifications, including the MedBiquitous Competency Framework specification.

This document uses the following conventions:

Convention	Description
<b>Bold Text</b>	When used with an XML element name, indicates that the element contains sub-elements.
<i>Italics</i>	When used in an XML element description, an attribute of the XML element.
<b>Monospaced type</b>	Sample XML tags, code, schema, or portion thereof.

The document uses graphics generated by Altova XML Spy® software, which uses the following graphical conventions.

## 5 Other Standards, Specifications, or Schema Referenced

This standard references: [\(verify\)](#)

- ANSI/MEDBIQ LO.10.1-2008, Healthcare Learning Object Metadata [[Healthcare LOM](#)]  
Healthcare LOM provides the format for identifiers and metadata about the competency framework.
- Competency Object [[Competency Object](#)]  
Competency Framework may reference individual statements of expectation using a MedBiquitous defined format or the IEEE Reusable Competency Definition.
- DCMI Terms [[DCMITerms](#)]  
Competency Framework may indicate is this framework replaces or is replaced by another framework using DCMI Terms.
- 1484.12.3-2005, IEEE Standard for Learning Technology-Extensible Markup Language (XML) Schema Definition Language Binding for Learning Object Metadata [[LOM](#)]  
Healthcare LOM extends the IEEE LOM standard.
- 1484.20.1-2007 - IEEE Standard for Learning Technology-Data Model for Reusable Competency Definitions [[IEEE RCD](#)]  
Competency Framework may reference individual statements of expectation using a MedBiquitous defined format or the IEEE Reusable Competency Definition.
- Simple Knowledge Organizations System [[SKOS](#)]  
The Competency Framework uses select SKOS vocabulary classes nfor conceptual relationships.
- XHTML™ 1.0 The Extensible HyperText Markup Language (Second Edition) [[XHTML](#)]  
XHTML provides the format for supporting information embedded in the competency framework.

## 6 Terminology

Much of the terminology in this area is ill-defined or ambiguous, often employed differently (and sometimes interchangeably) by different professionals [[Harden 1](#)]. To ensure clarity and consistency we provide working definitions of the terminology we use in the context of this paper:

- **Competence** – possession of sufficient and necessary knowledge, skill and attitude by an individual to allow her to safely and effectively perform a specific job.
- **Competency** – a statement describing a specific ability, or set of abilities, requiring specific knowledge, skill and/or attitude. Competencies are used to set performance standards that must be met [[Albanese 1](#)].
- **Competency Framework** – an organized and structured representation of a set of interrelated and purposeful competency objects.
- **Competency Object** – an umbrella term used by the CWG to describe any abstract statement of learning or performance expectations, and information related to the statement. Statements can be learning outcomes, competencies per se, learning objectives, professional roles, topics, classifications/collections, etc. The Competency Object may include additional data to expand on or support the statement. The Object is abstract in the sense that it does not inherently contain information about connections of the statement to individuals or events or other objects.
- **Learning Objective** – the intended aggregate learner endpoint for an activity, typically directly linked to the means by which it is to be achieved. Learning objectives may be derived from competencies or learning outcomes.
- **Learning Outcome** – the intended aggregate learner endpoint for a program, typically independent of the means by which the outcome is achieved. Used to identify, define and communicate the skills and qualities graduates should have [[Harden 2](#)].
- **Learning Object** – a digital resource used to support learning.
- **Performance** – a demonstration of practice, such as patient care. Can be used as evidence of one or more competencies.

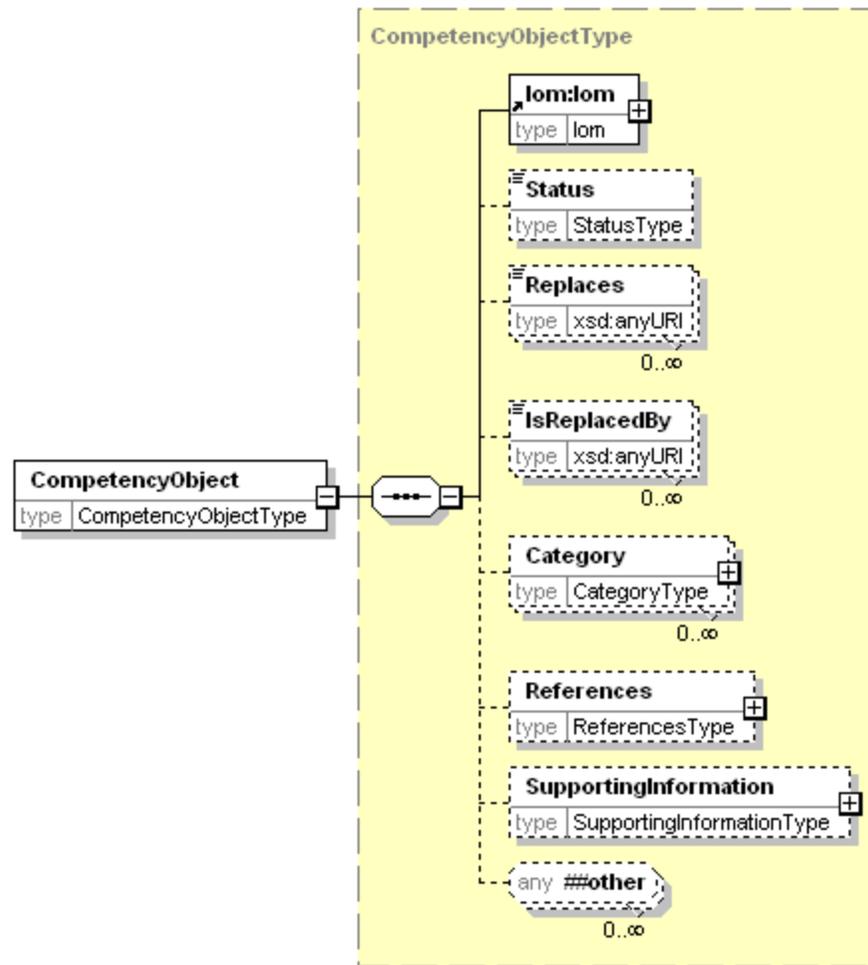
## 7 Competency Object Schema Grammar

The following sections explain the Competency Object Schema grammar. Values in bold under XML Tags column indicate that the element has sub-elements.

All the elements having sub-elements will be defined in separate sections. All elements without sub-elements will be defined within the appropriate element sections that use them.

### 7.1 CompetencyObject

CompetencyObject is the root element. It contains subelements that define and uniquely identify a competency. CompetencyObject must occur once within a competency object document.



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www.altova.com

## CompetencyObject Element Information

Element	Description	Required	Multiplicity	Datatype
<b>CompetencyObject</b>	CompetencyObject is the root element. It contains subelements that define a single competency in detail.	Required	1	Container

---

Element	Description	Required	Multiplicity	Datatype
<b>lom</b>	<p>lom is the subelement of CompetencyObject. It contains subelements that define identifier, title, description, publisher, and other descriptive information about this competency.</p> <p>The lom element is defined in the Healthcare Learning Object Metadata standard defined by MedBiquitous. Please see the Healthcare Learning Object Metadata Specifications and Description document and the IEEE Standard for Learning Technology-Extensible Markup Language (XML) Schema Definition Language Binding for Learning Object Metadata, 1484.12.3-2005, <a href="http://ieeexplore.ieee.org/servlet/opac?punumber=10263">http://ieeexplore.ieee.org/servlet/opac?punumber=10263</a> for more information on the sub-elements of lom.</p> <p>The following sub-elements of lom are required in a competency object:</p> <p><b>identifier</b></p> <p>Defines a unique identifier for the competency. For competency objects, identifiers must be in the form of a URI.</p> <p><b>title</b></p> <p>Defines the title for this competency in one or more languages.</p> <p>The description element is recommended to provide a description of the competency in one or more languages should a description be necessary.</p> <p>Other recommended: publisher, copyright, description,</p>	Required	1	Container  For more information, see ANSI/MEDBIQ LO.10.1-2008 Healthcare Learning Object Metadata Specifications and Description Document and healthcarelom.xsd.

Element	Description	Required	Multiplicity	Datatype
Category	<p>Category is the subelement of CompetencyObject. It is modeled after the Atom category element and defines a category associated with this competency. Category has the following attributes:</p> <p><i>term</i> The category for this competency object. The term attribute is required.</p> <p><i>scheme</i> A URI for the categorization scheme. As a best practice, category definitions may be posted at the URI referenced.</p> <p><i>label</i> A human-readable label for the term that may be displayed in end user applications.</p> <p>Example:</p> <pre>&lt;category term= "measurable outcomes" scheme= "<a href="http://tinyurl.com/2fosonk">http://tinyurl.com/2fosonk</a>" /&gt;</pre>	Optional	0 or more	Empty
<b>References</b>	<p>References is the subelement of CompetencyObject. References contains subelements that define specific references to the literature related to this competency. See section References element for more information.</p>	Optional	0 or 1	Container

Element	Description	Required	Multiplicity	Datatype
<b>SupportingInformation</b>	SupportingInformation is the subelement of CompetencyObject. It contains subelements that include or link to supporting information, such as formatted or lengthy descriptions of the competency object. See section SupportingInformation for more information.	Optional	0 or more	Container
<b>XtensibleInfo</b>	XtensibleInfo contains sub-elements defined by the organization implementing the schema. See section XtensibleInfo for more information.	Optional	0 or 1	Container

Example:

```
<CompetencyObject xmlns="http://ns.medbiq.org/competencyobject/v1/"
xmlns:lom="http://ltsc.ieee.org/xsd/LOM" xmlns:ex="http://ltsc.ieee.org/xsd/LOM/extend"
xmlns:ag="http://ltsc.ieee.org/xsd/LOM/unique" xmlns:voc="http://ltsc.ieee.org/xsd/LOM/vocab"
xmlns:a="http://ns.medbiq.org/address/v1/" xmlns:hx="http://ns.medbiq.org/lom/extend/v1/"
xmlns:hv="http://ns.medbiq.org/lom/vocab/v1/" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://ns.medbiq.org/competencyobject/v1/_object.xsd">

  <lom:lom>

    <lom:general>

      <lom:identifier>

        <lom:catalog>URI</lom:catalog>

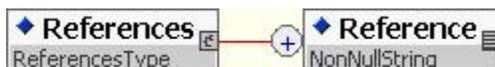
        <lom:entry>http://www.example.org/competency/12345</lom:entry>

      </lom:identifier>
    </lom:general>
  </lom:lom>
</CompetencyObject>
```

```
<lom:title>
  <lom:string language="en">Professionalism</lom:string>
</lom:title>
<lom:description>
  <lom:string language="en">Exhibiting character, spirit, and standing suitable to the
profession.</lom:string>
</lom:description>
</lom:general>
</lom:lom>
<Category term ="role"/> >
<References>
  <Reference>Advancing education in medical professionalism: Anresource from the ACGME Outcome Project,
The Accreditation Council for Graduate Medical Education, 2004. Accessed online 24 March 2010 at:
http://www.acgme.org/outcome/implement/profm\_resource.pdf</Reference>
</References>
</CompetencyObject>
```

## 7.2 References Element

References contains subelements that define specific references to the literature related to this competency.



### References Element Information

Element	Description	Required	Multiplicity	Datatype
References	References is the subelement of CompetencyObject. References contains subelements that define specific references to the literature related to this competency.	Optional	0 or 1	Container
Reference	Reference is the subelement of References. Each Reference contains a single reference to the literature related to this competency.	Optional	0 or more	Non-null string

Example:

<References>

<Reference>Advancing education in medical professionalism: Anresource from the ACGME Outcome Project, The Accreditation Council for Graduate Medical Education, 2004. Accessed online 24 March 2010 at: [http://www.acgme.org/outcome/implement/profm\\_resource.pdf](http://www.acgme.org/outcome/implement/profm_resource.pdf)</Reference>

<Reference>Embedding Professionalism in Medical Education: Assessment as a Tool for Implementation. National Board of Medical Examiners, 2002.

Accessed online 24 March 2010 at:  
[http://www.nbme.org/PDF/NBME\\_AAMC\\_ProfessReport.pdf](http://www.nbme.org/PDF/NBME_AAMC_ProfessReport.pdf)

</References>

### 7.3 Supporting Information Element

SupportingInformation includes or links to supporting information, such as descriptions of the rationale for developing the framework and its intended use.



Element	Description	Required	Multiplicity	Datatype
<b>SupportingInformation</b>	SupportingInformation is the subelement of CompetencyFramework. It contains subelements that include or link to supporting information, such as descriptions of the rationale for developing the framework and its intended use.	Optional	0 or more	Container
Link	Link is the subelement of SupportingInformation. It provides a URL or URI reference to a supporting resource, such as a pdf or html file describing the purpose of the framework in detail.  Link must contain a valid URI.	Either Link or xhtml:div is required	0 or 1	Restricted

---

Element	Description	Required	Multiplicity	Datatype
xhtml:div	<p>A div element is a mixed type element referenced from XHTML. The div element can include a mix of text and XHTML tags as specified by the XHTML schema.</p> <p>For more information, see “XHTML™ 1.0 The Extensible HyperText Markup Language” at: <a href="http://www.w3.org/TR/xhtml1/">http://www.w3.org/TR/xhtml1/</a></p>	Either Link or xhtml:div is required	0 or 1	Container

---

Example:

```
<SupportingInformation>
```

```
  <Link>http://www.example.org/competencyobject1_formatted</Link>
```

```
</SupportingInformation>
```

Or

<SupportingInformation>

<xhtml:div>

<h1>Professionalism</h1>

<p>Respect</p>

<ol>

<li>Respects institutional staff and representatives; respects faculty during teaching sessions</li>

<li>Respects patient rights/dignity (privacy/confidentiality, consent); knocks on door, introduces self, drapes appropriately, and shows respect for patient privacy needs</li>

<li>Demonstrates tolerance to a range of behaviors and beliefs</li>

<li>Does not disturb small group sessions</li>

</ol>

<p>Caring and Compassion</p>

. . .

</xhtml:div>

</SupportingInformation>

## 8 Sample XML Documents

```
<CompetencyObject xmlns="http://ns.medbiq.org/competencyobject/v1/"
xmlns:lom="http://ltsc.ieee.org/xsd/LOM"
xmlns:ex="http://ltsc.ieee.org/xsd/LOM/extend"
xmlns:ag="http://ltsc.ieee.org/xsd/LOM/unique"
xmlns:voc="http://ltsc.ieee.org/xsd/LOM/vocab"
xmlns:a="http://ns.medbiq.org/address/v1/"
xmlns:hx="http://ns.medbiq.org/lom/extend/v1/"
xmlns:hv="http://ns.medbiq.org/lom/vocab/v1/"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://ns.medbiq.org/competencyobject/v1/_object.xsd">

  <lom:lom>

    <lom:general>

      <lom:identifier>

        <lom:catalog>URI</lom:catalog>

        <lom:entry>http://www.example.org/competency/12345</lom:entry>

      </lom:identifier>

      <lom:title>

        <lom:string language="en">Professionalism</lom:string>

      </lom:title>

      <lom:description>

        <lom:string language="en">Exhibiting character, spirit, and
standing suitable to the profession.</lom:string>

      </lom:description>

    </lom:general>

    <lom:lifeCycle>

      <lom:contribute>

        <lom:entity>BEGIN:VCARD\nFN:Center for Really Good
DocsEND:VCARD</lom:entity>
```

---

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```
</lom:contribute>

</lom:lifeCycle>

</lom:lom>

<Category term = "role"/> >

<References>

  <Reference>Advancing education in medical professionalism: Anresource
  from the ACGME Outcome Project, The Accreditation Council for Graduate
  Medical Education, 2004. Accessed online 24 March 2010 at:
  http://www.acgme.org/outcome/implement/profm_resource.pdf</Reference>

</References>

</CompetencyObject>
```

## 9 References

To be completed