

# **ViMCOX - Virtual Museum and Cultural Object Exchange Format**

Specification of the XML-Schema vimcox-1.1.xsd

Version 1.1

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**Abstract:** This specification reports the metadata element set ViMCOX. It is for describing digitized cultural objects and virtual museums. ViMCOX is based on several international standards. Digital representations of virtual museums and cultural objects must be stored in a adequate data structure. This serves to digital preservation and ensures the quality of the digitized data.

**Keywords:** Metadata Standard, XML Schema, Cultural Heritage, Virtual Museum

**Changelog:** Conversion from museumdat to LIDO v1.0. New and updated metadata elements are Viewpoints, Partitionwalls, Interaction Behavior, Custom Room Shape, Outdoorarea, Tombstone as well as additional minor changes.

# Contents

<b>1</b>	<b>Introduction</b>	<b>8</b>
<b>2</b>	<b>Existing Metadata Standards</b>	<b>11</b>
2.1	DCMES . . . . .	11
2.2	CDWA Lite . . . . .	11
2.3	museumdat . . . . .	11
2.4	SPECTRUM . . . . .	12
2.5	LIDO . . . . .	12
2.6	VRA Core . . . . .	12
<b>3</b>	<b>ViMCOX Elements</b>	<b>13</b>
3.1	Administrative Metadata . . . . .	13
3.1.1	appellationValue . . . . .	14
3.1.2	creator . . . . .	14
3.1.3	date_created . . . . .	14
3.1.4	rights . . . . .	15
3.1.5	date_modified . . . . .	17
3.2	Descriptive Metadata . . . . .	18
3.2.1	descriptiveNoteValue . . . . .	18
3.2.2	creator . . . . .	18
3.2.3	measurements . . . . .	18
3.2.4	creation_date . . . . .	19
3.2.5	objectCreationLocation . . . . .	19
3.2.6	objectStyle . . . . .	20
3.2.7	displayMaterialsTech . . . . .	20
3.2.8	material_set . . . . .	21
3.2.9	production_period . . . . .	21
3.2.10	type . . . . .	22

---

3.3	Museum Metadata . . . . .	22
3.3.1	administrative_museum_metadata . . . . .	22
3.3.1.1	company . . . . .	23
3.3.2	descriptive_museum_metadata . . . . .	23
3.3.2.1	abbreviation . . . . .	23
3.3.2.2	contact_information . . . . .	24
3.3.2.3	history . . . . .	28
3.3.2.4	statistic . . . . .	28
3.3.2.5	address . . . . .	29
3.3.2.6	coordinates . . . . .	30
3.4	Building Metadata . . . . .	32
3.4.1	id . . . . .	32
3.4.2	administrative_building_metadata . . . . .	32
3.4.3	descriptive_building_metadata . . . . .	33
3.4.3.1	barrier_free . . . . .	33
3.4.3.2	exhibition_space . . . . .	33
3.4.3.3	dating . . . . .	34
3.4.3.4	year_of_construction . . . . .	34
3.4.3.5	number_of_levels . . . . .	34
3.4.3.6	level . . . . .	35
3.4.3.7	last_change . . . . .	39
3.5	Room Metadata . . . . .	40
3.5.1	administrative_room_metadata . . . . .	40
3.5.1.1	textures . . . . .	40
3.5.1.2	source_folder . . . . .	41
3.5.2	descriptive_room_metadata . . . . .	41
3.5.2.1	custom_room_shape . . . . .	41
3.5.2.2	walls . . . . .	42
3.5.2.3	partitionwall . . . . .	46
3.5.2.4	viewpoint . . . . .	48
3.5.2.5	threshold . . . . .	50
3.5.2.6	mainentrance . . . . .	52
3.5.2.7	mainentrance_absolute_coordinates . . . . .	52
3.5.2.8	object . . . . .	52
3.6	Object Metadata . . . . .	53
3.7	Image Metadata . . . . .	54
3.7.1	administrative_image_metadata . . . . .	54
3.7.1.1	texturesource . . . . .	54

---

3.7.1.2	x3dsource . . . . .	55
3.7.1.3	thumbnailsource . . . . .	55
3.7.1.4	passepourt_size . . . . .	55
3.7.1.5	frame_size . . . . .	56
3.7.2	descriptive_image_metadata . . . . .	56
3.7.2.1	production_method . . . . .	57
3.7.2.2	resolution . . . . .	57
3.7.2.3	compression_method . . . . .	58
3.7.2.4	color_depth . . . . .	58
3.7.2.5	lom_interaction . . . . .	58
3.7.2.6	audio_clip_id . . . . .	59
3.8	Sculpture Metadata . . . . .	59
3.8.1	administrative_sculpture_metadata . . . . .	59
3.8.1.1	texturesource . . . . .	60
3.8.1.2	x3dsource . . . . .	60
3.8.1.3	thumbnailsource . . . . .	60
3.8.1.4	descriptive_sculpture_metadata . . . . .	60
3.8.1.5	production_method . . . . .	61
3.8.1.6	lom_interaction . . . . .	61
3.9	Interaction Canvas Metadata . . . . .	61
3.9.1	administrative_interaction_canvas_metadata . . . . .	61
3.9.1.1	thumbnailsource . . . . .	62
3.9.1.2	resolution . . . . .	62
3.9.1.3	sensor_size . . . . .	62
3.9.1.4	fps . . . . .	63
3.9.1.5	descriptive_interaction_canvas_metadata . . . . .	63
3.9.1.6	production_method . . . . .	64
3.9.1.7	lom_interaction . . . . .	64
3.10	Door Metadata . . . . .	64
3.10.1	administrative_door_metadata . . . . .	64
3.10.1.1	texture . . . . .	65
3.10.1.2	x3dsource . . . . .	65
3.10.1.3	thumbnailsource . . . . .	66
3.10.1.4	frame . . . . .	66
3.10.2	descriptive_door_metadata . . . . .	67
3.11	Window Metadata . . . . .	67
3.12	Media Metadata . . . . .	67
3.13	Audio Metadata . . . . .	67

---

3.13.1	administrative_audio_metadata . . . . .	68
3.13.1.1	path . . . . .	68
3.13.2	descriptive_audio_metadata . . . . .	68
3.13.2.1	album . . . . .	69
3.13.2.2	genre . . . . .	69
3.13.2.3	year . . . . .	70
3.13.2.4	filesize . . . . .	70
3.13.2.5	bit_rate . . . . .	70
3.13.2.6	duration . . . . .	71
3.13.2.7	format . . . . .	71
3.14	Video Metadata . . . . .	71
3.14.1	administrative_video_metadata . . . . .	72
3.14.1.1	path . . . . .	72
3.14.2	descriptive_video_metadata . . . . .	72
3.14.2.1	filesize . . . . .	72
3.14.2.2	duration . . . . .	73
3.14.2.3	format . . . . .	73
3.14.2.4	subject . . . . .	73
3.14.2.5	resolution . . . . .	73
3.15	Interior Metadata . . . . .	73
3.15.1	administrative_interior_object_metadata . . . . .	74
3.15.1.1	textures . . . . .	74
3.15.1.2	x3dsouce . . . . .	74
3.15.1.3	thumbnailsouce . . . . .	74
3.15.2	descriptive_interior_object_metadata . . . . .	75
3.16	Furniture Metadata . . . . .	75
3.16.1	administrative_furniture_metadata . . . . .	75
3.16.2	descriptive_furniture_metadata . . . . .	76
3.17	Light Source Metadata . . . . .	76
3.17.1	administrative_light_source_metadata . . . . .	76
3.17.2	descriptive_light_source_metadata . . . . .	77
3.18	Plant Metadata . . . . .	77
3.18.1	administrative_plant_metadata . . . . .	78
3.18.2	descriptive_plant_metadata . . . . .	78
3.18.2.1	origin . . . . .	78
3.18.2.2	plant_family . . . . .	79
3.19	Any Type Interior Metadata . . . . .	79
3.19.1	name . . . . .	79

---

3.19.2	administrative_any_metadata . . . . .	80
3.19.3	descriptive_any_metadata . . . . .	80
3.20	Tombstone Metadata . . . . .	81
3.20.1	id . . . . .	81
3.20.2	administrative_tombstone_metadata . . . . .	81
3.20.2.1	texturesource . . . . .	81
3.20.2.2	x3dsource . . . . .	82
3.20.2.3	thumbnailsource . . . . .	82
3.20.3	descriptive_tombstone_metadata . . . . .	82
3.20.3.1	production_method . . . . .	82
3.20.3.2	lom_interaction . . . . .	82
3.21	Behavioral Metadata . . . . .	83
3.21.0.3	user_interaction . . . . .	83
3.21.0.4	scale_behavior . . . . .	83
3.21.0.5	translation_behavior . . . . .	83
3.21.0.6	rotation_behavior . . . . .	84
3.22	Outdoorarea Metadata . . . . .	85
3.22.1	administrative_outdoorarea_metadata . . . . .	85
3.22.2	descriptive_outdoorarea_metadata . . . . .	86
3.22.2.1	viewpoints . . . . .	86
3.22.2.2	roads . . . . .	86
3.22.2.3	background . . . . .	89
3.22.2.4	landmarks . . . . .	90
3.22.2.5	threshold . . . . .	92
3.22.2.6	exhibitionareas . . . . .	93
3.22.2.7	terrainmodel . . . . .	95
<b>4</b>	<b>Conclusion</b>	<b>98</b>

# Chapter 1

## Introduction

### ViMCOX

With the availability of low cost digitization techniques and the emerging global distribution of virtual museums more digital data of cultural objects needs to be maintained. Digitized information must be described and stored in a useful data structure which defines rule sets for unified storage. The digitization of cultural objects creates a series of museum collections that are stored in different places. Museum objects from different collections can be linked and presented in a virtual exhibition. In reality, this would not be possible because the objects are in different places and the merging would result in heavy costs. The data collections of all museums can be combined and presented in a virtual museum. To achieve this, the digitized cultural objects must be stored in a common format. A common exchange format ensures that the digitized objects can be archived and reused. Existing metadata standards for describing collections and cultural objects are available but they do not consider any metadata sets to describe virtual museum exhibition space - lighting, exhibit positioning, user interaction, Points Of Interest or spatial design and layout.

ViMCOX is an extension of the ARCO[VSMM2010] (Augmented Representation of Cultural Objects) standard. It describes modern virtual museums with both old and contemporary resources, including interactive exhibition content and room installations, together with its multimedia representations. Virtual museums cannot be described using classical museum metadata standards developed to describe core records for various works of art because these standards cannot handle virtual instances or describe spatial exhibition layout for virtual museums. Therefore, since neither exchange format mentioned in [VSMM2010] and [SCCC2010] explicitly supports sophisticated virtual museum design; typical room arrangements, appearance and illumination concepts; or user-interaction behavior following certain interaction logic, it was necessary to develop a metadata standard that covers both the acquisition of



cultural objects and various parameters to specify exhibition layout and room design.

ViMCOX is a set of metadata elements used to describe an entire virtual museum. This includes a hierarchical description of buildings, rooms and cultural objects. ViMCOX addresses not only digitized paintings and sculptures but any digital artwork, allowing curators to design any kind of exhibition. Elements of existing metadata standards were adopted to avoid overlaps and redundancy. Apart from existing museum metadata standards for cataloging collections, ViMCOX should be used only as a publishing format for virtual museums in 3D. To achieve cross-domain data exchange and interoperability ViMCOX now references LIDO[LIDO 2012] as interchange metadata standard. LIDO is the international successor of the metadata format museumdat[DMB 2009] and covers a wide range of collection areas and topics. Thus, a variety of works from the fields of architecture, archeology, botany, geology, art, technology and zoology can be acquired and described.

The metadata standard ViMCOX includes both descriptive metadata elements for object identification and administrative metadata for copyright matters and object administration. Further important changes are established in this new version ViMCOX 1.1, which will allow modeling of outdoor exhibition areas with artifacts, in a similar manner to rooms located indoors. Elements that aid in navigation, like roads, landmarks, thresholds and selectable viewpoints, will also be included.

In this specification the metadata standard ViMCOX is defined. ViMCOX seeks to describe all aspects of a virtual museum including descriptions of buildings, rooms and cultural objects, assets, lighting and outdoor areas. ViMCOX specifies the metadata elements regarding hierarchical structure and importance. The metadata elements in ViMCOX are, if possible, adopted from existing metadata elementsets to avoid a partial overlaps and conflicts.

### **Virtual Museums**

New developments in information and communication technologies are emerging. More and more opportunities for museums to present their cultural heritage become available.

Cultural objects are traditionally presented in an exhibition within the facilities of a museum. This form of presentation is rather stationary and location dependend. Visitors have the opportunity to explore the exhibiton and it's exposed cultural objects during the opening hours. Due to various obstacles such as geographic constrains, traveling costs, time-conditions (travelling exhibitions) or political reasons some real world exhibitions may not be reachable for everyone. In comparison virtual museum exhibitions can be made available to everyone via the world wide web.

Usually only a part of a museum's collection is presented in an exhibition. This may be caused by limited exhibition space or due to the fragile nature of some cultural objects or artifacts. A virtual museum exhibition is not bound to any spatial boundaries and can present various or all cultural objects from one specific museum collection or even a junction of several independent museum collections.

Virtual museums are location and time independent. They can be visited at any time and from anywhere in the world in a cost-effective manner over the Internet.

Virtual museums have no geographic boundaries. They have always enough storage and exhibition space. Therefore, in a virtual museum, all objects of a museum collection can be exhibited.

Objects which may be explored in a real museum only from a distance, can be examined in a virtual museum from close range. Object details become visible, which real museum visitors would hardly or never notice.

For educational purposes a virtual museum can be used as a medium of information and knowledge. As a learning museum it serves through the use of various media such as audio or video for inspiration, learning and entertainment.

# Chapter 2

## Existing Metadata Standards

### 2.1 DCMES

The DCMES (*Dublin Core Metadata Element Set*) is a vocabulary for describing resources of any kind on the World Wide Web. It was developed and released by the open organization DCMI (*Dublin Core Metadata Initiative*). DCMES contains fifteen key elements for use in resource description. [DCMI 2010]

### 2.2 CDWA Lite

CDWA Lite (*Categories for the Description of Works of Art Lite*) is a metadata standard developed at Getty Research Institute to describe objects of fine art. It contains 22 elements and is based on CDWA (*Categories for the Description of Works of Art*) and CCO (*Cataloging Cultural Objects*). It is optimized for use via OAI-PMH (*Open Archives Initiatives Protocol for Metadata Harvesting*). CDWA Lite includes both administrative and descriptive metadata [CDWA Lite 2005].

### 2.3 museumdat

Museumdat is a metadata standard developed by the professional group for "the documentation in German Museums Association". Museumdat is a generalization of the metadata standard CDWA Lite for facilitating the documentation of different collection types, such as natural history or cultural history. Additionally museumdat compatible to the CIDOC (*International Committee for Documentation*) Conceptual Reference Model [ICOM-CIDOC 2006]. The goal of museumdat is to act as a central exchange format for museum objects between

museum portals in Germany. Museumdat contains 23 elements, which are partitioned into administrative and a descriptive metadata [DMB 2009].

## 2.4 SPECTRUM

SPECTRUM is a British standard for the documentation and management of a museum collections. It is published and coordinated by the British organization of museum collections and standards mda ( textit Museum Documentation Assosiation). SPECTRUM was developed by a collaboration of over 100 experts from the museum area. It is a universal format for the exchange of museum object data between different administrative systems for museum collections which are used internationally [SPECTRUM].

## 2.5 LIDO

The metadata standard LIDO (*Lightweight Information Describing Objects*) is a harvesting-format. It provides core data sets of museum objects and can be adopted for the used in many kinds of collections, such as archaeological or cultural history museums. LIDO is a joint initiative by the developers of CDWA Lite, museumdat and SPECTRUM, and integrates the publication relevant concepts of these metadata standards [LIDO 2012].

## 2.6 VRA Core

VRA Core is a data standard for the description of works of visual culture. It is managed and published by the Visual Resources Association Data Standards Committee. VRA Core is used to transfer and exchange object data in the field of cultural heritage. VRA Core contains both administrative and descriptive metadata for the description of artwork collections[VRA 2007].

# Chapter 3

## ViMCOX Elements

Gilliland-Swetland[Gilliland 2000] introduced different categories of metadata. These are Administrative Metadata, Descriptive Metadata, Preservation Metadata, Technical Metadata, and Useage Metadata.

The Elements in ViMCOX are categorised in Administrative Metadata and Descriptive Metadata.

The Administrative Metadata is used to describe copyright and administration aspects of information resources.

Descriptive Metadata is used to describe a resource. Descriptive Metadata can include elements such as title, author or creation date of a digital resource.

### 3.1 Administrative Metadata

For the administrative metadata, an abstract class (abstract complex type) is defined. It contains all basic Administrative Metadata. Each item which derives from this abstract class inherits all of its elements. Extensions which should be present in all derived elements, are defined in this abstract class.

### 3.1.1 appellationValue

Titles, identifying phrases, or names given to a work of art, architecture, or material culture. For complex works, series, or collections, the title may refer to a discrete unit within the larger entity (a print from a series, a photograph in a collection, a panel from a fresco cycle, a building within a temple complex) or it may identify only the larger entity (series, collection, cycle) itself. ([CDWA Lite 2005], [DMB 2009])

Element tag	<vimcox:appellationValue>
Type	string
Required	yes
Repeatable	no

**Example:**

```
<vimcox:appellationValue>Poncho_de_nudos</vimcox:appellationValue>
```

### 3.1.2 creator

The name of the creator of the metadata.

Element tag	<dc:creator>
Type	string
Required	yes
Repeatable	no

**Example:**

```
<dc:creator>Valentin Wolf</dc:creator>
```

### 3.1.3 date\_created

A concise description of the creation date of the metadata element set.

Element tag	<vimcox:date_created>
Type	dateTime_type
Required	yes
Repeatable	no

**Example:**

```
<vimcox:date_created>2010-10-09T15:06:58</vimcox:date_created>
```

**3.1.4 rights**

Information about the holder of the rights, the start and end date of the copyright, the type of the copyright, a URL with information about the rights of a work / object.

Element tag	<vimcox:rights>
Required	no
Repeatable	no
Attributes	start_date, end_date
Subelements	rights_holder, descriptiveNoteValue, url, type

**start\_date, end\_date**

Information about the start date and end date of the copyright of a work / object.

Element tag	<vimcox:start_date>, <vimcox:end_date>
Type	string
Required	no
Repeatable	no

**rights\_holder**

Information about the holder of the rights of a work / object.

Element tag	<vimcox:rights_holder>
Type	string
Required	yes
Repeatable	no

**descriptiveNoteValue**

A relatively brief essay-like text that describes the content and context of the work, including comments and an interpretation that may supplement, qualify, or explain the physical

characteristics, subject, circumstances of creation or discovery, or other information about the work[LIDO 2012].

Element tag	<vimcox:descriptiveNoteValue>
Data type	string
Required	no
Repeatable	no

### Example:

```
<vimcox:descriptiveNoteValue>During the Bronze Age (around 3200-1100 BC),
a number of cultures flourished on the islands of the Cyclades, in Crete
and on the Greek mainland. They were mainly farmers, but trade across the
sea, particularly in raw materials such as obsidian (volcanic glass) and
metals, was growing.</vimcox:descriptiveNoteValue>
```

<sup>1</sup>

### url

A URL may contain information about the rights of a work / object.

Element tag	<vimcox:url>
Type	uri
Required	no
Repeatable	no

### Example:

```
<vimcox:rights vimcox:start_date='2008-01-01'
  vimcox:end_date='2008-07-01'>
  <vimcox:rights_holder>Valentin Wolf</vimcox:rights_holder>
  <dc:description>Rights information about the image 'poncho de nudos'.
  </dc:description>
  <vimcox:url>http:\\www.uni-due.de\\rights.txt</vimcox:url>
</vimcox:rights>
```

---

<sup>1</sup>British Museum [http://www.britishmuseum.org/explore/cultures/europe/ancient\\_greece.aspx](http://www.britishmuseum.org/explore/cultures/europe/ancient_greece.aspx)



### 3.1.5 date\_modified

Information about modification of the metadata element set.

Element tag	<vimcox:date_modified>
Data type	date
Required	no
Repeatable	no
Attributes	name, version, path

#### **name**

Name of the person who has changed the metadata element set.

Element tag	<vimcox:name>
Data type	string
Required	yes
Repeatable	no

#### **version**

Version of the previous metadata element set.

Element tag	<vimcox:version>
Data type	string
Required	yes
Repeatable	no

#### **path**

Path where the previous metadata element set is.

Element tag	<vimcox:path>
Data type	string
Required	no
Repeatable	no

**Example:**

```
<vimcox:date_modified vimcox:name='Valentin Wolf'
  vimcox:path='http:\\www.uni-due.de\cg\MAC.xml'
  vimcox:version="String">1967-08-13</vimcox:date_modified>
```

## 3.2 Descriptive Metadata

Also for the descriptive metadata, an abstract class (abstract complex type) is defined. There are all the basic descriptive metadata contained. Each item which derives from the abstract class inherit all its elements. Each new elemnt can be extended subsequently.

### 3.2.1 descriptiveNoteValue

Information about the the rights of a work / object. The specification of the element is in chapter 3.1.4

### 3.2.2 creator

The name of the creator of a work / object.

Element tag	<dc:creator>
Type	string
Required	yes
Repeatable	no

**Example:**

```
<dc:creator>Valentin Wolf</dc:creator>
```

### 3.2.3 measurements

Information about the dimensions, width, length, height of a work / object.

Element tag	<vimcox:measurements>
Required	no
Repeatable	no
Subelements	length, width, height

### length, width, height

Information about the length, width and height.

Element tag	<vimcox:length>, <vimcox:width>, <vimcox:height>
Type	decimal
Required	no
Repeatable	no

#### Example:

```
<vimcox:measurements>  
  <vimcox:length>3.40</vimcox:length>  
  <vimcox:width>1.62</vimcox:width>  
  <vimcox:height>2.36</vimcox:height>  
</vimcox:measurements>
```

### 3.2.4 creation\_date

Information about the date of creation, design, production, construction of the work/object or its components.

Element tag	<vimcox:creation_date>
Data type	date
Required	no
Repeatable	no

#### Example:

```
<vimcox:creation_date>2000-01-01</vimcox:creation_date>
```

### 3.2.5 objectCreationLocation

Information about the place of manufacture or the creation location of creation of a work / object.

Element tag	<vimcox:objectCreationLocation>
Data type	string
Required	no
Repeatable	no

**Example:**

```
<vimcox:objectCreationLocation>Santiago-Chile
</vimcox:objectCreationLocation>
```

**3.2.6 objectStyle**

Term that identifies the named, defined style, historical or artistic period, movement, group, or school whose characteristics are represented in the work being cataloged. [CDWA Lite 2005]

Element tag	<vimcox:objectStyle>
Data type	string
Required	no
Repeatable	no

**Example:**

```
<vimcox:objectStyle>expressionismus</vimcox:objectStyle>
```

**3.2.7 displayMaterialsTech**

An indication of the substances or materials used in the creation of a work, as well as any implements, production or manufacturing techniques, processes, or methods incorporated in its fabrication, presented in a syntax suitable for display to the end-user and including any necessary indications of uncertainty, ambiguity, and nuance. For works on paper, descriptions of watermarks may also be included. (For marks applied to the work or support by the artist or subsequently by another person, see Inscriptions.) [CDWA Lite 2005]

Element tag	<vimcox:displayMaterialsTech>
Data type	string
Format	Text
Required	no
Repeatable	no

**Example:**

```
<vimcox:displayMaterialsTech>brush, canvas, paint
</vimcox:displayMaterialsTech>
```

**3.2.8 material\_set**

Information about the substances from which the work / object is composed.

Element tag	<vimcox:material_set>
Required	no
Repeatable	no
Subelements	material

**material**

Substance from which a work / object is composed..

Element tag	<vimcox:material>
Data type	string
Required	yes
Repeatable	yes

**Example:**

```
<vimcox:material_set>
  <vimcox:material>oil paint</vimcox:material>
</vimcox:material_set>
```

**3.2.9 production\_period**

Information about the production period when the element is created.

Element tag	<vimcox:production_period>
Data type	string
Required	no
Repeatable	no

**Example:**

```
<vimcox:production_period>Barock</vimcox:production_period>
```

**3.2.10 type**

Information about the type of the work / object.

Element tag	<dc:type>
Data type	any
Required	no
Repeatable	no

**Example:**

```
<dc:type>a345</dc:type>
```

**3.3 Museum Metadata**

The root element "museum" contain the information about a whole virtual museum.

Element tag	<vimcox:museum>
Required	yes
Repeatable	no
Sub elements	administrative_museum_metadata, vimcox:descriptive_museum_metadata, buildings, rooms, objects and outdoorareas

**3.3.1 administrative\_museum\_metadata**

The element "administrative\_museum\_metadata" contains the administrative metadata of a museum. This element is derived from the abstract class "administrative\_metadata" (cf. chapter 3.1).

Element tag	<vimcox:administrative_museum_metadata>
Required	no
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified and company

The specifications of the elements `appellationValue`, `creator`, `date_created`, `rights` and `date_modified` are in chapter 3.1.

### 3.3.1.1 company

Information about the company which is responsible for the provided metadata.

Element tag	<code>&lt;vimcox:company&gt;</code>
Data type	string
Required	no
Repeatable	no

#### Example:

```
<vimcox:company>University of Duisburg-Essen</vimcox:company>
```

### 3.3.2 descriptive\_museum\_metadata

The element "descriptive\_museum\_metadata" contains the descriptive metadata of a museum. This element is derived from the abstract class "descriptive\_metadata" (cf. chapter 3.2).

Element tag	<code>&lt;vimcox:descriptive_museum_metadata&gt;</code>
Required	no
Repeatable	no
Subelements	<code>descriptiveNoteValue</code> , <code>creator</code> , <code>measurements</code> , <code>creation_date</code> , <code>objectCreationLocation</code> , <code>objectStyle</code> , <code>displayMaterialsTech</code> , <code>material_set</code> , <code>production_period</code> , <code>type</code> , <code>abbreviation</code> , <code>contact_information</code> , <code>history</code> , <code>statistic</code> , <code>address</code> , <code>coordinates</code>

The specifications of the elements `descriptiveNoteValue`, `creator`, `measurements`, `creation_date`, `objectCreationLocation`, `objectStyle`, `displayMaterialsTech`, `material_set`, `production_period` and `type`, are in chapter 3.2.

#### 3.3.2.1 abbreviation

Information about the abbreviation of the building.

Element tag	<vimcox:abbreviation>
Data type	string
Required	no
Repeatable	no

**Example:**

```
<vimcox:abbreviation>MAC</vimcox:abbreviation>
```

**3.3.2.2 contact\_information**

Information about the contact persons of a museum.

Element tag	<vimcox:contact_information>
Data type	string
Required	no
Repeatable	yes
Sub elements	name, address

**name**

The Name of a contact person.

Element tag	<vimcox:name>
Data type	string
Required	yes
Repeatable	no

**address**

Information about the address of a museum.

Element tag	<vimcox:address>
Data type	string
Required	yes
Repeatable	no
Sub elements	email, fax, postcode, telephone, url, street_name, house_number, city, state, country



**email**

Information about a e-mail address.

Element tag	<vimcox:email>
Data type	string
Required	no
Repeatable	no

**fax**

Information about a fax number.

Element tag	<vimcox:fax>
Data type	string
Required	no
Repeatable	no

**postcode**

Information about a postcode.

Element tag	<vimcox:postcode>
Data type	string
Required	no
Repeatable	no

**telephone**

Information about a telephone number.

Element tag	<vimcox:telephone>
Data type	string
Required	no
Repeatable	no

**url**

Information about any url.

Element tag	<vimcox:url>
Data type	anyUri
Required	no
Repeatable	no

**street\_name**

Information about a street name.

Element tag	<vimcox:street_name>
Data type	string
Required	yes
Repeatable	no

**house\_number**

Information about a house number.

Element tag	<vimcox:house_number>
Data type	integer
Required	yes
Repeatable	no

**city**

Information about a city.

Element tag	<vimcox:city>
Data type	string
Required	yes
Repeatable	no

**state**

Information about a state.

Element tag	<vimcox:state>
Data type	string
Required	no
Repeatable	no

**country**

Information about a country.

Element tag	<vimcox:country>
Data type	string
Required	no
Repeatable	no

**Example:**

```
<vimcox:contact_information>
  <vimcox:name>Valentin Wolf</vimcox:name>
  <vimcox:address>
    <vimcox:email>testmail@uni-due.de</vimcox:email>
    <vimcox:fax>020344466677</vimcox:fax>
    <vimcox:postcode>47054</vimcox:postcode>
    <vimcox:telephone>02034477889</vimcox:telephone>
    <vimcox:url>www.uni-due.de</vimcox:url>
    <vimcox:street_name>Lotharstrasse</vimcox:street_name>
    <vimcox:house_number>78</vimcox:house_number>
    <vimcox:city>Duisburg</vimcox:city>
    <vimcox:state>Nordrhein-Westfalen</vimcox:state>
    <vimcox:country>Deutschland</vimcox:country>
  </vimcox:address>
</vimcox:contact_information>
```

### 3.3.2.3 history

Information about the founder and the inauguration of the building.

Element tag	<history>
Required	no
Repeatable	no
Subelements	founder, inauguration

### founder

Information about the founder of a museum.

Element tag	<vimcox:founder>
Data type	string
Required	yes
Repeatable	no

### inauguration

Information about the inauguration of a museum.

Element tag	<vimcox:inauguration>
Data type	gYear
Required	yes
Repeatable	no

### Example:

```
<vimcox:history>  
  <vimcox:founder>Universidad de Chile</vimcox:founder>  
  <vimcox:inauguration>1947</vimcox:inauguration>  
</vimcox:history>
```

### 3.3.2.4 statistic

Information about the average number of visitors of the virtual museum (per year).

Element tag	<vimcox:statistic>
Required	no
Repeatable	no
Subelements	year, average_attendance

**year**

Information about the average number of visitors.

Element tag	<vimcox:year>
Data type	gYear
Required	yes
Repeatable	yes

**average\_attendance**

Information about the average number of visitors.

Element tag	<vimcox:average_attendance>
Data type	integer
Required	yes
Repeatable	yes

**Example:**

```
<vimcox:statistic>
  <vimcox:year>2009</vimcox:year>
  <vimcox:average_attendance>35695</vimcox:average_attendance>
</vimcox:statistic>
```

**3.3.2.5 address**

Information about the address of the museum.

The element is specified in "contact\_information" in Section 3.3.2.2.

**3.3.2.6 coordinates**

Information about the coordinates of the building in the co-ordinate system WGS84.

Element tag	<vimcox:coordinates>
Required	no
Repeatable	no
Subelements	origin, rotation_matrix

**origin**

Information about the origin of the museum in the co-ordinate system WGS84.

Element tag	<vimcox:origin>
Required	yes
Repeatable	no
Subelements	x, y, z

**x, y, z**

Information about the x-axis, y-axis and z-axis direction.

Element tag	<vimcox:x>, <vimcox:y>, <vimcox:z>
Data type	decimal
Required	yes
Repeatable	no

**rotation\_matrix**

Information about the rotation matrix of the museum with regard to the earth co-ordinate system in the co-ordinate system WGS84.

Element tag	<vimcox:rotation_matrix>
Required	yes
Repeatable	no
Subelements	row1, row2, row3, row4

**row1, row2, row3, row4**

Information about the row1, row2, row3, row4 of the rotations matrix in the co-ordinate system WGS84.

Element tag	<vimcox:row1>, <vimcox:row2>, <vimcox:row3>, <vimcox:row4>
Required	yes
Repeatable	no
Attribute	w, x, y, z

**w, x, y, z** Information about the x-axis, y-axis, z-axis direction and w in the co-ordinate system WGS84.

Element tag	<vimcox:x>, <vimcox:y>, <vimcox:z>, <vimcox:w>
Data Type	decimal
Required	yes
Repeatable	no

**Example:**

```
<vimcox:coordinates>
  <vimcox:origin>
    <vimcox:x>2.54</vimcox:x>
    <vimcox:y>1.43</vimcox:y>
    <vimcox:z>3.56</vimcox:z>
  </vimcox:origin>
  <vimcox:rotation_matrix>
    <vimcox:row1 vimcox:w="1.0" vimcox:x="0.0" vimcox:y="0.0"
      vimcox:z="0.0"/>
    <vimcox:row2 vimcox:w="0.0" vimcox:x="1.0" vimcox:y="0.0"
      vimcox:z="0.0"/>
    <vimcox:row3 vimcox:w="0.0" vimcox:x="0.0" vimcox:y="1.0"
      vimcox:z="0.0"/>
    <vimcox:row4 vimcox:w="0.0" vimcox:x="0.0" vimcox:y="0.0"
      vimcox:z="1.0"/>
  </vimcox:rotation_matrix>
</vimcox:coordinates>
```

## 3.4 Building Metadata

The Information about a building is in the element "building". It is the root-Element of the building metadata.

Element tag	<vimcox:building>
Required	no
Repeatable	yes
Attributes	id
Subelements	administrative_building_metadata, descriptive_building_metadata

### 3.4.1 id

Id of a resource.

Element tag	<vimcox:id>
Data type	string
Required	yes
Repeatable	no

#### Example:

```
<vimcox:building vimcox:id="buil01"/>
```

### 3.4.2 administrative\_building\_metadata

Information about the administrative metadata of a building.

This element is derived from the abstract class "administrative\_metadata" (cf. chapter 3.1).

Element tag	<vimcox:administrative_building_metadata>
Required	no
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified

The specifications of the elements appellationValue, creator, date\_created, rights and date\_modified are in chapter 3.1.



### 3.4.3 descriptive\_building\_metadata

The element "descriptive\_building\_metadata" contain the descriptive metadata of a building. This element is derived from the abstract class "descriptive\_metadata" (cf. chapter. 3.2).

Element tag	<vimcox:descriptive_museum_metadata>
Required	no
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type, barrier_free, exhibition_space, dating, outside_world_texture, year_of_construction, number_of_levels, levels, last_change

The definition of the elements descriptiveNoteValue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, is in chapter 3.2.

#### 3.4.3.1 barrier\_free

Information about the accessibility of a building.

Element tag	<vimcox:barrier_free>
Data type	boolean
Required	no
Repeatable	no

#### Example:

```
<vimcox:barrier_free>true</vimcox:barrier_free>
```

#### 3.4.3.2 exhibition\_space

Information about the whole exhibition area of a building.

Element tag	<vimcox:exhibition_space>
Data type	integer
Required	no
Repeatable	no

**Example:**

```
<vimcox:exhibition_space>3054</vimcox:exhibition_space>
```

**3.4.3.3 dating**

Information about the period of time of arise of a building.

Element tag	<vimcox:dating>
Data type	year
Required	no
Repeatable	no

**Example:**

```
<vimcox:dating>1910</vimcox:dating>
```

**3.4.3.4 year\_of\_construction**

Information about the year of construction of a building.

Element tag	<vimcox:year_of_construction>
Data type	year
Required	no
Repeatable	no

**Example:**

```
<vimcox:year_of_construction>1916</vimcox:year_of_construction>
```

**3.4.3.5 number\_of\_levels**

Information about the number of levels a building has.

Element tag	<vimcox:number_of_levels>
Data type	integer
Required	no
Repeatable	no

**Example:**

```
<vimcox:number_of_levels>3</vimcox:number_of_levels>
```

**3.4.3.6 level**

Information about the levels of a building.

Element tag	<vimcox:level>
Required	no
Repeatable	yes
Attributes	number
Subelements	title, descriptiveNote, entrance_hall, rooms

**number**

Information about the number of a level.

Element tag	<number>
Required	yes
Repeatable	no

**appellationValue**

AppellationValue / name of the level.

The specification of the element is in chapter 3.1.1.

**descriptiveNoteValue**

Description of a level.

The specification of the element is in chapter 3.1.4.

**entrance\_hall**

Information about the entrance hall of a level.

A entrance hall is equally defined as a room. The corresponding specification can be found in chapter 3.5. There is an additional subelement "connectors" defined.

### **connector**

Information about the connectors of a entrance hall. A connector is a vertical connection between two entrance halls (levels) and can be for example a elevator or a staircase.

Element tag	<vimcox:connector>
Required	no
Repeatable	yes
Attributes	id, linked_entrancehall, linked_connector
Subelements	type, descriptiveNoteValue, location_in_entrancehall

### **id**

Id of the resource.

The attribute is specified in chapter 3.4.1.

### **linked\_entrancehall**

Information about the linked entrance hall.

Element tag	<vimcox:linked_entrancehall>
Data type	string
Required	no
Repeatable	no

### **linked\_connector**

Information about the linked connector.

Element tag	<vimcox:linked_connector>
Data type	string
Required	no
Repeatable	no

**type**

Information about the type of the connector.  
The element is specified in Chapter 3.2.10.

**descriptiveNoteValue**

The description of a connector.  
The element is specified in Chapter 3.1.4.

**location\_in\_entrancehall**

Information about the location of the connector in a entrance hall.

Element tag	<vimcox:location_in_entrancehall>
Required	no
Repeatable	no
Subelements	wall, x, y, z

**wall**

Information on which wall of a room the object is.

Element tag	<vimcox:wall>
Data type	string
Required	yes
Repeatable	no

**x, y, z**

Information about the x-axis direction.  
The specification is in chapter 3.3.2.6.

### room

Information about the rooms of a level.

Element tag	<vimcox:room>
Required	no
Repeatable	yes
Attributes	id
Subelements	source

### id

Id of the resource.  
The attribute is specified in chapter 3.4.1.

### source

Information about the path of the XML instance, which contains the linked room.

Element tag	<vimcox:source>
Data type	anyUri
Required	yes
Repeatable	no

### Example:

```
<vimcox:level vimcox:number="2">
  <vimcox:appellationValue>Level nr 2</vimcox:appellationValue>
  <vimcox:descriptiveNoteValue>The level number 2
</vimcox:descriptiveNoteValue>
  <vimcox:entrance_hall vimcox:id="en231">
  <vimcox:connectors>
    <vimcox:connector vimcox:linked_entrancehall="en231" vimcox:id="con21"
```

```

vimcox:linked_connector="con25">
  <dc:type>Elevator</dc:type>
  <vimcox:descriptiveNoteValue>Elevator with 2 doors.
</vimcox:descriptiveNoteValue>
  <vimcox:location_in_entrancehall>
    <vimcox:wall>N</vimcox:wall>
    <vimcox:x>1.0</vimcox:x>
    <vimcox:y>0.24</vimcox:y>
    <vimcox:z>2.0</vimcox:z>
  </vimcox:location_in_entrancehall>
</vimcox:connector>
</vimcox:connectors>
</vimcox:entrance_hall>
<vimcox:rooms>
  <vimcox:room vimcox:id="room81">
    <vimcox:source>room81.xml</vimcox:source>
  </vimcox:room>
</vimcox:rooms>
</vimcox:level>

```

### 3.4.3.7 last\_change

Information about the date of the last modification of a building.

Element tag	<vimcox:last_change>
Data type	date
Required	no
Repeatable	no
Attribute	name (Data type: string; notwendig)

#### name

Information about the person who has at last changed the building.  
The specification of the element is in chapter 3.3.2.2.

#### Example:

```
<last_change name="Peter Mueller">2010-06-04</last_change>
```

## 3.5 Room Metadata

A room is in the element "room" described. It is the root-element of the room metadata.

Element tag	<vimcox:room>
Data type	date
Required	no
Repeatable	yes
Attribute	id
Subelements	administrative_room_metadata, descriptive_room_metadata

### Id

Id of the resource. The specification of the element is in chapter 3.4.1.

### 3.5.1 administrative\_room\_metadata

Information about the administrative metadata of a room

This element is derived from the abstract class "administrative\_metadata" (cf. chapter 3.1).

Element tag	<vimcox:administrative_room_metadata>
Required	no
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, textures, source_folder

The specifications of the elements appellationValue, creator, date\_created, rights and date\_modified are in chapter 3.1.

#### 3.5.1.1 textures

Information about the textures of a room.

Element tag	<vimcox:textures>
Required	no
Repeatable	no
Subelements	wall_textur_path, bottom_textur_path, top_textur_path



**wall\_textur\_path, bottom\_textur\_path, top\_textur\_path**

Information about the storage location of the wall, floor and bottom textures.

**Example:**

```
<vimcox:textures>
  <vimcox:wall_texture_path>wallpaper.jpg</vimcox:wall_texture_path>
  <vimcox:bottom_texture_path>parquet.jpg</vimcox:bottom_texture_path>
  <vimcox:top_texture_path>ceiling.jpg</vimcox:top_texture_path>
</vimcox:textures>
```

**3.5.1.2 source\_folder**

Information about the storage location (folder) of the XML file/instance of a room. The element is specified in Chapter 3.4.3.6.

**3.5.2 descriptive\_room\_metadata**

Information about the descriptive metadata of a room.

This element is derived from the abstract class "descriptive\_metadata" (cf. chapter. 3.2).

Element tag	<vimcox:descriptive_room_metadata>
Required	no
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type, thresholds, partitionwalls, viewpoints, mainentrance, mainentrance_absolute_coordinates, outdoor, objects

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.2.

**3.5.2.1 custom\_room\_shape**

The element "custom\_room\_shape" is an optional element for specifying individual room shapes i.e based on floorplans or 2D sketches. You need to define at least three walls which are ideally ordered and connected to each other.

**custom\_room\_shape**

Element tag	<vimcox:custom_room_shape>
Required	no
Repeatable	no
Subelements	wall (3-n)

**Example:**

```

<vimcox:custom_room_shape>
  <vimcox:wall vimcox:wallnumber="0" vimcox:id="w0">
    ...
  </vimcox:wall>
  <vimcox:wall vimcox:wallnumber="1" vimcox:id="w1">
    ...
  </vimcox:wall>
  ...
  <vimcox:wall vimcox:wallnumber="n" vimcox:id="wn">
    ...
  </vimcox:wall>
</vimcox:custom_room_shape>

```

**3.5.2.2 walls****wall**

This element is the parent of a wall. It wraps the visual and construction parameters of a wall and provides a numerical identifier (wallnumber) to order walls and a descriptor (id) for a wall.

Element tag	<vimcox:wall>
Required	yes
Repeatable	yes
Attributes	id, wallnumber
Subelements	wall_type, wall_properties

### wall\_type

This type is the basic specification for walls and partition walls. A wall is defined by two bottom points and parameters for height, width, length and appearance.

Element tag	<vimcox:wall_type>
Required	no
Repeatable	yes
Subelements	point1, point2, height, width, length, texture

### point1 and point2

These elements are specifying the two bottom points of each wall. Absolute point2D: point1 is the bottom left corner and point2 is the bottom right corner.

### point2D

Specifies a 2D point (decimal).

Element tag	<vimcox:start_point>
Required	yes
Repeatable	no
Subelements	x, y

### x, y

Information about the x-axis, y-axis direction.

Element tag	<vimcox:x>, <vimcox:y>
Data Type	decimal
Required	yes
Repeatable	no

### height, width and length

These attributes are decimal values describing the dimension of a wall. Length is an optional parameter.

**texture**

This element specifies the Texture of a wall.

**wall\_property\_type**

Element tag	<vimcox:wall_property_type>
Required	no
Repeatable	no
Subelements	doors, windows, textureproperties

**doors**

This element specifies a door in a wall.

Element tag	<vimcox:doors>
Required	no
Repeatable	no
Attributes	doorWidth, doorHeight, frame

**doorWidth**

This attribute specifies the width of a door.

**doorHeight**

This attribute specifies the height of a door.

**frame**

This boolean attribute specifies the usage of a door frame.

**windows**

This element specifies the number and shape of windows in a wall.

Element tag	<vimcox:windows>
Required	no
Repeatable	no
Attributes	numberOfWindows, windowArc

### numberOfWindows

This attribute specifies the number of windows which should be placed on a specific wall, assuming that windows are equally distributed.

### windowArc

This attribute specifies a none negative interger number of steps, which are used to form the arcs of all windows located on a specific wall.

### texturewrap

This property specifies the texturewrapping (texture rastarization) parameter of a virtual wall in x and y direction.

Element tag	<vimcox:texturewrap>
Required	no
Repeatable	no
Attributes	x, y

### Example:

```
<vimcox:wall vimcox:id="w26" vimcox:wallnumber="26">
  <vimcox:wall>
    <vimcox:point1>
      <vimcox:x>16.0</vimcox:x>
      <vimcox:y>24.0</vimcox:y>
    </vimcox:point1>
    <vimcox:point2>
      <vimcox:x>12.0</vimcox:x>
      <vimcox:y>24.0</vimcox:y>
    </vimcox:point2>
    <vimcox:height>5.0</vimcox:height>
```

```

<vimcox:width>0.0</vimcox:width>
<vimcox:length>0.0</vimcox:length>
<vimcox:texture>
    <vimcox:wall_texture_path>wallpaper.jpg
    </vimcox:wall_texture_path>
</vimcox:texture>
<vimcox:wallproperties>
    <vimcox:doors vimcox:doorWidth="3"
    vimcox:doorHeight="3"
    vimcox:frame="false" />
    <vimcox:texturewrap vimcox:x="1"
    vimcox:y="1" />
</vimcox:wallproperties>
</vimcox:wall>
</vimcox:wall>

```

### 3.5.2.3 partitionwall

Partition walls are for the purpose of separating, dividing or beveling rooms . Exhibits can be placed on both sides.

Element tag	<vimcox:partitionwall>
Required	no
Repeatable	yes
Attributes	id
Subelements	wall, objects

#### wall

This element is specified in Chapter 3.5.2.2.

#### object

Information about the linked objects of a partitionwall. Objects is a list of referenced objects. Opposed to objects which are referenced in a room, partitionwall objects have an additional parameter to define the location of an exhibit (front or back side).

Element tag	<vimcox:object>
Required	no
Repeatable	yes
Attributes	frontfacing, id
Subelements	location_on_wall, user_interaction_behavior

**Id**

This attribute is the referenced ID of an object.

**frontfacing**

Determines the side on which the exhibit will be placed.

**location\_on\_wall**

Specifies the position of an exhibit on this particular partition wall.

**user\_interaction\_behavior**

Specifies the user interaction behavior of an exhibit on this particular partition wall.

**Example:**

```
<vimcox:partitionwall vimcox:id="pWall">
  <vimcox:wall>
    <vimcox:point1>
      <vimcox:x>-2.0</vimcox:x>
      <vimcox:y>0.0</vimcox:y>
    </vimcox:point1>
    <vimcox:point2>
      <vimcox:x>2.0</vimcox:x>
      <vimcox:y>0.0</vimcox:y>
    </vimcox:point2>
    <vimcox:height>6.0</vimcox:height>
    <vimcox:width>0.2</vimcox:width>
    <vimcox:length>0.0</vimcox:length>
  </vimcox:wall>
  <vimcox:objects>
    <vimcox:object vimcox:frontfacing="true"
      vimcox:id="idSculpture">
      <vimcox:location_on_wall>
```

```

        <vimcox:x>0.0</vimcox:x>
        <vimcox:y>2.0</vimcox:y>
        <vimcox:z>0.5</vimcox:z>
        </vimcox:location_on_wall>
    </vimcox:object>
</vimcox:objects>
</vimcox:partitionwall>

```

### 3.5.2.4 viewpoint

A viewpoint is a camera pose, marking Points Of Interest (POIs), and is composed of location and a view direction information.

Element tag	<vimcox:viewpoint>
Data type	decimal and string
Required	no
Repeatable	no
Subelements	location, orientation, description

#### location

Information about a 3D point, XYZ of a position.

Element tag	<vimcox:location>
Required	yes
Repeatable	no
Subelements	x, y, z

#### x, y, z

Information about the x-axis, y-axis, z-axis direction.  
The specification is in chapter 3.3.2.6.

#### orientation

Information about a 3D point, XYZ of a rotation.



Element tag	<vimcox:orientation>
Required	yes
Repeatable	no
Subelements	x, y, z, angle

**angle**

Information about the viewing angle of a viewpoint.

Element tag	<vimcox:angle>
Data type	decimal
Required	yes
Repeatable	no

**x, y, z**

Information about the axis of rotation.

Element tag	<vimcox:x>, <vimcox:y>, <vimcox:z>
Data Type	integer
Required	yes
Repeatable	no

**description**

Description of a viewpoint.

Element tag	<vimcox:description>
Data type	string
Required	no
Repeatable	no

**Example:**

```
<vimcox:viewpoint vimcox:id="vp28">
  <vimcox:location>
```

```

    <vimcox:x>0</vimcox:x>
    <vimcox:y>2</vimcox:y>
    <vimcox:z>0</vimcox:z>
  </vimcox:location>
  <vimcox:orientation>
    <vimcox:x>0</vimcox:x>
    <vimcox:y>1</vimcox:y>
    <vimcox:z>0</vimcox:z>
    <vimcox:angle>1.57</vimcox:angle>
  </vimcox:orientation>
  <vimcox:description>Exhibit 1</vimcox:description>
</vimcox:viewpoint>

```

### 3.5.2.5 threshold

Information about the thresholds/entrances of a room. A threshold is a horizontal connection between two rooms and can be for example a door or a gateway.

Element tag	<vimcox:threshold>
Required	no
Repeatable	no
Attributes	id, linked_room, linked_threshold, local_viepoint
Subelements	type, descriptiveNote, location_in_room

#### id

Id of the resource.

The attribute is specified in chapter 3.4.1.

#### linked\_room

Information about the linked room of a threshold.

The element has the same specification like "linked\_entrancehall" in "connector" in chapter 3.4.3.6.

#### linked\_threshold

Information about the linked threshold of a threshold.

The element has the same specification like "linked\_connector" in "connector" in chapter 3.4.3.6.

### **local\_viewpoint**

ID of a local Viewpoint which is loaded when entering the room through this threshold.

### **type**

Information about the type of a threshold.

Das Element hat die gleiche Definition wie unter "connector" in Section 3.2.10.

### **descriptiveNote**

Description of a threshold.

The element is specified in Chapter ??.

**location\_in\_room** Information about the location of the threshold in a room.

The element has the same specification like "location\_in\_entrancehall" in Chapter 3.4.3.6.

### **Example:**

```
<vimcox:threshold vimcox:linked_room="room231" vimcox:id="thre28"
  vimcox:linked_threshold="thre29" vimcox:local_viewpoint="vp29">
  <dc:type>Door</dc:type>
  <vimcox:descriptiveNote>Door.
</vimcox:descriptiveNote>
  <vimcox:location_in_room>
    <vimcox:wall>N</vimcox:wall>
    <vimcox:x>1.0</vimcox:x>
    <vimcox:y>0.24</vimcox:y>
    <vimcox:z>2.0</vimcox:z>
  </vimcox:location_in_room>
```

```
</vimcox:threshold>
```

### 3.5.2.6 mainentrance

Information about the main entrance of a room.

Element tag	<vimcox:mainentrance>
Data type	string
Required	no
Repeatable	no

#### Example:

```
<vimcox:mainentrance>N</vimcox:mainentrance>
```

### 3.5.2.7 mainentrance\_absolute\_coordinates

Information about the coordinates of the main entrance of a room.

Element tag	<vimcox:mainentrance_absolute_coordinates>
Data type	string
Required	no
Repeatable	no

#### Example:

```
<vimcox:mainentrance_absolute_coordinates> 33o26'6.44"S; 70o38'39.79"W
</vimcox:mainentrance_absolute_coordinates>
```

### 3.5.2.8 object

Information about the linked objects of a room.

Element tag	<vimcox:object>
Required	no
Repeatable	no
Attributes	id
Subelements	location_in_room

**id**

Id of the object.

The element is specified in Chapter 3.4.1.

**location\_in\_room**

Information about the location of an object in a room.

The element has the same specification like "location\_in\_entrancehall" in Chapter 3.4.3.6.

**Example:**

```
<vimcox:object>
  <vimcox:id>ob03</vimcox:id>
  <vimcox:location_in_room>
    <vimcox:wall>N</vimcox:wall>
    <vimcox:x>1.0</vimcox:x>
    <vimcox:y>0.24</vimcox:y>
    <vimcox:z>2.0</vimcox:z>
  </vimcox:location_in_room>
</vimcox:object>
```

## 3.6 Object Metadata

Information about an object. It is the root-element of the object metadata.

Element tag	<vimcox:object>
Required	no
Repeatable	yes
Attributes	id
Subelements	image, sculpture, interaction_Canvas, interior, door, window, media, tombstone

**id** Id of the resource. The element is specified in Chapter 3.4.1.

## 3.7 Image Metadata

The element contain the whole description about a image.

Element tag	<vimcox:image>
Required	no
Repeatable	no
Attributes	id
Subelements	administrative_image_metadata, descriptive_image_metadata

### 3.7.1 administrative\_image\_metadata

Information about the administrative metadata of a image.

This element is derived from the abstract class "administrative\_metadata" (cf. chapter 3.1).

Element tag	<vimcox:administrative_image_metadata>
Required	no
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, texture-source, x3dsource, thumbnailsource, passepartout_size, frame_size

The specifications of the elements appellationValue, creator, date\_created, rights and date\_modified are in chapter 3.1.

#### 3.7.1.1 texturesource

Storage location of the image of a object.

Element tag	<vimcox:texturesource>
Data type	anyUri
Required	yes
Repeatable	no

**Example:**

```
<vimcox:texturesource>C:/temp/ponchodenudos.jpg</vimcox:texturesource>
```

### 3.7.1.2 x3dsourc

Storage location of the x3d file.

Element tag	<vimcox:x3dsourc>
Data type	anyUri
Required	yes
Repeatable	no

**Example:**

```
<vimcox:x3dsourc>C:/temp/ponchodenudos.x3d</vimcox:x3dsourc>
```

### 3.7.1.3 thumbnailsource

Storage location of the thumbnail of a object.

Element tag	<vimcox:thumbnailsource>
Data type	anyUri
Required	yes
Repeatable	no

**Example:**

```
<vimcox:thumbnailsource>C:/temp/ponchodenudos_preview.gif
</vimcox:thumbnailsource>
```

### 3.7.1.4 passepartout\_size

Information aobut the passepartout size of a image.

Element tag	<vimcox:passepartout_size>
Required	no
Repeatable	no
Subelements	height, width

**height, width**

Information about the hight. Information about the width.

Element tag	<vimcox:height>, <vimcox:width>
Data type	decimal
Required	yes
Repeatable	no

**Example:**

```
<vimcox:passepout_size>
  <vimcox:height>2.4</vimcox:height>
  <vimcox:width>1.2</vimcox:width>
</vimcox:passepout_size>
```

**3.7.1.5 frame\_size**

Information about the frame size of a image.

Element tag	<vimcox:frame_size>
Required	no
Repeatable	no
Subelements	height, width

**height, width**

Information about the height. Information about the width.

The element is specified in Chapter 3.7.1.4.

**Example:**

```
<vimcox:frame_size>
  <vimcox:height>8.4</vimcox:height>
  <vimcox:width>7.2</vimcox:width>
</vimcox:frame_size>
```

**3.7.2 descriptive\_image\_metadata**

This element is derived from the abstract class "descriptive\_metadata" (cf. chapter. 3.2).



Element tag	<vimcox:descriptive_image_metadata>
Required	no
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type, production_method, resolution, compression_method, color_depth, lom_interaction, audio_clip_id

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.2.

### 3.7.2.1 production\_method

The production or manufacturing processes, techniques, and methods incorporated in the fabrication or alteration of the work or image.[VRA 2007]

Element tag	<vimcox:production_method>
Data type	string
Required	no
Repeatable	no

#### Example:

```
<vimcox:production_method>Plasticina sobre madera
</vimcox:production_method>
```

### 3.7.2.2 resolution

Information about the resolution in dpi of a image.

Element tag	<vimcox:resolution>
Data type	string
Required	no
Repeatable	no

#### Example:

```
<vimcox:resolution>200</vimcox:resolution>
```

### 3.7.2.3 compression\_method

Information about the compression method of a image.

Element tag	<vimcox:compression_method>
Data type	string
Required	no
Repeatable	no

**Example:**

```
<vimcox:compression_method>JPEG 2000</vimcox:compression_method>
```

### 3.7.2.4 color\_depth

Information about the color depth of a image in bit.

Element tag	<vimcox:color_depth>
Data type	nonNegativeIntager
Required	no
Repeatable	no

**Example:**

```
<vimcox:color_depth>32</vimcox:color_depth>
```

### 3.7.2.5 lom\_interaction

Information about the lom interaction of a image.

Element tag	<vimcox:lom_interaction>
Required	no
Repeatable	no
Subelements	lom_interaction_type, lom_interaction_level

**lom\_interaction\_type, lom\_interaction\_level**

Information about the lom interaction type and level.

Element tag	<vimcox:lom_interaction_type>, <vimcox:lom_interaction_level>
Data type	String
Required	yes
Repeatable	no

**Example:**

```
<vimcox:lom_interaction>
  <vimcox:lom_interaction_type>active</vimcox:lom_interaction_type>
  <vimcox:lom_interaction_level>medium</vimcox:lom_interaction_level>
</vimcox:lom_interaction>
```

**3.7.2.6 audio\_clip\_id**

Information about a audio clip of a image.

Element tag	<vimcox:audio_clip_id>
Data type	string
Required	no
Repeatable	no

**Example:**

```
<vimcox:audio_clip_id>clip1</vimcox:audio_clip_id>
```

**3.8 Sculpture Metadata**

The element contain the information to describe a sculpture. It has the subelements "administrative\_sculpture\_metadata" an "descriptive\_sculpture\_metadata".

Element tag	<vimcox:sculpture>
Required	no
Repeatable	no
Subelements	administrative_sculpture_metadata, descriptive_sculpture_metadata

**3.8.1 administrative\_sculpture\_metadata**

Information about the administrative metadata of a sculpture.

This element is derived from the abstract class "administrative\_metadata" (cf. chapter 3.1).

Element tag	<vimcox:administrative_sculpture_metadata>
Required	no
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, texture-source, x3dsource, thumbnailsource

The specifications of the elements appellationValue, creator, date\_created, rights and date\_modified are in chapter 3.1.

### 3.8.1.1 texturesource

Storage location of the image of a object.  
The element is specified in Chapter 3.7.1.1.

### 3.8.1.2 x3dsource

Storage location of the x3d file.  
The element is specified in Chapter 3.7.1.2.

### 3.8.1.3 thumbnailsource

Storage location of the thumbnail of a object.  
The element is specified in Chapter 3.7.1.3.

### 3.8.1.4 descriptive\_sculpture\_metadata

Information about the descriptive metadata of a sculpture.  
This element is derived from the abstract class "descriptive\_metadata" (cf. chapter. 3.2).

Element tag	<vimcox:descriptive_sculpture_metadata>
Required	no
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type, production_method, lom_interaction

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date,

objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.2.

### 3.8.1.5 production\_method

The production or manufacturing processes, techniques, and methods incorporated in the fabrication or alteration of the work or image. [VRA 2007]

The element is specified in Chapter 3.7.2.1.

### 3.8.1.6 lom\_interaction

Information about the lom interaction of a sculpture.

The element is specified in Chapter 3.7.2.5.

## 3.9 Interaction Canvas Metadata

Information about the interaction canvas metadata.

Element tag	<vimcox:interaction_canvas>
Required	no
Repeatable	no
Subelements	administrative_interaction_canvas_metadata, descriptive_interaction_canvas_metadata

### 3.9.1 administrative\_interaction\_canvas\_metadata

Information about the administrative metadata of a interaction canvas.

This element is derived from the abstract class "administrative\_metadata" (cf. chapter 3.1).

Element tag	<vimcox:administrative_interaction_canvas_metadata>
Required	no
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, thumbnail-source, resolution, sensor_size, fps

The specifications of the elements appellationValue, creator, date\_created, rights and date\_modified are in chapter 3.1.

**3.9.1.1 thumbnailsource**

The element is specified in Chapter 3.7.1.3.

**3.9.1.2 resolution**

Information about the resolution of the Java script node generated image content. (cf. [?], Chapter 5.4.2).

Element tag	<vimcox:resolution>
Required	yes
Repeatable	no
Subelements	resolution_x, resolution_y

**resolution\_x, resolution\_y**

Information about the resolution in x-axis and y-axis.

Element tag	<vimcox:resolution_x>, <vimcox:resolution_y>
Required	yes
Repeatable	no

**Example:**

```
<vimcox:resolution>
  <vimcox:resolution_x>200</vimcox:resolution_x>
  <vimcox:resolution_y>300</vimcox:resolution_y>
</vimcox:resolution>
```

**3.9.1.3 sensor\_size**

The size of the sensor placed in a room to pinpoint visitors position.

Element tag	<vimcox:sensor_size>
Required	yes
Repeatable	no
Subelements	sensor_width, sensor_length

**sensor\_width, sensor\_length**

The width and length of the sensor placed in a room to pinpoint visitors position.

Element tag	<vimcox:sensor_width>, <vimcox:sensor_length>
Data type	decimal
Required	no
Repeatable	no

**Example:**

```
<vimcox:sensor_size>
  <vimcox:sensor_width>26.5</vimcox:sensor_width>
  <vimcox:sensor_length>15.4</vimcox:sensor_length>
</vimcox:sensor_size>
```

**3.9.1.4 fps**

Information about the update rate of the canvas.

Element tag	<vimcox:fps>
Data type	integer
Required	no
Repeatable	no

**Example:**

```
<vimcox:fps>35</vimcox:fps>
```

**3.9.1.5 descriptive\_interaction\_canvas\_metadata**

Information about the descriptive metadata of a interaction canvas.

This element is derived from the abstract class "descriptive\_metadata" (cf. chapter. 3.2).

Element tag	<vimcox:descriptive_interaction_canvas_metadata>
Required	no
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type, production_method, lom_interaction

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.2.

### 3.9.1.6 production\_method

The production or manufacturing processes, techniques, and methods incorporated in the fabrication or alteration of the work or image. [VRA 2007]

The element is specified in Chapter 3.7.2.1.

### 3.9.1.7 lom\_interaction

Information about the lom interaction of a interaction canvas.

The element is specified in Chapter 3.7.2.5.

## 3.10 Door Metadata

Information about the metadata of a door.

Element tag	<vimcox:door>
Required	no
Repeatable	no
Subelemente	administrative_door_metadata, descriptive_door_metadata

### 3.10.1 administrative\_door\_metadata

Information about the administrative metadata of a door.

This element is derived from the abstract class "administrative\_metadata" (cf. chapter 3.1).



Element tag	<vimcox:administrative_door_metadata>
Required	yes
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, texture, x3dsource, thumbnailsource, frame

The specifications of the elements appellationValue, creator, date\_created, rights and date\_modified are in chapter 3.1.

### 3.10.1.1 texture

Storage location of the texture of a door.

Element tag	<vimcox:texture>
Required	no
Repeatable	no
Attribute	name

#### name

Name/label/material of the texture.

Element tag	<vimcox:texture>
Required	no
Repeatable	no

#### Example:

```
<vimcox:textur vimcox:name="wood">C:/temp/door_texture_wood01.jpg
</vimcox:textur>
```

### 3.10.1.2 x3dsource

Storage location of the corresponding x3d file.

The element is specified in Chapter 3.7.1.2.

### 3.10.1.3 thumbnailsource

Storage location of the thumbnail of a object.  
The element is specified in Chapter 3.7.1.3.

### 3.10.1.4 frame

Information about the frame.

Element tag	<vimcox:frame>
Required	yes
Repeatable	no
Subelements	thickness, texture

### thickness

Information about the thickness of a frame.

Element tag	<vimcox:thickness>
Data type	decimal
Required	no
Repeatable	no

### texture

Storage location of a texture of a frame.  
The element is specified in Chapter 3.10.1.1.

### Example:

```
<vimcox:frame>  
  <vimcox:thickness>20</vimcox:thickness>  
  <vimcox:texture vimcox:name="wood">C:/temp/frame_texture_wood01.jpg  
  </vimcox:texture>  
</vimcox:frame>
```

### 3.10.2 descriptive\_door\_metadata

Information about the descriptive metadata of a door. This element is derived from the abstract class "descriptive\_metadata" (cf. chapter. 3.2).

Element tag	<vimcox:descriptive_museum_metadata>
Required	yes
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type,

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.2.

## 3.11 Window Metadata

Information about the window metadata.

This element is derived from the class "door" (cf. chapter 3.10).

## 3.12 Media Metadata

Information about the metadata of a media object.

Element tag	<vimcox:media>
Required	no
Repeatable	no
Subelements	audio, video

## 3.13 Audio Metadata

Information about the audio metadata.

Element tag	<vimcox:audio>
Required	no
Repeatable	no
Subelements	administrative_audio_metadata, descriptive_audio_metadata

### 3.13.1 administrative\_audio\_metadata

Information about the administrative audio metadata.

This element is derived from the abstract class "administrative\_metadata" (cf. chapter 3.1).

Element tag	<vimcox:administrative_audio_metadata>
Required	yes
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, path

The specifications of the elements appellationValue, creator, date\_created, rights and date\_modified are in chapter 3.1.

#### 3.13.1.1 path

Information about the storage location of the audio file.

Element tag	<vimcox:path>
Data type	anyUri
Required	no
Repeatable	no

**Example:**

```
<vimcox:path>C:/temp/audio01.wave</vimcox:path>
```

### 3.13.2 descriptive\_audio\_metadata

Information about the descriptive audio metadata.

This element is derived from the abstract class "descriptive\_metadata" (cf. chapter. 3.2).

Element tag	<vimcox:descriptive_audio_metadata>
Required	yes
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type, album, genre, year, filesize, bit_rate, duration, format

The specifications of the elements descriptiveNotevalue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.2.

### 3.13.2.1 album

Information about album in which the audio file is available.

Element tag	<vimcox:album>
Required	no
Repeatable	no

#### Example:

```
<vimcox:album>The All-Time Greatest Hits</vimcox:album>
```

### 3.13.2.2 genre

Information about the genre of a audio track.

Element tag	<vimcox:genre>
Data type	string
Required	no
Repeatable	no

#### Example:

```
<vimcox:genre>Jazz</vimcox:genre>
```

### 3.13.2.3 year

Information about the year of the appearance of an audio track.

Element tag	<vimcox:year>
Data type	gYear
Required	no
Repeatable	no

**Example:**

```
<vimcox:year>1996</vimcox:year>
```

### 3.13.2.4 filesize

Information about the size in mb.

Element tag	<vimcox:filesize>
Data type	decimal
Required	no
Repeatable	no

**Example:**

```
<vimcox:filesize>25.54</vimcox:filesize>
```

### 3.13.2.5 bit\_rate

Information about the bit rate in kbps of an audio track.

Element tag	<vimcox:bit_rate>
Data type	integer
Required	no
Repeatable	no

**Example:**

```
<vimcox:bit_rate>128</vimcox:bit_rate>
```

### 3.13.2.6 duration

Information about the length in minutes.

Element tag	<vimcox:duration>
Data type	decimal
Required	no
Repeatable	no

**Example:**

```
<vimcox:duration>2.54</vimcox:duration>
```

### 3.13.2.7 format

Information about the file format.

Element tag	<vimcox:format>
Data type	string
Required	no
Repeatable	no
Herkunft	dc.xsd

**Example:**

```
<vimcox:format>wave</vimcox:format>
```

## 3.14 Video Metadata

Information about the video metadata.

Element tag	<vimcox:video>
Required	yes
Repeatable	no
Subelements	administrative_video_metadata, descriptive_video_metadata

### 3.14.1 administrative\_video\_metadata

Information about the administrative video metadata.

This element is derived from the abstract class "administrative\_metadata" (cf. chapter 3.1).

Element tag	<vimcox:administrative_video_metadata>
Required	yes
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, path

The specifications of the elements appellationValue, creator, date\_created, rights and date\_modified are in chapter 3.1.

#### 3.14.1.1 path

Information about the storage location of the video file.

The element is specified in Chapter 3.13.1.1.

### 3.14.2 descriptive\_video\_metadata

Information about the descriptive video metadata.

This element is derived from the abstract class "descriptive\_metadata" (cf. chapter. 3.2).

Element tag	<vimcox:descriptive_video_metadata>
Required	yes
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type, filesize, duration, format, subject, resolution

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.2.

#### 3.14.2.1 filesize

Information about the size in mb.

The element is specified in Chapter 3.13.2.4.



### 3.14.2.2 duration

Information about the length in minutes.  
The element is specified in Chapter 3.13.2.6.

### 3.14.2.3 format

Information about the video format.  
The element is specified in Chapter 3.13.2.7.

### 3.14.2.4 subject

Information about the subjects of a video.

Element tag	<dc:subject>
Data type	string
Required	no
Repeatable	no

#### Example:

```
<dc:subject>Making of</dc:subject>
```

### 3.14.2.5 resolution

Information about the resolution of a video.

Element tag	<vimcox:resolution>
Data type	string
Required	no
Repeatable	no

#### Example:

```
<vimcox:resolution>640 x 480</vimcox:resolution>
```

## 3.15 Interior Metadata

Information about the interior metadata.

Element tag	<vimcox:resolution>
Required	no
Repeatable	no
Subelements	furniture, light_source, vegetation, any

The abstract classes "administrative\_interior\_object\_metadata" and "descriptive\_interior\_object\_metadata" are defined for the implementation of the interior sub elements. The sub elements of these abstract classes are contained in every subsequent interior object.

### 3.15.1 administrative\_interior\_object\_metadata

This is an abstract class which is derived from the abstract class "administrative\_metadata" (cf. chapter 3.1).

Element tag	<vimcox:administrative_interior_object_metadata>
Sub elements	appellationValue, creator, date_created, rights, date_modified, textures, x3dsource, thumbnailsource

The specifications of the elements appellationValue, creator, date\_created, rights and date\_modified are in chapter 3.1.

#### 3.15.1.1 textures

Source folders of the textures of an object.

#### 3.15.1.2 x3dsource

Storage location of the x3d file.

The element is specified in Chapter 3.7.1.2.

#### 3.15.1.3 thumbnailsource

Storage location of the thumbnail of an object.

The element is specified in Chapter 3.7.1.3.

### 3.15.2 descriptive\_interior\_object\_metadata

The element is an abstract class which is derived from the abstract class "descriptive\_metadata" (cf. chapter. 3.2).

Element tag	<vimcox:descriptive_interior_object_metadata>
Required	yes
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type,

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.2.

## 3.16 Furniture Metadata

Information about the metadata of a furniture.

Element tag	<vimcox:furniture>
Required	yes
Repeatable	no
Subelements	administrative_furniture_metadata, descriptive_furniture_metadata

### 3.16.1 administrative\_furniture\_metadata

Information about the administrative metadata of a furniture.

This element is derived from the abstract class "administrative\_interior\_object\_metadata" (cf. chapter 3.15.1).

Element tag	<vimcox:administrative_furniture_metadata>
Required	yes
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, textures, x3dsources, thumbnailsources

The specifications of the elements `appellationValue`, `creator`, `date_created`, `rights`, `date_modified`, `textures`, `x3dsource` and `thumbnailsource` are chapter 3.15.1.

### 3.16.2 `descriptive_furniture_metadata`

Information about the descriptive metadata of a furniture.

This element is derived from the abstract class "descriptive\_interior\_object\_metadata" (cf. chapter. 3.15.2).

Element tag	<vimcox:descriptive_furniture_metadata>
Required	yes
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type,

The specifications of the elements `descriptiveNoteValue`, `creator`, `measurements`, `creation_date`, `objectCreationLocation`, `objectStyle`, `displayMaterialsTech`, `material_set`, `production_period` and `type`, are in chapter 3.15.2.

## 3.17 Light Source Metadata

Information about the metadata of a furniture.

Element tag	<vimcox:light_source>
Required	yes
Repeatable	no
Subelements	administrative_light_source_metadata, descriptive_light_source_metadata

### 3.17.1 `administrative_light_source_metadata`

Information about the administrative metadata of a furniture.

This element is derived from the abstract class "administrative\_interior\_object\_metadata" (cf. chapter 3.15.1).

Element tag	<vimcox:administrative_light_source_metadata>
Required	yes
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, textures, x3dsurface, thumbnailsurface

The specifications of the elements appellationValue, creator, date\_created, rights, date\_modified, textures, x3dsurface and thumbnailsurface are in chapter 3.15.1.

### 3.17.2 descriptive\_light\_source\_metadata

Information about the descriptive metadata of a furniture.

This element is derived from the abstract class "descriptive\_interior\_object\_metadata" (cf. chapter. 3.15.2).

Element tag	<vimcox:descriptive_light_source_metadata>
Required	yes
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type,

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.15.2.

## 3.18 Plant Metadata

Information about the metadata of a plant.

Element tag	<vimcox:plant>
Required	yes
Repeatable	no
Subelements	administrative_plant_metadata, descriptive_plant_metadata

### 3.18.1 administrative\_plant\_metadata

Information about the administrative metadata of a plant.

This element is derived from the abstract class "administrative\_interior\_object\_metadata" (cf. chapter 3.15.1).

Element tag	<vimcox:administrative_plant_metadata>
Required	yes
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, textures, x3dsresource, thumbnailsource

The specifications of the elements appellationValue, creator, date\_created, rights, date\_modified, textures, x3dsresource and thumbnailsource are in chapter 3.15.1.

### 3.18.2 descriptive\_plant\_metadata

Information about the descriptive metadata of a plant.

This element is derived from the abstract class "descriptive\_interior\_object\_metadata" (cf. chapter. 3.15.2).

Element tag	<vimcox:descriptive_plant_metadata>
Required	yes
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type, origin, plant_family

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.15.2.

#### 3.18.2.1 origin

Information about the origin of a plant.

Element tag	<vimcox:origin>
Data type	string
Required	no
Repeatable	no

**Example:**

```
<vimcox:origin>Sri Lanka</vimcox:origin>
```

**3.18.2.2 plant\_family**

Information about the plant family of a plant.

Element tag	<vimcox:plant_family>
Data type	string
Required	no
Repeatable	no

**Example:**

```
<vimcox:plant_family>Lorbeergewaechse (Lauraceae)</vimcox:plant_family>
```

**3.19 Any Type Interior Metadata**

Information about the metadata of a any type interior object.

Element tag	<vimcox:plant>
Required	yes
Repeatable	no
Attributes	name
Subelements	administrative_any_metadata, descriptive_any_metadata

**3.19.1 name**

Information about the name of the object.

Element tag	<vimcox:name>
Data type	string
Required	yes
Repeatable	no

**Example:**

```
<vimcox:any vimcox:name="heating"/>
```

**3.19.2 administrative\_any\_metadata**

Information about the administrative metadata of a any type interior object.

This element is derived from the abstract class "administrative\_interior\_object\_metadata" (cf. chapter 3.15.1).

Element tag	<vimcox:administrative_any_metadata>
Required	yes
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, textures, x3dsurface, thumbnailsurface

The specifications of the elements appellationValue, creator, date\_created, rights, date\_modified, textures, x3dsurface and thumbnailsurface are in chapter 3.15.1.

**3.19.3 descriptive\_any\_metadata**

Information about the descriptive metadata of a any type interior object.

This element is derived from the abstract class "descriptive\_interior\_object\_metadata" (cf. chapter. 3.15.2).

Element tag	<vimcox:descriptive_plant_metadata>
Required	yes
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date,



objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.15.2.

## 3.20 Tombstone Metadata

Information about the metadata of a tombstone.

Element tag	<vimcox:tombstone>
Required	no
Repeatable	no
Attributes	id
Subelements	administrative_tombstone_metadata, descriptive_tombstone_metadata

### 3.20.1 id

Id of the resource.

The element is specified in Chapter 3.4.1.

### 3.20.2 administrative\_tombstone\_metadata

Information about the administrative metadata of a tombstone.

This element is derived from the abstract class "administrative\_metadata" (cf. chapter 3.15.1).

Element tag	<vimcox:administrative_tombstone_metadata>
Required	no
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified, texture-source, x3dsource, thumbnailsource

The specifications of the elements appellationValue, creator, date\_created, rights and date\_modified are in chapter 3.1.

#### 3.20.2.1 texturesource

Storage location of the image of a tombstone.

The element is specified in Chapter 3.7.1.1.

### 3.20.2.2 x3dsource

Storage location of the x3d file.  
The element is specified in Chapter 3.7.1.2.

### 3.20.2.3 thumbnailsource

Storage location of the thumbnail of a tombstone.  
The element is specified in Chapter 3.7.1.3.

## 3.20.3 descriptive\_tombstone\_metadata

This element is derived from the abstract class "descriptive\_metadata" (cf. chapter. 3.2).

Element tag	<vimcox:descriptive_tombstone_metadata>
Required	no
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type, production_method, lom_interaction

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.2.

### 3.20.3.1 production\_method

The production or manufacturing processes, techniques, and methods incorporated in the fabrication or alteration of the tombstone. [VRA 2007]  
The element is specified in Chapter 3.7.2.1.

### 3.20.3.2 lom\_interaction

Information about the lom interaction of a tombstone.  
The element is specified in Chapter 3.7.2.5.

## 3.21 Behavioral Metadata

### 3.21.0.3 user\_interaction

Stores a list of user-interaction behaviors, which will be assigned to a referenced object.

Element tag	<vimcox:behavior_type>
Subelements	ScaleBehavior, TranslationBehaviorXY, TranslationBehaviorXZ, RotationBehavior, FullrotationBehavior

### 3.21.0.4 scale\_behavior

Specifies the ScaleBehavior by defining the scale axis, number of steps which should be used to perform the scaling and a decremental/incremental scale value.

Element tag	<vimcox:scale_behavior_type>
Attributes	axis, steps, value

Enumeration for specifying a scale axis.

Element tag	<vimcox:scale_axis_type>
Type	String, Enumeration
Range	X, Y, Z, XY, XZ, YZ, XYZ

#### Example:

```
<vimcox:user_interaction_behavior>
  <vimcox:ScaleBehavior vimcox:axis="Z"
    vimcox:steps="5"
    vimcox:value="1"/>
</vimcox:user_interaction_behavior>
```

### 3.21.0.5 translation\_behavior

Specifies the TranslationBehavior by defining a 2D plane as reference for displacement. This element can be nested within TranslationBehaviorXY or TranslationBehaviorXZ.

Element tag	<vimcox:translation_behavior_type>
Subelements	sensor

Specifies a 2D plane for object displacement. Values can be varied to restrict movement. I.e. allowing translation only in vertical direction.

Element tag	<vimcox:sensor_parameter_type>
Subelements	sensorStart, sensorEnd

### 3.21.0.6 rotation\_behavior

Specifies the RotationBehavior by defining the axis of rotation and optional values for restricting the rotation angle (clamps rotation values between min/max values).

Element tag	<vimcox:rotation_behavior_type>
Attributes	axis, minAngle, maxAngle

Enumeration for specifying a rotation axis.

Element tag	<vimcox:rotation_axis_type>
Type	String, Enumeration
Range	X, Y, Z

#### Example:

```
<vimcox:user_interaction_behavior>
  <vimcox:RotationBehavior vimcox:axis="X"
  vimcox:minAngle="0" vimcox:maxAngle="-1"/>
  <vimcox:ScaleBehavior vimcox:axis="XY"
  vimcox:steps="2" vimcox:value="0.2"/>
  <vimcox:TranslationBehaviorXY>
    <vimcox:sensor>
      <vimcox:sensorStart>
        <vimcox:x>0</vimcox:x>
        <vimcox:y>0</vimcox:y>
      </vimcox:sensorStart>
      <vimcox:sensorEnd>
        <vimcox:x>5</vimcox:x>
```

```

        <vimcox:y>5</vimcox:y>
      </vimcox:sensorEnd>
    </vimcox:sensor>
  </vimcox:TranslationBehaviorXY>
</vimcox:user_interaction_behavior>

```

## 3.22 Outdoorarea Metadata

The Information about outdoorareas. The type "outdoorareas" is a listing of outdoorarea types, it is the root-Element of the outdoorarea metadata.

Element tag	<vimcox:outdoorarea>
Required	no
Repeatable	yes
Attributes	id
Subelements	administrative_outdoorarea_metadata, descriptive_outdoorarea_metadata

**id** Id of the resource. The element is specified in Chapter 3.4.1.

### Example:

```
<vimcox:outdoorarea vimcox:id="outdoor01"/>
```

### 3.22.1 administrative\_outdoorarea\_metadata

Information about the administrative metadata of a outdoorarea.

This element is derived from the abstract class "administrative\_metadata" (cf. chapter 3.1).

Element tag	<vimcox:administrative_outdoorarea_metadata>
Required	no
Repeatable	no
Sub elements	appellationValue, creator, date_created, rights, date_modified

The specifications of the elements appellationValue, creator, date\_created, rights and date\_modified are in chapter 3.1.

### 3.22.2 descriptive\_outdoorarea\_metadata

The element "descriptive\_outdoorarea\_metadata" contains the descriptive metadata of a building. This element is derived from the abstract class "descriptive\_metadata" (cf. chapter. 3.2).

Element tag	<vimcox:descriptive_doutdoorarea_metadata>
Required	no
Repeatable	no
Subelements	descriptiveNoteValue, creator, measurements, creation_date, objectCreationLocation, objectStyle, displayMaterialsTech, material_set, production_period, type, viewpoints, roads, background, landmarks, thresholds, exhibitionareas, terrainmodel

The specifications of the elements descriptiveNoteValue, creator, measurements, creation\_date, objectCreationLocation, objectStyle, displayMaterialsTech, material\_set, production\_period and type, are in chapter 3.2.

#### 3.22.2.1 viewpoints

The element "viewpoints" is a listing of multiple viewpoint types. The specification can be found in Chapter 3.5.2.4

#### 3.22.2.2 roads

Information about the roads of a outdoorarea. "roads" is a listing of multiple road types, it is the root-Element of the road metadata

Element tag	<vimcox:road>
Required	yes
Repeatable	yes
Subelements	road_width, texturesource, start_point, end_point, control_point, direction, middle_point

#### road\_width

Information about the size of a road.

Element tag	<vimcox:road_width>
Required	yes
Repeatable	no
Subelements	width

**width**

Information about the width.

The element is specified in Chapter 3.7.1.4.

**texturesource**

Storage location of the image of a road.

The element is specified in Chapter 3.7.1.1.

**start\_point**

Information about the startpoint of a road.

Element tag	<vimcox:start_point>
Required	yes
Repeatable	no
Subelements	x, z

**x, z**

Information about the x-axis, z-axis direction.

Element tag	<vimcox:x>, <vimcox:z>
Data Type	decimal
Required	yes
Repeatable	no

**end\_point**

Information about the endpoint of a road.

Element tag	<vimcox:end_point>
Required	yes
Repeatable	no
Subelements	x, z

**x, z**

Information about the x-axis, z-axis direction. 3.22.2.2.

### **control\_point**

Information about the center of a arcroad.

Element tag	<vimcox:control_point>
Required	no
Repeatable	no
Subelements	x, z

**x, z**

Information about the x-axis, z-axis direction. 3.22.2.2.

### **direction**

Information about direction of a arcroad.

Element tag	<vimcox:direction>
Data type	string
Required	no
Repeatable	no

### **middle\_point**



Information about the midpoint of a road.

Element tag	<vimcox:middle_point>
Required	no
Repeatable	no
Subelements	x, z

**x, z**

Information about the x-axis, z-axis direction. 3.22.2.2.

### Example:

```
<vimcox:road>
  <vimcox:road_width>
    <vimcox:width>3</vimcox:width>
  </vimcox:road_width>
  <vimcox:texturesource>C:\...\road.JPG</vimcox:texturesource>
  <vimcox:start_point>
    <vimcox:x>-127.484</vimcox:x>
    <vimcox:z>148.981</vimcox:z>
  </vimcox:start_point>
  <vimcox:end_point>
    <vimcox:x>-88.916</vimcox:x>
    <vimcox:z>103.019</vimcox:z>
  </vimcox:end_point>
  <vimcox:control_point>
    <vimcox:x>-78</vimcox:x>
    <vimcox:z>90</vimcox:z>
  </vimcox:control_point>
  <vimcox:direction>clockwise</vimcox:direction>
</vimcox:road>
```

### 3.22.2.3 background

Information about the backgroundtexture of a outdoorarea.

Element tag	<vimcox:background>
Required	yes
Repeatable	no
Subelements	back_texture, bottom_texture, front_texture, left_texture, right_texture, top_texture

**back\_texture, bottom\_texture, front\_texture, left\_texture, right\_texture, top\_texture**  
 Defines the path of the back, bottom, front, left, right and top textures of a background of a outdoorarea (SkyBox Textures).

Element tag	<vimcox:back_textur>, <vimcox:bottom_textur>, <vimcox:front_textur>, <vimcox:left_textur>, <vimcox:right_textur>, <vimcox:top_textur>
Data type	string
Required	no
Repeatable	no
Attribute	name

### name

Name or label of atexture. The specification is in chapter 3.3.2.2.

### Example:

```
<vimcox:background>
  <vimcox:back_texture>back.jpg</vimcox:back_texture>
  <vimcox:bottom_texture>bottom.jpg</vimcox:bottom_texture>
  <vimcox:front_texture>front.jpg</vimcox:front_texture>
  <vimcox:left_texture>left.jpg</vimcox:left_texture>
  <vimcox:right_texture>right.jpg</vimcox:right_texture>
  <vimcox:top_texture>top.jpg</vimcox:top_texture>
</vimcox:background>
```

#### 3.22.2.4 landmarks

Landmarks are geographic features like easily recognizable buildings, structures, monuments and so forth which allows eased navigation and orientation. landmarks is a listing of multiple

landmark types, it is the root-Element for landmark metadata.

Element tag	<vimcox:landmark>
Required	yes
Repeatable	yes
Attribute	id
Subelements	x3dsource, location_in_outdoor, rotation

### **x3dsource**

Storage location of the x3d file.

The element is specified in Chapter 3.7.1.2.

### **location\_in\_outdoor**

Information about the position of a landmark in outdoorarea.

Element tag	<vimcox:location_in_outdoor>
Required	yes
Repeatable	no
Subelements	x, y, z

### **x, y, z**

Information about the x-axis, y-axis, z-axis direction.

The specification is in chapter 3.3.2.6.

### **rotation**

Information about the orientation of a landmark in outdoorarea.

Element tag	<vimcox:rotation>
Required	yes
Repeatable	no
Subelements	x, y, z, angle

**angle**

Information about the rotationangle of a object.  
The element is specified in Chapter 3.5.2.4.

**x, y, z**

Information about the axis of rotation.  
The element is specified in Chapter 3.5.2.4.

**Example:**

```
<vimcox:landmark id="mainentrance">
  <vimcox:x3dsource>C:\Landmark\mainentrance.x3d</vimcox:x3dsource>
  <vimcox:location_in_outdoor>
    <vimcox:position>N</vimcox:position>
    <vimcox:x>-125.75</vimcox:x>
    <vimcox:y>0.01</vimcox:y>
    <vimcox:z>146.91</vimcox:z>
  </vimcox:location_in_outdoor>
  <vimcox:rotation>
    <vimcox:x>0</vimcox:x>
    <vimcox:y>1</vimcox:y>
    <vimcox:z>0</vimcox:z>
    <vimcox:angle>-0.698</vimcox:angle>
  </vimcox:rotation>
</vimcox:landmark>
```

**3.22.2.5 threshold**

Information about the thresholds/entrances of a outdoorarea. A threshold is a horizontal connection between rooms or outdoorareas and can be for example a door, teleporter or a gateway.

The element is specified in Chapter 3.5.2.5.

### 3.22.2.6 exhibitionareas

Information about a exhibitionarea of a outdoorarea. "exhibitionareas" is a listing of more exhibition area types, it is the root-Element of the exhibitionarea metadata

Element tag	<vimcox:exhibitionareas>
Required	yes
Repeatable	yes
Attribute	id
Subelements	location_in_outdoor, rotation, exhibitionarea_size, objects

#### id

Id of the resource.

The element is specified in Chapter 3.4.1.

#### location\_in\_outdoor

Information about the position of a exhibitionarea in outdoorarea.

The element is specified in Chapter 3.22.2.7.

#### rotation

Information about the orientation of a exhibitionarea in outdoorarea.

The element is specified in Chapter 3.22.2.7.

#### exhibitionarea\_size

Information about the size of a exhibition area.

Element tag	<vimcox:exhibitionarea_size>
Required	yes
Repeatable	no
Subelements	length, width

**length, width**

Information about the length and width.  
The element is specified in Chapter 3.2.3.

**objects**

Information/List of exhibits which are referenced in an exhibition area.

Element tag	<vimcox:objects>
Required	yes
Repeatable	no
Attribute	id
Subelements	location_in_outdoor, rotation

**id**

Id of the resource.  
The element is specified in Chapter 3.4.1.

**location\_in\_outdoor**

Information about the position of a object in exhibition area.  
The element is specified in Chapter 3.22.2.7.

**rotation**

Information about the orientation of a object in exhibitionarea area.  
The element is specified in Chapter 3.22.2.7.

**Example:**

```
<vimcox:exhibitionareas id="AREA1">  
  <vimcox:location_in_outdoor>
```

```
<vimcox:x>-75.86</vimcox:x>
<vimcox:y>-0.005</vimcox:y>
<vimcox:z>-27.26</vimcox:z>
</vimcox:location_in_outdoor>
<vimcox:rotation>
  <vimcox:x>0</vimcox:x>
  <vimcox:y>1</vimcox:y>
  <vimcox:z>0</vimcox:z>
  <vimcox:angle>-0.698</vimcox:angle>
</vimcox:rotation>
<vimcox:exhibitionarea_size>
  <vimcox:length>32</vimcox:length>
  <vimcox:width>20</vimcox:width>
</vimcox:exhibitionarea_size>
<vimcox:objects>
  <vimcox:object id="TOMBSTONE_1">
    <vimcox:location_in_outdoor>
      <vimcox:x>-76</vimcox:x>
      <vimcox:y>0.25</vimcox:y>
      <vimcox:z>-27</vimcox:z>
    </vimcox:location_in_outdoor>
    <vimcox:rotation>
      <vimcox:x>0</vimcox:x>
      <vimcox:y>1</vimcox:y>
      <vimcox:z>0</vimcox:z>
      <vimcox:angle>0.872</vimcox:angle>
    </vimcox:rotation>
  </vimcox:object>
</vimcox:objects>
</vimcox:exhibitionareas>
```

### 3.22.2.7 terrainmodel

Information about the default terrainmodel used in this outdoor area. The default model contains trees, benches, hills or mountains.

Element tag	<vimcox:terrainmodel>
Required	yes
Repeatable	no
Subelements	x3dsource, location_in_outdoor, rotation

### **x3dsource**

Storage location of the x3d file.  
The element is specified in Chapter 3.7.1.2.

### **location\_in\_outdoor**

Information about the position of the terrainmodel in outdoorarea.

Element tag	<vimcox:location_in_outdoor>
Required	yes
Repeatable	no
Subelements	x, y, z

### **x, y, z**

Information about the x-axis, y-axis, z-axis direction.  
The specification is in chapter 3.3.2.6.

### **rotation**

Information about the orientation of the terrainmodel in outdoorarea.

Element tag	<vimcox:rotation>
Required	yes
Repeatable	no
Subelements	x, y, z, angle

### **angle**



Information about the rotation angle of a object.  
The element is specified in Chapter 3.5.2.4.

**x, y, z**

Information about the axis of rotation.  
The element is specified in Chapter 3.5.2.4.

# Chapter 4

## Conclusion

With the creation and dissemination of virtual museums arise digital data containing the description of cultural objects. These must be stored in an appropriate data format. It serves to archive and reuse the data.

We have presented the metadata element set ViMCOX, which serves both the description of cultural objects and the description of virtual museums as a whole.

The defined metadata were transferred to a defined hierarchical data structure and an XML schema file. The XML schema has been implemented including the existing standards.

The XML Schema "vimcox-1.1.xsd" fulfills the following requirements:

- The structure of the XML schema is constructed in a hierarchical form.
- The XML schema is modular and is thus extensible at any time. The elements and content models are reusable.
- The elements of the XML schemas have a description.
- The defined necessary elements are the minimal set of elements of a virtual museum.
- The XML schema includes some elements from different XML schemas, making it interoperable with them.

Until now there was no metadata standard, which could describe a whole virtual museum. This specification defines the metadata standard ViMCOX, which can describe a complete virtual museum regarding exhibition design and layout. This includes a description of buildings, rooms, objects, user-interaction behaviors and outdoor areas of a museum.

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