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| --- |
|  |
| |  |  |  | | --- | --- | --- | | 75 | Date: | $date.get(‘MMMM YYYY’) | |
| Archetype Modeling Language (AML)  #set ($version = “0.5”)  #set($documentNo = “health/2014-10-01”)  Version: $version  **OMG Document Number: $documentNo**  **Standard document URL: http://www.omg.org/spec/AML/1.0**  Original File: N/A |

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**Preface**

**OMG**

Founded in 1989, the Object Management Group, Inc. (OMG) is an open membership, not-for-profit computer industry standards consortium that produces and maintains computer industry specifications for interoperable, portable, and reusable enterprise applications in distributed, heterogeneous environments. Membership includes Information Technology vendors, end users, government agencies, and academia.  
  
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• UML  
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**OMG Middleware Specifications**

• CORBA/IIOP  
• IDL/Language Mappings  
• Specialized CORBA specifications  
• CORBA Component Model (CCM)

**Platform Specific Model and Interface Specifications**

• CORBAservices  
• CORBAfacilities  
• OMG Domain specifications  
• OMG Embedded Intelligence specifications  
• OMG Security specifications

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The type styles shown below are used in this document to distinguish programming statements from ordinary English. However, these conventions are not used in tables or section headings where no distinction is necessary.

Times/Times New Roman - 10 pt.: Standard body text

**Helvetica/Arial - 10 pt. Bold: OMG Interface Definition Language (OMG IDL) and syntax elements.**

Courier - 10 pt. Bold: Programming language elements.

Helvetica/Arial - 10 pt : Exceptions

NOTE: Terms that appear in italics are defined in the glossary. Italic text also represents the name of a document, specification, or other publication.

# Scope

The objective of this RFP is to provide a standard for modeling Archetype Models (AMs) using UML, to support the representation of Clinical Information Modeling Initiative (CIMI) artifacts in UML. Archetypes are Platform Independent Models (PIMs), which are developed as a set of constraints on a specific Reference Model (RM).

The goal of the Archetype Modeling Language (AML) is to provide a common approach to modeling Archetype Models (AMs) using UML, thereby supporting the representation of Clinical Information Modeling Initiative (CIMI) artifacts in UML. Archetypes are Platform Independent Models (PIMs), which are specified by applying a set of constraints on a specific Reference Model (RM).

AML is specified as a UML Profile comprised of three sub-profiles, which collectively meet the requirements of archetype modeling:

* *Reference Model Profile (RMP)*: Enables the specification of reference models upon which archetypes can be based.
* *Constraint Model Profile (CMP)*: Supports the specification of constraints on a given reference model, to enable the development of archetypes, including Clinical Information Models (CIMs).
* *A Terminology Binding Profile (TBP)*: Supports the binding of information models to terminology[, with optional support for binding to CTS2] [TBR]. Terminology bindings include:
  1. *Value Bindings*: Support linking the data model to value domains, which restrict the valid value of an attribute to a set of values that corresponds to a set of meanings recorded in an external terminology;
  2. *Semantic Bindings:* Define the meaning of model elements, using concepts in an external terminology; and
  3. *Constraint Bindings:* Specify constraints on the information model, using concepts and relationships defined in an external terminology.

This set of UML sub-profiles enables the specification of CIMI clinical model content (using the CIMI Reference Model), and the generation of CIMI clinical model artifacts, such as the Archetype Definition Language (ADL). While the transformation of AML models to an instance of the Archetype Object Model v1.5 (AOM-1.5) is optional, this transformation must be possible. The Archetype Definition Language (ADL) is a serialization of the Archetype Object Model.

# Conformance

[TBD – After completion of Sections 7 and 8.]

# Normative References

The following normative documents contain provisions which, through reference in this text, constitute provisions of this specification. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply.

NOTE 1: The openEHR references have invalid hyperlinks – openEHR was moved from an SVN repository to GitHub – correction of references is in progress.

NOTE 2: Required versions of some references were not specified in the RFP.

[ADL] openEHR *Archetype Definition Language Version 1.4 (ADL)*, <http://www.openehr.org/releases/1.0.2/architecture/am/adl.pdf>

[AOM] openEHR *Archetype Object Model* (corresponding to ADL version 1.4), <http://www.openehr.org/releases/1.0.2/architecture/am/aom.pdf>

[AOMT] openEHR Archetype Templates, <http://www.openehr.org/svn/specification/TRUNK/publishing/architecture/am/tom.pdf>

[ARCH] openEHR *Archetypes: Constraint-based Domain Models for Future-proof Information Systems*, <http://www.openehr.org/publications/archetypes/archetypes_beale_oopsla_2002.pdf>

[CIMI] CIMI Reference Model Requirements, <http://informatics.mayo.edu/CIMI/index.php/CIMI_Reference_Model_Requirements>

[CTS2] OMG *Common Terminology Service 2 (CTS2)*, <http://www.omg.org/spec/CTS2/1.1/>

[HLV7v3] *HL7 Version 3 Standard: Core Principles and Properties of Version 3 Models*, <http://www.hl7.org/implement/standards/product_brief.cfm?product_id=58>

[MDMI] OMG *Model Driven Message Interoperability (MDMI), Version 1.0*, <http://www.omg.org/spec/MDMI/1.0/>

[MDR] *ISO/IEC 11179, Information Technology, -- Metadata registries*, <http://metadata-standards.org/11179/>

[NIEM] OMG *UML Profile for NIEM Version 1.0*, <http://www.omg.org/spec/NIEM-UML/1.0/>

[OCL] OMG *Object Constraint Language (OCL), Version 2.4*, <http://www.omg.org/spec/OCL/2.4/>

[ODM] OMG *Ontology Definition Metamodel (ODM) Version 1.1*, <http://www.omg.org/spec/ODM/1.1/>

[QVT] OMG *Meta Object Facility (MOF) 2.0 Query/View/Transformation, V1.2 (Beta)*, <http://www.omg.org/spec/QVT/1.2/Beta/>

[UML] OMG Unified Modeling Language (UML) Version 2.5 – Beta 2, <http://www.omg.org/spec/UML/2.5/Beta2/>

# Terms and Definitions

For the purposes of this specification, the following terms and definitions apply.

Archetype

An archetype is a re-usable, formal model of a concept. An archetype is expressed as a computable set of constraint statements, on an underlying reference model (URM). Concepts that can be modeled using archetypes include weight measurement, blood pressure, microbiology results, discharge referral, prescription, diagnosis. CIMI archetypes will be represented as an instance of the ‘Archetype Object Model’.

Archetype Definition Language

ADL is a formal language for expressing archetypes. It provides a formal, textual syntax for describing constraints on any domain entity whose data is described by an information model (also known as the 'underlying reference model'). The ADL syntax is semantically equivalent to the AOM, and represents one possible serialisation of the AOM. The current version of ADL is known as 'ADL 1.5'.

Archetype Instance

A single instantiation of data conforming to a specific archetype. In the context of CIMI this data will typically be clinical.

Archetype Model

An archetype model [TBD].

Archetype Object Model

The AOM is the definitive expression of archetype semantics, and is independent of any particular syntax. The AOM is defined as an object model, using a UML class diagram. It is a generic model, meaning that it can be used to express archetypes for any reference model in a standard way. Version 1.4 of the AOM was standardized in ISO-13606:2. The current version is known as 'AOM 1.5'.

Archetype Query Language

Archetype Query Language (AQL) is a declarative query language developed specifically for expressing queries used for searching and retrieving the clinical data found in archetype-based EHRs. AQL expresses the queries at the archetype level, i.e. semantic level, other than at the data instance level. This is the key in achieving sharing queries across system boundaries or enterprise boundaries.

Clinical Data Repository

A data store that holds and manages clinical data collected from service encounters at the point-of-service locations, for example: hospitals, clinics, etc.

Clinical Document Architecture

The HL7 Clinical Document Architecture (CDA) is an XML-based markup standard intended to specify the encoding, structure and semantics of clinical documents for exchange.

Clinical Information Model

A representation of the structured clinical information (including relationships, constraints and terminology), that describes a specific clinical concept - e.g. a blood pressure observation, a Discharge Summary, or a Medication Order.

Clinical Information Modeling Initiative

An initiative established to “improve the interoperability of healthcare information systems through shared implementable clinical information models.”

Clinical Information Modeling Initiative (CIMI) Reference Model

The CIMI Reference Model is the Underlying Reference Model on which CIMI's clinical models (i.e. archetypes) are defined. This reference model defines a rigorous and stable set of modeling patterns, including a set of complex data types, information patterns (e.g. data, qualifier, state), and structural patterns (e.g. composition, entry, tree). All CIMI clinical models (i.e. archetypes) will be defined by constraining the CIMI reference model. The reference model is intended to be instantiated with patient data, which conforms to the constraints defined by the associated clinical model.

Clinical Model Governance

A set of policies and processes through which the high clinical quality of all clinical artifacts (including clinical models and-or archetypes) is maintained during creation, storage, verification, maintenance, and distribution, by, for and on behalf of CIMI.

Clinical Model Repository

A clinical model repository is a data store that holds clinical information models and associated artifacts in an agreed sharable format.

Clinical Model Verification

Clinical model verification is the act of reviewing, inspecting or testing, in order to establish that a specification meets appropriate clinical safety and quality standards.

Clinical Modeling Language

A clinical modeling language is used to define clinical information models.

Clinical Requirement

Clinical requirements articulate clinical needs, including clinical practices, standards, guidelines, principles and other clinical concepts.

Code System

A managed collection of uniquely identifiable concepts with associated representations. A code system may also form an ontological system for representing a set of concepts, e.g. SNOMED-CT, LOINC, ICD-10, etc.

Common Terminology Services 2 (CTS2)

CTS2 is an OMG specification that provides a standard interface to disparate terminology sources. The Information Model specifies the structural definition, attributes and associations of Resources common to structured terminologies such as Code Systems, Binding Domains and Value Sets. The Computational Model specifies the service descriptions and interfaces needed to access and maintain structured terminologies.

Concept

In information modeling, a concept represents an “idea” as a word or phrase in order to support human understanding, but may also be represented with a concept identifier in order to bind it to a controlled terminology or ontology.

Concept Domain

A named category of like concepts that will be bound to one or more coded elements in an information model. Concept Domains exist to constrain the intent of the coded element and are independent of any specific vocabulary, code system, or Realm. A Concept Domain provides a high level grouping for all things possible in a given domain from which value sets will be constructed.

Concept Domain Binding

The association of a value set with a concept domain in a given context.

Conceptual Information Model

A representation of real-world objects and their relationships and constraints as understood by domain experts. A conceptual model should include no implementation-specific details.

Conformance

The requirement that those who participate in CIMI by contributing data components or creating and sharing ADL artifacts are following the agreed-upon procedures for doing so and that all documentation meets minimum criteria and the CIMI Naming and Design Rules where applicable.

Constraint Model

A formal specification used for describing constraints on an Underlying Reference Model. The Constraint Model is used to express clinical information models (i.e. archetypes). Not to be confused with the clinical information models that are instances of the constraint model.

Detailed Clinical Model

A relatively small, standalone information model designed to express a precise clinical concept in a standardized and reusable manner.

Fully Defined Concept

A concept that is uniquely defined by a set of defining relationships.

Information Model

A structured representation of the information requirements of a domain including the classes of information required and their attributes, relationships and constraints.

Node

A named part of an information model.

Ontology

A formal representation of knowledge as a set of concept identifiers, terms describing the concepts so identified, and the relationships among them.

Reference Model

A Reference Model is an information model which defines a set of modelling patterns upon which the clinical models are defined.

Reference Terminology

A terminology designed to provide common semantics for diverse implementations.

Semantic Binding

The association of a node in an information model with a concept from a controlled terminology that represents its meaning.

Terminology

A vocabulary of technical terms used in a particular field, subject, science, or art.

Terminology Binding

The assertion of a relationship between an information model and a terminology.

Value Binding

The association of a given node in a clinical model with the set of valid concepts that may populate it.

Value Set

A set of concept identifiers deemed valid for use in a specific context, especially to define the domain of a data element.

# Symbols

## Graphical Symbols

[TBD]

## Abbreviations

ADL Archetype Definition Language

AM Archetype Model

AML Archetype Modeling Language

AOM Archetype Object Model

AQL Archetype Query Language

CDA Clinical Document Architecture

CDL Clinical Document Language

CDR Clinical Data Repository

CIM Clinical Information Model

CIMI Clinical Information Modeling Initiative

CMP Constraint Model Profile

CRM Clinical Reference Model

CTS2 Common Terminology Services 2

EHR Electronic Health Record

HL7 Health Level Seven

LOINC Logical Observation Identifiers Names and Codes

MDA Model Driven Architecture

OMG Object Management Group

OpenEHR Open Electronic Health Record

PIM Platform Independent Model

PSM Platform Specific Model

RM Reference Model

RMP Reference Model Profile

SNOMED CT Systematized Nomenclature of Medicine – Clinical Terms

TBP Terminology Binding Profile

UML Unified Modeling Language

URI Uniform Resource Identifier

URM Underlying Reference Model

# Additional Information

## Changes to Adopted OMG Specifications

No changes to adopted OMG specifications are required to adopt this specification.

## 

## 6.2 Acknowledgements

The following companies submitted this specification:

1. Mayo Clinic
2. Visumpoint, LLC

The following companies supported this specification:

1. Escape Velocity, LLC

The following companies and organizations provided assistance aiding the development of this specification.

1. Intermountain Health [TBR]
2. The openEHR Foundation

#import('js', 'com.nomagic.reportwizard.tools.script.JavaScriptTool')#import("query", "com.nomagic.reportwizard.tools.QueryTool")#import('text', 'com.nomagic.reportwizard.tools.TextTool')#set($printedEnums = $array.createArray())#set($printedInterfaces = $array.createArray())#set($printedClasses = $array.createArray())#set($printedDataTypes = $array.createArray())#set($printedStereoTypes = $array.createArray())#set($level = 0)#foreach ($pkg in $packageScope) #packageList($pkg, 1)#end#macro (writeText $txt)#set($txt1 = $text.html($txt)) $txt1#end#macro (writeBookmark1 $obj1 $dp1 $withNum)#if($withNum == “true”)

# $bookmark.create($obj1.ID, $dp1)

#else

# $bookmark.create($obj1.ID, $dp1)

#end#end#macro (writeHeader1 $dp2 $withNum)#if($withNum == “true”)

# $dp2

#else

# $dp2

#end#end#macro (writeBookmark2 $obj2 $dp3 $withNum)#if($withNum == “true”)

## $bookmark.create($obj2.ID, $dp3)

#else

## $bookmark.create($obj2.ID, $dp3)

#end#end#macro (writeHeader2 $dp4 $withNum)#if($withNum == “true”)

## $dp4

#else

## $dp4

#end#end#macro (writeBookmark3 $obj3 $dp5 $withNum)#if($withNum == “true”)

### $bookmark.create($obj3.ID, $dp5)

#else

### $bookmark.create($obj3.ID, $dp5)

#end#end#macro (writeHeader3 $dp6 $withNum)#if($withNum == “true”)

### $dp6

#else

### $dp6

#end#end#macro (writeBookmark4 $obj4 $dp7 $withNum)#if($withNum == “true”)

#### $bookmark.create($obj4.ID, $dp7)

#else

#### $bookmark.create($obj4.ID, $dp7)

#end#end#macro (writeHeader4 $dp8 $withNum)#if($withNum == “true”)

#### $dp8

#else

#### $dp8

#end#end#macro (writeBookmark5 $obj45 $dp75 $withNum)#if($withNum == “true”)

##### **$bookmark.create($obj45.ID, $dp75)**

#else

#### $bookmark.create($obj45.ID, $dp75)

#end#end#macro (writeHeader5 $dp55 $withNum)#if($withNum == “true”)

##### **$dp55**

#else

#### $dp55

#end#end#macro (writeBookmark $obj4 $dp7 $withNum)#if($withNum == “true”)

1. **$bookmark.create($obj4.ID, $dp7)**

#else

**$bookmark.create($obj4.ID, $dp7)**

#end#end#macro (writeHeader $dp8 $withNum)#if($withNum == “true”)

1. **$dp8**

#else

**$dp8**#end#end#macro (writeListItem $dp9)

* **$dp9**#end

#macro (writeCode $code)

$code#end

## MACRO printAttr

#macro(printAttr $att)

**• $att.visibility $att.name#if($att.type) : #if($js.eval(‘(typeQN.indexOf(“UML Standard Profile”) != -1)’, ‘typeQN’, $att.type.qualifiedName))$att.type.name#else$bookmark.open($att.type.ID, $att.type.name)#end #end#if($att.multiplicity != “”) [$att.multiplicity]#end#if($att.defaultValue) = $att.defaultValue.text#end**

#if($att.documentation != “”)#writeText($att.documentation)#end#end

## MACRO printOper

#macro(printOper $oper)#set($paramLists = $oper.ownedParameter)#set($size = 0)#foreach($p in $paramLists)#if($p.direction != “return”)#set($size = $size +1)#end#end#set($i = 1)

**• $oper.visibility $oper.name (#foreach($param in $paramLists)#if($param.direction != “return”)$param.name#if($param.type) : #if($js.eval(‘(typeQN.indexOf(“UML Standard Profile”) != -1)’, ‘typeQN’, $param.type.qualifiedName))$param.type.name#else $bookmark.open($param.type.ID, $param.type.name)#end#end#if($param.multiplicity != “”) [$param.multiplicity]#end#if($param.defaultValue) = $param.defaultValue.text#end#if($size != $i), #end#set($i = $i + 1)#end#end)#if($oper.type) : #if($js.eval(‘(typeQN.indexOf(“UML Standard Profile”) != -1)’, ‘typeQN’, $oper.type.qualifiedName))$oper.type.name#else $bookmark.open($oper.type.ID, $oper.type.name)#end#end#if($oper.hasTypeModifier() && $oper.typeModifier != “”)$oper.typeModifier#end**

#if($oper.documentation != “”)#writeText($oper.documentation)#end#end

#macro(printAsso $attribute $association $object)#foreach($member in $association.memberEnd)#if($member.type != $object)#set($memberEnd = $member)#end#end

**• $memberEnd.visibility#if($attribute.name != “”) $attribute.name#end#if($memberEnd.type) : #if($js.eval(‘(typeQN.indexOf(“UML Standard Profile”) != -1)’, ‘typeQN’,$memberEnd.type.qualifiedName))$memberEnd.type.name#else$bookmark.open($memberEnd.type.ID,$memberEnd.type.name)#end#end#if($memberEnd.multiplicity !=“”)[$memberEnd.multiplicity]#end#if($memberEnd.defaultValue) = $memberEnd.defaultValue.text#end**

#if($association.documentation)#writeText($association.documentation)#end#if($memberEnd.documentation != “”) #writeText($memberEnd.documentation) #end#end

#macro (writeHeading $object $disp $isBookmark $headingLevel $headType $withNumbering)#if($headType != “”)#set($disp = “<$headType> $disp”)#end#if($headingLevel == 1)#if($isBookmark == “true”)#writeBookmark1($object $disp $withNumbering)#else#writeHeader1($disp $withNumbering)#end#elseif($headingLevel == 2)#if($isBookmark == “true”)#writeBookmark2($object $disp $withNumbering)#else #writeHeader2($disp $withNumbering)#end#elseif($headingLevel == 3)#if($isBookmark == “true”)#writeBookmark3($object $disp $withNumbering)#else#writeHeader3($disp $withNumbering)#end#elseif($headingLevel == 4)#if($isBookmark == “true”)#writeBookmark4($object $disp $withNumbering)#else#writeHeader4($disp $withNumbering)#end#elseif($headingLevel == 5)#if($isBookmark == “true”)#writeBookmark5($object $disp $withNumbering)#else#writeHeader5($disp $withNumbering)#end #else#if($isBookmark == “true”)#writeBookmark($object $disp $withNumbering)#else#writeHeader($disp $withNumbering)#end#end#end#macro(findNestedElement $object)#set($innerElement = $report.getInnerElement($object))#foreach($nested in $innerElement)#if($nested.elementType != “package” && $nested.elementType != “model” && $nested.elementType != “profile” )#if($nested.elementType == “interface”)#set($tmp = $nestedInterface.add($nested))#elseif($nested.elementType == “class”)#set($tmp = $nestedClass.add($nested))#elseif($nested.elementType == “enumeration”)#set($tmp = $nestedEnum.add($nested))#elseif($nested.elementType == “datatype”)#set($tmp = $nestedDataTypes.add($nested))#elseif($nested.elementType == “stereotype”)#set($tmp = $nestedStereoTypes.add($nested))#end#set($in = $report.getInnerElement($nested))#if($in.size() > 0)#findNestedElement($nested)#end#end#end#end

## MACRO packageList

#macro (packageList, $parentPackage, $plevel)#set($packageInterface = $array.createArray())#set($packageClass = $array.createArray())#set($packageEnum = $array.createArray())#set($packageDataTypes = $array.createArray())#set($packageStereoTypes = $array.createArray())#set($nestedInterface = $array.createArray())#set($nestedClass = $array.createArray())#set($nestedEnum = $array.createArray())#set($nestedDataTypes = $array.createArray())#set($nestedStereoTypes = $array.createArray())#if(($parentPackage.elementType ==“package”)||($parentPackage.elementType == “profile”))#foreach($element in $parentPackage.ownedElement)#if($element.elementType == “interface”)#set($tmp = $packageInterface.add($element))#set($inner = $report.getInnerElement($element))#if($inner.size() > 0)#findNestedElement($element)#end#elseif($element.elementType == “class”)#set($tmp = $packageClass.add($element))#set($inner = $report.getInnerElement($element))#if($inner.size() > 0)#findNestedElement($element)#end#elseif($element.elementType == “enumeration”)#set($tmp = $packageEnum.add($element))#set($inner = $report.getInnerElement($element))#if($inner.size() > 0)#findNestedElement($element)#end#elseif($element.elementType == “datatype”)#set($tmp = $packageDataTypes.add($element))#set($inner = $report.getInnerElement($element))#if($inner.size() > 0)#findNestedElement($element)#end#elseif($element.elementType == “stereotype”)#set($tmp = $packageStereoTypes.add($element))#set($inner = $report.getInnerElement($element))#if($inner.size() > 0)#findNestedElement($element)#end#end#end#end#set($tmp = $array.addCollection($packageInterface, $nestedInterface))#set($tmp = $array.addCollection($packageClass, $nestedClass))#set($tmp = $array.addCollection($packageEnum, $nestedEnum))#set($tmp = $array.addCollection($packageDataTypes, $nestedDataTypes))#set($tmp = $array.addCollection($packageStereoTypes, $nestedStereoTypes))#set($diagramList = $array.createArray())#foreach($d in $sorter.humanSort($parentPackage.ownedDiagram))#if(($d.diagramType == “Class Diagram”)|| ($d.diagramType == “Profile Diagram”) ||($d.diagramType == “Package Diagram”))#set($tmp = $diagramList.add($d))#end#end#if($parentPackage != $project.model)#set($displayTitle = $js.eval(‘pkgname.replace(/[0-9\.]\s\*/gi, “”)’, ‘pkgname’, $parentPackage.name))#if($js.eval(‘(pkgn.charAt(0) > “7”)&&(pkgn.indexOf(“.”) != -1)’, ‘pkgn’, $parentPackage.name))#writeHeading($displayTitle, $displayTitle, “false”, $plevel, “Package”, “true”)#else#writeHeading($displayTitle, $displayTitle, “false”, $plevel, “”, “true”) #end#if($parentPackage.documentation != “”)#writeText($parentPackage.documentation)#end

#printDiagrams($diagramList $plevel)

#end#set ($subPackages = $parentPackage.nestedPackage)#foreach ($pkg in $sorter.humanSort($subPackages))

#if ($plevel == 1)#packageList($pkg, 2)#elseif($plevel == 2)#packageList($pkg, 3)#elseif($plevel == 3)#packageList($pkg, 4)#else#packageList($pkg, 5)#end#end#end

##MACRO printDiagrams

#macro (printDiagrams $pkgdiagrams $diagIndent)#if($pkgdiagrams)#if($pkgdiagrams.size() > 0)#foreach($diag in $sorter.humanSort($pkgdiagrams))

$image.setWidth($diag.image, -2)

**$bookmark.create($diag.ID, $js.eval(‘ename.replace(/[0-9\.]\s\*/gi, “”)’, ‘ename’, $diag.name))**

#if($diag.documentation != “”)#writeText($diag.documentation)#end #set($diagramElements = $array.createArray()) #set($diagramElements = $report.getDiagramElements($diag)) #set($interfaceLists = $array.createArray()) #set($classLists = $array.createArray()) #set($enumLists = $array.createArray()) #set($dataTypesLists = $array.createArray()) #set($stereoTypesLists = $array.createArray())#foreach($element in $diagramElements)#if($element.elementType == “interface”)#set($tmp = $interfaceLists.add($element))#set($tmp = $packageInterface.remove($element))#elseif($element.elementType == “class”)#set($tmp = $classLists.add($element))#set($tmp = $packageClass.remove($element))#elseif($element.elementType == “datatype”)#set($tmp = $dataTypesLists.add($element))#set($tmp = $packageDataTypes.remove($element))#elseif($element.elementType == “stereotype”)#set($tmp = $stereoTypesLists.add($element))#set($tmp = $packageStereoTypes.remove($element))#elseif($element.elementType == “enumeration”)#set($tmp = $enumLists.add($element))#set($tmp = $packageEnum.remove($element))#end#end#if($dataTypesLists.size() > 0)#set($knownDataTypes = $array.createArray())#foreach($dtp in $sorter.humanSort($dataTypesLists))#if(!$printedDataTypes.contains($dtp))#set($tmp = $printedDataTypes.add($dtp))#createCommonContent($dtp, “DataType”, $diagIndent)#else#set($tmp = $knownDataTypes.add($dtp))#end#end#if($knownDataTypes.size() > 0) #writeHeading($knownDataTypes, “Known other Data Types”, “false”, 6, “”, “false”) #set($size = $knownDataTypes.size())#foreach($e in $knownDataTypes)$bookmark.open($e.ID, $e.name)#if($size != $velocityCount), #end#end#end#end#if($interfaceLists.size() > 0)#set($knownInterface = $array.createArray())#foreach($interface in $sorter.humanSort($interfaceLists))#if(!$printedInterfaces.contains($interface))#set($tmp = $printedInterfaces.add($interface))#createCommonContent($interface, “Interface” , $diagIndent)#else#set($tmp = $knownInterface.add($interface))#end#end#if($knownInterface.size() > 0)#writeHeading($knownInterface, “Known other interfaces” , “false”, 6, “”, “false”)#set($size = $knownInterface.size())#foreach($i in $knownInterface)$bookmark.open($i.ID, $i.name)#if($size != $velocityCount), #end#end#end#end#if($classLists.size() > 0)#set($knownClass = $array.createArray())#foreach($class in $sorter.humanSort($classLists))#if(!$printedClasses.contains($class))#set($tmp = $printedClasses.add($class))#createCommonContent($class, “Class” , $diagIndent)#else#set($tmp = $knownClass.add($class))#end#end#if($knownClass.size() > 0)#writeHeading($knownClass, “Known other classes” , “false”, 6, “”, “false”)#set($size = $knownClass.size())#foreach($c in $knownClass)$bookmark.open($c.ID,$c.name)#if($size != $velocityCount), #end#end#end#end#if($enumLists.size() > 0)#set($knownEnum = $array.createArray())#foreach($enum in $sorter.humanSort($enumLists))#if(!($printedEnums.contains($enum)))#set ($tmp = $printedEnums.add($enum))#createEnumerationContent($enum, $diagIndent)#else#set($tmp = $knownEnum.add($enum))#end#end#if($knownEnum.size() > 0)#writeHeading($knownEnum, “Known other enumerations” , “false”, 6, “”, “false”)#set($size = $knownEnum.size())#foreach($e in $knownEnum)$bookmark.open($e.ID, $e.name)#if($size != $velocityCount), #end#end#end#end#if($stereoTypesLists.size() > 0)#set($knownStereoTypes = $array.createArray())#foreach($stp in $sorter.humanSort($stereoTypesLists))#if(!$printedStereoTypes.contains($stp))#set($tmp = $printedStereoTypes.add($stp))#createCommonContent($stp, “Stereotype” , $diagIndent)#else#set($tmp = $knownStereoTypes.add($stp))#end#end#if($knownStereoTypes.size() > 0)#writeHeading($knownStereoTypes, “Known other Stereotypes” , “false”, 6, “”, “false”)#set($size = $knownStereoTypes.size())#foreach($e in $knownStereoTypes)$bookmark.open($e.ID,$e.name)#if($size != $velocityCount), #end#end #end#end#end#if($packageDataTypes.size() > 0)#set($knownDataType = $array.createArray())#foreach($dtp in $sorter.humanSort($packageDataTypes))#if(!$printedDataTypes.contains($dtp))#set($tmp = $printedDataTypes.add($dtp))#createCommonContent ($dtp, “DataType” , $diagIndent)#else#set($tmp = $knownDataType.add($dtp))#end#end#if($knownDataType.size() > 0)#writeHeading($knownDataType, “Known other Data Types” , “false”, 6, “”, “false”)#set($size = $knownDataType.size())#foreach($i in $knownDataType)$bookmark.open($i.ID,$i.name)#if($size != $velocityCount), #end#end#end#end#if($packageInterface.size() > 0)#set($knownInterface = $array.createArray())#foreach($interface in $sorter.humanSort($packageInterface))#if(!$printedInterfaces.contains($interface))#set($tmp = $printedInterfaces.add($interface))#createCommonContent($interface, “Interface” , $diagIndent)#else#set($tmp = $knownInterface.add($interface))#end#end#if($knownInterface.size() > 0)#writeHeading($knownInterface, “Known other interfaces” , “false”, 6, “”, “false”)#set($size = $knownInterface.size())#foreach($i in $knownInterface)$bookmark.open($i.ID, $i.name)#if($size != $velocityCount), #end#end#end#end#if($packageClass.size() > 0)#set($knownClass = $array.createArray())#foreach($class in $sorter.humanSort($packageClass))#if(!$printedClasses.contains($class))#set($tmp = $printedClasses.add($class))#createCommonContent($class, “Class” , $diagIndent)#else#set($tmp = $knownClass.add($class))#end#end#if($knownClass.size() > 0)#writeHeading($knownClass, “Known other classes” , “false”, 6, “”, “false”)#set($size = $knownClass.size())#foreach($c in $knownClass)$bookmark.open($c.ID, $c.name)#if($size != $velocityCount), #end#end#end#end#if($packageEnum.size() > 0)#set($knownEnum = $array.createArray())#foreach($enum in $sorter.humanSort($packageEnum))#if(!$printedEnums.contains($enum))#set($tmp = $printedEnums.add($enum))#createEnumerationContent($enum, $diagIndent)#else#set($tmp = $knownEnum.add($enum))#end#end#if($knownEnum.size() > 0)#writeHeading($knownEnum, “Known other enumerations” , “false”, 6, “”, “false”)#set($size = $knownEnum.size())#foreach($e in $knownEnum)$bookmark.open($e.ID, $e.name)#if($size != $velocityCount), #end#end#end#end#if($packageStereoTypes.size() > 0)#set($knownStereoType = $array.createArray())#foreach($stp in $sorter.humanSort($packageStereoTypes))#if(!$printedStereoTypes.contains($stp))#set($tmp = $printedStereoTypes.add($stp))#createCommonContent($stp, “Stereotype” , $diagIndent)#else#set($tmp = $knownStereoType.add($stp))#end#end#if($knownStereoType.size() > 0)#writeHeading($knownStereoType, “Known other Stereotypes” , “false”, 6, “”, “false”)#set($size = $knownStereoType.size())#foreach($i in $knownStereoType)$bookmark.open($i.ID,$i.name)#if($size != $velocityCount), #end#end#end#end#end#end#end

##MACRO createEnumerationContent

#macro(createEnumerationContent $enum $ind) #set($indent = $ind + 1)#writeHeading($enum, $enum.name, “true”, $indent, “Enumeration”, “true”)#if($enum.documentation != “”)#writeHeading($enum, “Description”, “false”, 6, “”, “false”)#writeText($enum.documentation) #end#set($allDiagrams = $project.getDiagrams())#set($pas = $enum.presentationElement)#set($size = $pas.size())#if($pas.size() > 0)#set($diagramList = $array.createArray())

#foreach($pa in $pas) #set($entry = $pa.diagramPresentationElement.name) #if(!$diagramList.contains($entry))#set($tmp = $diagramList.add($entry)) #end #end#end#if($diagramList.size() > 0)#writeHeading($diagramList, “Diagrams”, “false”, 6, “”, “false”)#foreach($diag1 in $diagramList)#set($targetDiag = $report.findElementByName($allDiagrams, $diag1))#if ($targetDiag.size() > 0)$bookmark.open($targetDiag.get(0).ID, $js.eval(‘ename.replace(/[0-9\.]\s\*/gi, “”)’, ‘ename’, $diag1))#end#if($size != $velocityCount), #end#end#end#set($enumLiterals = $enum.ownedLiteral)#if($enumLiterals.size() > 0) #writeHeading($implementInterface “Enumeration Literals”, “false”, 6, “”, “false”)#foreach($enumLit in $sorter.humanSort($enumLiterals)) #writeListItem($enumLit.name)#if($enumLit.documentation != “”)#writeText($enumLit.documentation)#end#end #end #end

## MACRO createCommonContent

#macro(createCommonContent $umlType $typeName $ind) #set($indent = $ind + 1)#writeHeading($umlType, $umlType.name, “true”, $indent, $typeName, “true”)#if($umlType.documentation != “”)#writeHeading($umlType, “Description”, “false”, 6, “”,“false”)#writeText($umlType.documentation)#end#set($allDiagrams = $project.getDiagrams())#set($pas = $umlType.presentationElement)#set($size = $pas.size())#if($pas.size() > 0)#set($diagramList = $array.createArray())#foreach($pa in $pas) #set($entry =$pa.diagramPresentationElement.name)#if(!$diagramList.contains($entry))#set($tmp = $diagramList.add($entry)) #end #end#end#if($diagramList.size() > 0)#writeHeading($diagramList “Diagrams”, “false”, 6, “”, “false”)#foreach($diag1 in $sorter.humanSort($diagramList))#set($targetDiag = $report.findElementByName($allDiagrams, $diag1))#if ($targetDiag.size() > 0)$bookmark.open($targetDiag.get(0).ID, $js.eval(‘ename.replace(/[0-9\.]\s\*/gi, “”)’, ‘ename’, $diag1))#end#if($size != $velocityCount), #end#end#end#if (($typeName != “DataType”)&&($typeName != “Interface”))#set($implementInterface = $umlType.realizedInterface)#set($size = $implementInterface.size())#if($implementInterface.size() > 0)#writeHeading($implementInterface “Implemented Interface”, “false”, 6, “”, “false”)#foreach($interface in $sorter.humanSort($implementInterface))$bookmark.open($interface.ID,$interface.name)#if($size != $velocityCount), #end#end#end#end#set($baseClassifier = $umlType.baseClassifier)#set($size = $baseClassifier.size())#if($baseClassifier.size() > 0)#writeHeading($baseClassifier, “Direct Known Superclasses (Generalization)”, “false”, 6, “”, “false”)#foreach($bclass in $sorter.humanSort($baseClassifier))$bookmark.open($bclass.ID, $bclass.name)#if($size !=$velocityCount), #end#end#end#set($specClassifier = $umlType.specificClassifier)#set($size = $specClassifier.size())#if($specClassifier.size() > 0)#writeHeading($specClassifier, “Direct Known Subclasses (Specialization)”, “false”, 6, “”, “false”)#foreach($sclass in $sorter.humanSort($specClassifier))$bookmark.open($sclass.ID, $sclass.name)#if($size !=$velocityCount), #end#end#end#set($allAtt= $array.createArray())#foreach($a in $umlType.ownedAttribute)#if(!$a.association) #set($tmp = $allAtt.add($a)) #end #end#if($allAtt.size() > 0)#writeHeading($allAtt, “Attributes”, “false”, 6, “”, “false”)#foreach($att in $allAtt)#if(!$att.association)#printAttr($att)#end#end#end#set($allOper = $umlType.ownedOperation)#if($allOper.size() > 0)#writeHeading($allOper, “Operations”, “false”, 6, “”, “false”)#foreach($oper in $allOper) #printOper($oper)#end#end

#set($associationLists = $array.createArray())#foreach($attribute in $umlType.ownedAttribute)#if($attribute.association)#set($tmp=$associationLists.add($attribute.association))#end#end#if($associationLists.size() > 0)#writeHeading($associationLists, “Associations”, “false”, 6, “”, “false”)

#foreach($attribute in $umlType.ownedAttribute) #if($attribute.association) #set($association = $attribute.association) #printAsso($attribute, $association, $umlType)#end #end #end

#set($rules = $array.createArray())#foreach($rule in $umlType.ownedRule) #set($tmp = $rules.add($rule)) #end

#if($rules.size() > 0)#writeHeading($rules, “Constraints”, “false”, 6, “”, “false”)#foreach ($rulei in $rules)

#writeListItem($rulei.name)#if ($rulei.specification)#if(($rulei.documentation)&&($rulei.documentation !=“”))#writeText($rulei.documentation)#end#if($rulei.specification.text != “”)#if($rulei.specification.language)$js.eval(‘lname.replace(“OCL2\.0”, “OCL”)’, ‘lname’, $rulei.specification.language.toString())#end#writeCode($rulei.specification.text)#end#end#end#end#end