



**SDMX**  
**INFORMATION MODEL:**  
**UML CONCEPTUAL DESIGN**  
**(VERSION 1.0)**



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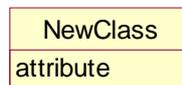
## 129 I. INTRODUCTION

130 This document is not normative, but provides a detailed view of the information  
131 model on which the normative SDMX specifications are based. Format implementors  
132 may wish to review the overview of the model presented in *Implementor's Guide for*  
133 *SDMX Format Standards*. Those new to the UML notation or to the concept of key  
134 families may wish to read the appendixes in this document as an introductory  
135 exercise.

### 136 A. Modelling technique and diagrammatic notes

137 The modelling technique used for the SDMX Information Model (SDMX-IM) is the  
138 Unified Modelling Language (UML). An overview of the constructs of UML that are  
139 used in the SDMX-IM can be found in the document "A Short Guide to UML in the  
140 SDMX Information Model"

141 UML diagramming allows a class to be shown with or without the compartments for  
142 one or both of attributes and operations (sometimes called methods). In this  
143 document the operations compartment is not shown as there are no operations.

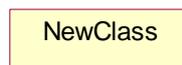


144

145 **Figure 1: Class with operations suppressed**

146 In some diagrams for some classes the attribute compartment is suppressed even  
147 though there may be some attributes. This is deliberate and is done to aid clarity of  
148 the diagram. The rules used are:

- 149 • The attributes will always be present on the class diagram where the class is  
150 defined and its attributes and associations are defined.
- 151 • On other diagrams, such as inheritance diagrams, the attributes may be  
152 suppressed from the class for clarity.



153

154 **Figure 2: Class with attributes also suppressed**

155 Note that, in any case, attributes inherited from a super class are not shown in the  
156 sub class.

157 The following table structure is used to in the definition of the classes,  
 158 attributes, and associations.

Class	Feature	Description
<b>Nearest MCV<sup>1</sup> Term</b>		
ClassName		
Nearest MCV term		
	<i>attributeName</i>	.
	<i>associationName</i>	
	<i>+roleName</i>	

159 The content in the Feature column comprises or explains one of the following  
 160 structural features of the class:

- 161 • Whether it is an abstract class
- 162 • The superclass this class inherits from, if any
- 163 • The sub classes of this class, if any
- 164 • Attribute – the *attributeName* is shown in Courier font
- 165 • Association – the *associationName* is shown in the standard font in
- 166 *italics*
- 167 • Role – the *+roleName* is shown in the standard font in *italics*

## 168 **B. Overall functionality**

169 The SDMX Information Model (SDMX-IM) is a conceptual metamodel from which  
 170 syntax specific implementations are developed. In version 1.0 the metamodel covers  
 171 the requirements for:

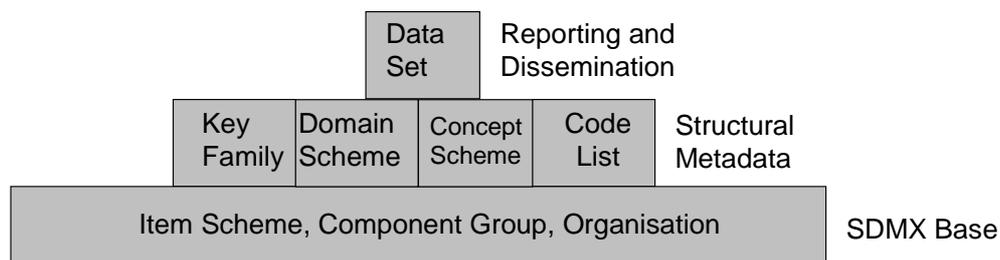
- 172 • Key family definition including domain category scheme, metadata concept  
 173 scheme, and code list
- 174 • Data and related metadata reporting and dissemination

175 The metamodel also supports the specific data requirements of the SDMX registry  
 176 version 1.0 where these requirements have an impact on the key family definition  
 177 and data reporting. The functions of the SDMX registry version 1.0, its model, and  
 178 the map to the SDMX-IM are documented separately.

---

<sup>1</sup> MCV – Metadata Common Vocabulary, which is under development by SDMX

179 The SDMX-IM will be developed in the near future to support other aspects of  
 180 statistical data and metadata reporting and dissemination. For this reason, the model  
 181 has been structured into a number of packages to aid both concurrent development  
 182 and ease of understanding. Furthermore, some advanced work has been done on  
 183 the features in the next version, and this has led to the development of the  
 184 SDMXBase package where common constructs have been abstracted into  
 185 “patterns”. This is to facilitate re-use of common structures, which can be augmented  
 186 by re-naming (sub classing) and the addition of specific associations and attributes  
 187 as required. Knowledge of these patterns will assist software development.  
 188 The SDMX-IM comprises a number of packages. These packages act as convenient  
 189 compartments for the various sub models in the SDMX-IM. The diagram below  
 190 shows the sub models of the SDMX-IM that are included in the version 1.0  
 191 specification.



192

193 **Figure 3: SDMX Information Model Version 1.0 package structure**

194 Although any package can make use of any construct in another package, in  
 195 conceptual terms the packages are shown in three layers:

- 196
- 197 • the SDMX Base layer comprises fundamental building blocks which are used by the Structural Metadata layer and the Reporting and Dissemination layer
  - 198 • the Structural Metadata layer comprises the definition of the structural artefacts needed to support data and metadata reporting and dissemination
  - 199
  - 200 • the Reporting and Dissemination layer comprises the definition of the data and metadata containers used for reporting and dissemination
  - 201

## 202 **II. ACTORS AND USE CASES**

### 203 **A. Actors and use cases**

204 In order to develop the data models it is necessary to understand the functions to be  
205 supported resulting from the requirements definition. These are defined in a use case  
206 model. The use case model comprises actors and use cases and these are defined  
207 below.

#### 208 **Actor**

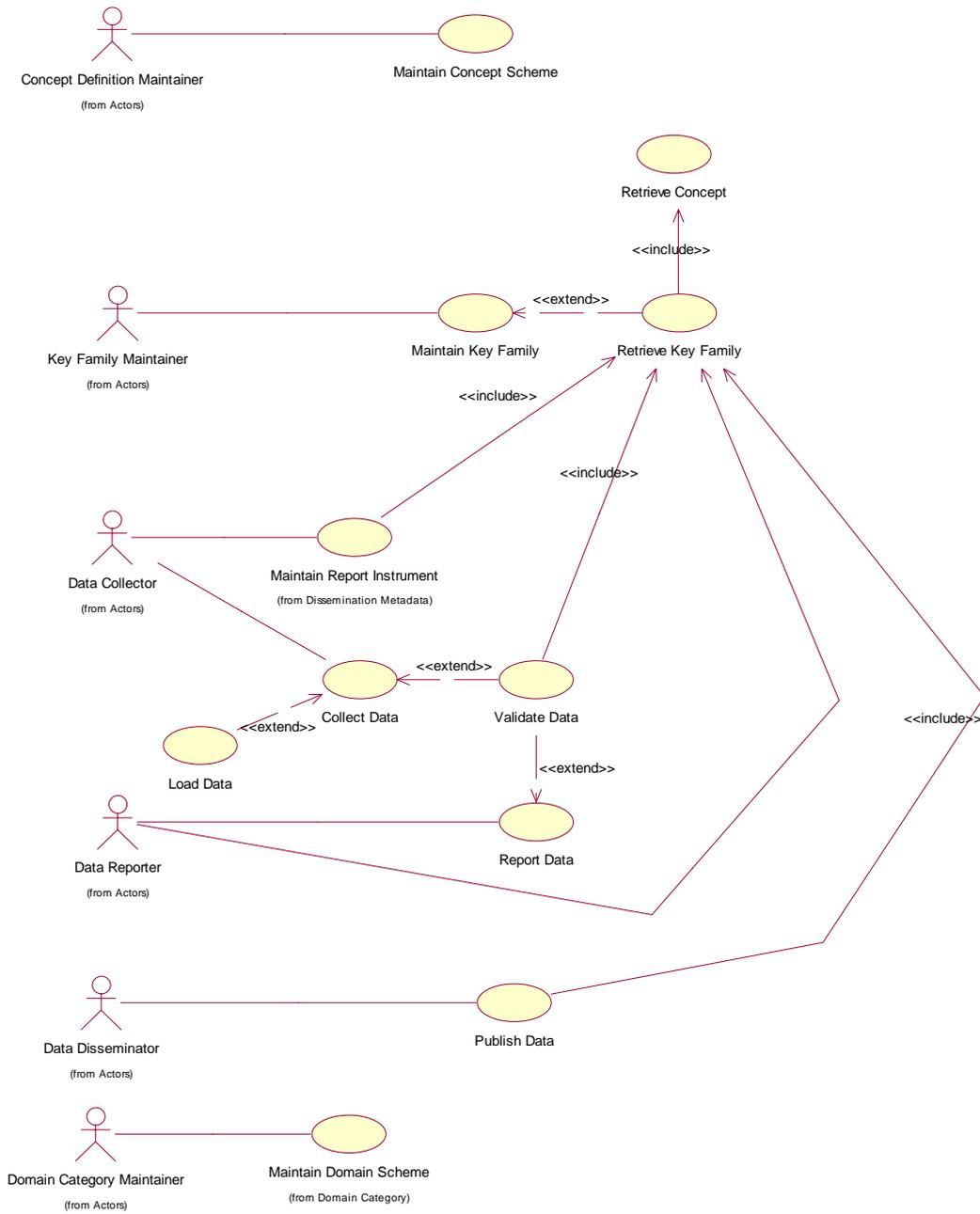
209 *“An actor defines a coherent set of roles that users of the system can play when*  
210 *interacting with it. An actor instance can be played by either an individual or an*  
211 *external system”*

#### 212 **Use case**

213 *“A use case defines a set of use-case instances, where each instance is a*  
214 *sequence of actions a system performs that yields an observable result of value*  
215 *to a particular actor”*

### 216 **B. Use case diagram**

217 The SDMX-IM model supports the following use cases.



218

219

**Figure 4: Use cases for data reporting and publishing**

**C. Explanation of the diagram**

Actor	Use Case	Description
 Concept Definition Maintainer		Responsible for maintaining the classification scheme that defines the metadata concepts used in key family definitions.
	 Maintain Concept Scheme	Creation and maintenance of the concept scheme.
	 Retrieve Concept	Retrieve a metadata concept for use in a process or for viewing.
 Key Family Maintainer		Responsible for maintaining key families.
	 Maintain Key Family	Creation and maintenance of the key family in terms of metadata concepts that comprise the dimensions and attributes of the key family structure, and the code lists used.  This use case is extended by the use case Retrieve Key Family.
	 Retrieve Key Family	Retrieve a key family for use in a process or for viewing.  This use case includes the

Actor	Use Case	Description
		use case RetrieveConcept.
 Data Collector		<p>Responsible for the collection of statistical data from reporting organizations. The actor is responsible for the collection process, including validation, and possibly, loading into a database. This actor may define report forms based on data flow definition and associated key family structure.</p>
	 Maintain Report Instrument	<p>Maintenance of reporting instruments such as XML, HTML, and spreadsheet forms.</p>
	 Collect Data	<p>The data collection process. This use case is optionally extended by Validate Data and Load Data.</p>
	 Validate Data	<p>Validation of the reported data according to the key family definition i.e. check that metadata concepts used for dimensions and attributes are consistent with the key family definition, and the values reported for concepts are consistent with the key family definition (e.g. they are contained in the</p>

Actor	Use Case	Description
		code list linked to the concept). This use case includes the use case Retrieve Key Family.
	 Load Data	Loading of the data into a database.
 Data Reporter		Responsible for reporting the data. Note that these data are in the form of a data set and in this model this actor does not report raw data. The reporter may validate the data set according to the key family definition.
	 Report Data	Reporting of the data. This use case is optionally extended by Validate Data.
 Data Disseminator		Responsible for disseminating data, including its publication.
	 Publish Data	Publish the data, for instance on a web site. This use case includes the use case Retrieve Key Family

Actor	Use Case	Description
 Domain Category Maintainer		Responsible for maintaining a domain category scheme.
	 Maintain Domain Scheme	Maintenance of a domain scheme. The actor will define the domain scheme in terms of domain categories that comprise the scheme.

221



222 **III. SDMX BASE PACKAGE**

223 **A. Introduction**

224 The constructs in the SDMX Base package comprise the fundamental building blocks  
225 that support many of the other structures in the model. For this reason, many of the  
226 classes in this package are abstract (i.e. only derived sub-classes can exist in an  
227 implementation).

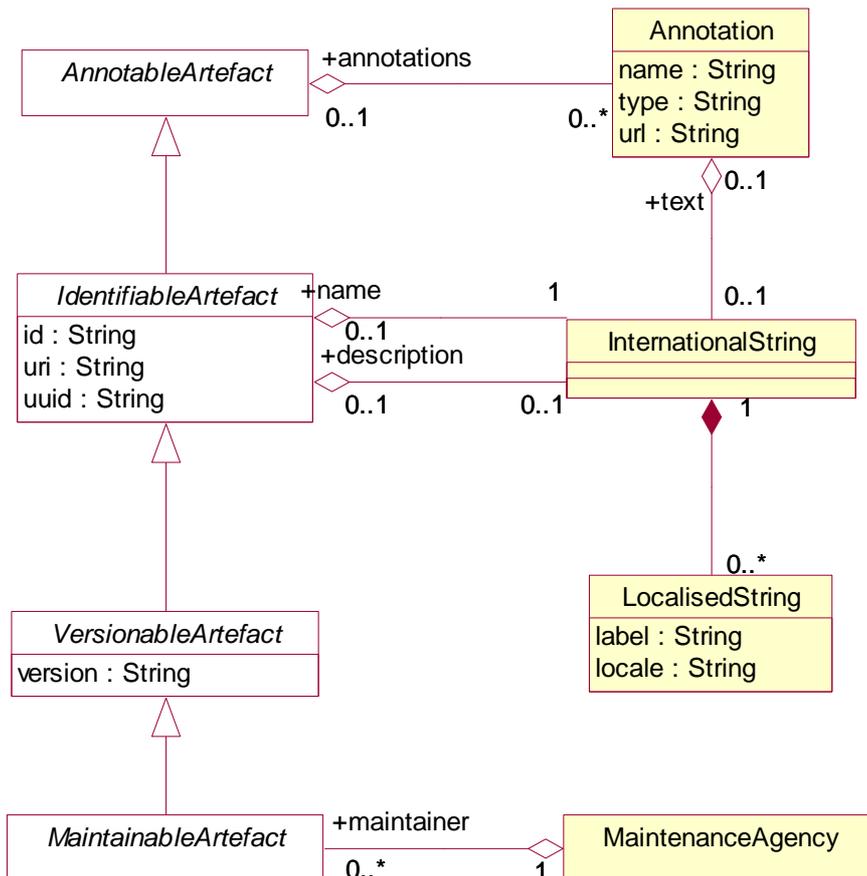
228 The motivation for establishing the SDMX Base package is as follows:

- 229 • It is accepted “Best Practise” to identify fundamental archetypes occurring in  
230 a model
- 231 • identification of commonly found structures or “patterns” leads to easier  
232 understanding
- 233 • identification of patterns encourages re-use

234 Each of the class diagrams in this section views classes from the SDMX Base  
235 package from a different perspective. There are detailed views of specific patterns,  
236 plus overviews showing inheritance between classes, and relationships amongst  
237 classes.

238

## B. SDMX Base

 239 **Class diagram**


240

241

**Figure 5: SDMX base classes**

 242 **Explanation of the diagram**

 243 a) Narrative

244 This group of classes forms the nucleus of the SDMX Information Model. It provides  
 245 features which are generally reusable by derived classes to support horizontal  
 246 functionality such as identity, versioning etc. None of these classes are specific to  
 247 statistical models, and could be used for any domain.

248

249 All classes derived from the abstract class *AnnotableArtefact* may have  
 250 Annotations (or notes); this is to comply with the ability to add notes to all SDMX-ML

251 elements. The *Annotation* is used to convey extra information to describe any  
 252 SDMX construct. This information may be in the form of a URL reference and / or a  
 253 multilingual text (represented by the association to *InternationalString*)  
 254 The *IdentifiableArtefact* is an abstract class that comprises the basic  
 255 attributes needed by many of the other classes in the metamodel. Concrete classes  
 256 based on *IdentifiableArtefact* all inherit the ability to be uniquely identified.  
 257 They also inherit the ability to carry annotations. In addition, the *+description* and  
 258 *+name* roles supports multilingual descriptions and names for all objects based on  
 259 *IdentifiableArtefact*. The *InternationalString* supports the  
 260 representation of a description in multiple locales (locale is similar to language but  
 261 includes geographic variations such as Canadian French, US English etc.). The  
 262 *LocalisedString* supports the representation of a description in one locale.  
 263 *VersionableArtefact* is an abstract class which inherits from  
 264 *IdentifiableArtefact* and adds versioning ability to all classes derived from it.  
 265 *MaintainableArtefact* further adds the ability for derived classes to be  
 266 maintained via its association to *MaintenanceAgency*.  
 267 The inheritance chain from *AnnotableArtefact* through to  
 268 *MaintainableArtefact* allows SDMX classes to inherit the features they need,  
 269 whether it be simple annotation, identity, versioning or maintenance.

270 b) Definitions

Class	Feature	Description
Nearest MCV Term		
<i>AnnotableArtefact</i>	Direct sub classes are: <i>IdentifiableArtefact</i>	Allows additional supporting documentation for SDMX objects to be specified.
	<i>+annotations</i>	This role allows some annotations to be linked to an SDMX object derived from <i>AnnotableArtefact</i> .
<i>Annotation</i>		Supplies additional supporting documentation for SDMX objects.

Class Nearest MCV Term	Feature	Description
	name	A name used to identify an annotation
	type	Specifies how the annotation is to be processed
	url	A link to external descriptive text
	+text	An <code>InternationalString</code> provides the multilingual text content of the annotation via this role.
<i>IdentifiableArtefact</i>	Superclass is <i>AnnotableArtefact</i> . Derived classes: <i>VersionableArtefact</i>	Provides identity to all derived classes. It also provides annotations to derived classes because it is a subclass of <code>AnnotableArtefact</code> .
	id	The unique identifier of the object.
	uri	Universal resource identifier that may or may not be resolved.
	uuid	Universally unique identifier – this is for use in registries: all registered objects have a uuid.
	+description	A multi-lingual description is provided by this role via the <code>InternationalString</code> class.

Class	Feature	Description
Nearest MCV Term		
	+name	A multi-lingual name is provided by this role via the <code>InternationalString</code> class
<i>VersionableArtefact</i>	Superclass is <i>IdentifiableArtefact</i> Derived classes: <i>MaintainableArtefact</i>	Provides versioning information for all derived objects.
	version	A version string following an agreed convention
<code>InternationalString</code>		The <code>InternationalString</code> is a collection of <code>LocalisedStrings</code> and supports the representation of a description in multiple locales.
<code>LocalisedString</code>		The <code>LocalisedString</code> supports the representation of a description in one locale (locale is similar to language but includes geographic variations such as Canadian French, US English etc.).
	label	Label of the string.
	locale	The geographic locale of the string e.g French, Canadian French.

Class Nearest MCV Term	Feature	Description
<i>MaintainableArtefact</i>	Inherits from VersionableArtefact Derived classes: <i>ComponentStructure</i> <i>StructureClassifier</i> <i>ItemScheme</i>	An abstract class to group together primary structural metadata artefacts. These artefacts need to be maintained by a Contact acting on behalf of a MaintenanceAgency.
	+maintainer	Derived classes will be maintained by the MaintenanceAgency specified by this role.

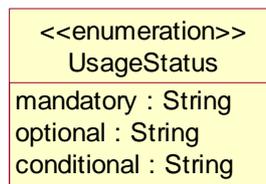
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272

### C. Data Types

273

#### Class diagram



274

275

**Figure 6: Enumerations**

276

#### Explanation of the diagram

277

##### a) Narrative

278

The `UsageStatus` enumeration is used as a data type on an attribute where the value of the attribute in an instance of the class must take one of the values in the `UsageStatus` (i.e. mandatory, optional, or conditional).

279

280

281

##### b) Definitions

Class Nearest MCV Term	Feature	Description

Class	Feature	Description
<b>Nearest MCV Term</b>		
UsageStatus		Lists the possible values that an attribute can take when it is assigned the data type of UsageStatus.
	mandatory	The usage is mandatory.
	optional	The usage is optional.
	conditional	The usage is mandatory when certain conditions are satisfied.

282

283

#### D. The Item Scheme Pattern

284

##### Context

285

The Item Scheme is a basic architectural pattern that allows the creation of list schemes for use in simple taxonomies, for example.

286

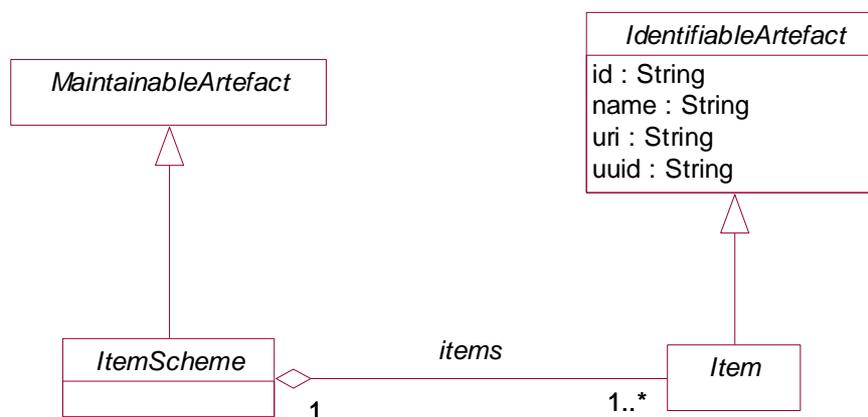
287

The Item Scheme is the basis for Domain Category Schemes, Code Lists and Concept Schemes.

288

289

##### Class Diagram



290

291

Figure 7: The Item Scheme pattern

292 **Explanation of the diagram**

 293 a) Narrative

294 The *ItemScheme* is an abstract class which defines a set of *Item* (this class is also  
 295 abstract). Its main purpose is to define a mechanism which can be used to create  
 296 taxonomies which can classify other parts of the SDMX Information Model. It is  
 297 derived from *MaintainableArtefact* which imbues the ability to be annotated,  
 298 have identity, versioning and be associated with a *MaintenanceAgency*. Example  
 299 of concrete classes are *DataCategoryScheme* and *DataCategory* – these are  
 300 shown later in the Inheritance class diagram.

301 *Item* inherits from *IdentifiableArtefact* and therefore has *id*, *uri* and  
 302 *uuid* attributes, a *name* in the form of an *InternationalString*, and may have a  
 303 *description* in the form of an *InternationalString*.

 304 b) Definitions

305

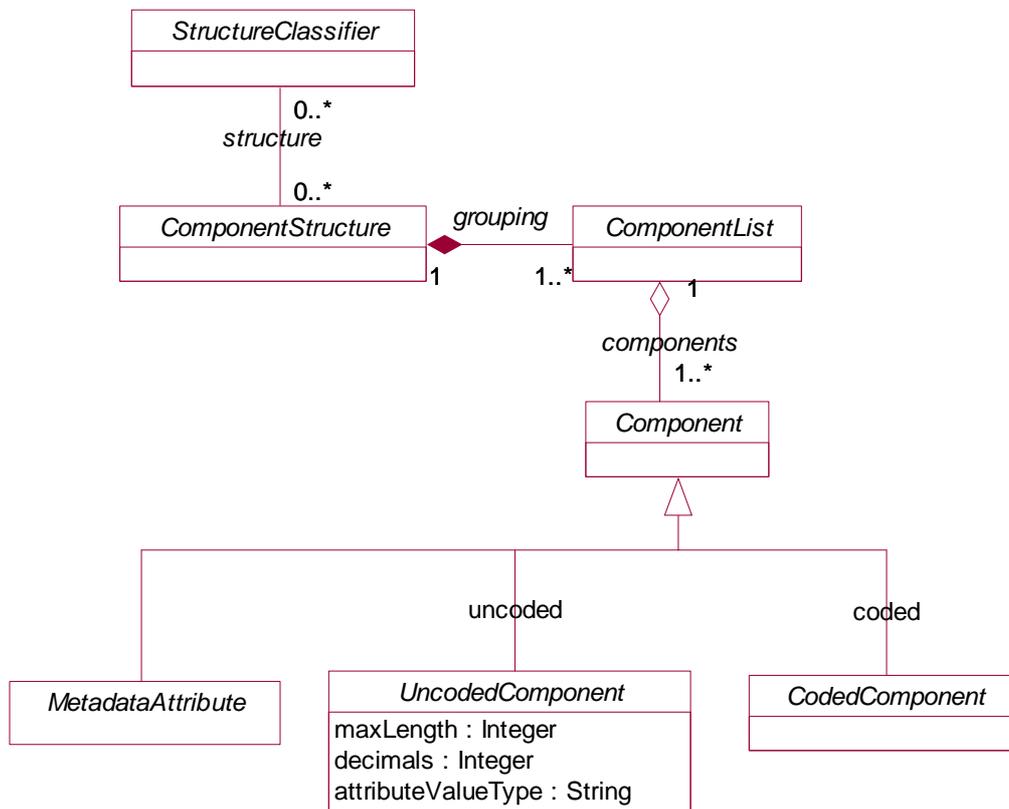
Class Nearest MCV Term	Feature	Description
<i>ItemScheme</i>	Inherits from: <i>MaintainableArtefact</i> Direct sub classes are: <i>DomainCategoryScheme</i> <i>ConceptScheme</i> <i>CodeList</i>	The descriptive information for an arrangement or division of objects into groups based on characteristics, which the objects have in common.
<i>Item</i>	Inherits from: <i>IdentifiableArtefact</i> Direct sub classes are <i>DomainCategory</i> <i>Concept</i> <i>Code</i>	The <i>Item</i> is an item of content in an <i>ItemScheme</i> . This may be a node in a taxonomy or ontology, a code in a code list etc.

306

307 **E. The Component Structure Pattern**

 308 **Context**

309 The Component Structure is a basic architectural pattern which allows the  
 310 specification of complex tabular structures which are often found in statistical data  
 311 (such as key family definitions). A Component Structure is a set of ordered lists. A  
 312 pattern to underpin this tabular structure has been elicited, so that it can be re-used  
 313 in future versions of the SDMX-IM to describe other metadata structures.

 314 **Class Diagram**


315

 316 **Figure 8: The Component Structure pattern**

 317 **Explanation of the diagram**

 318 a) Narrative

319 The *ComponentStructure* is an abstract class which contains a set of one or more  
 320 *ComponentList*(s) (this class is also abstract). An example of a concrete

321 *ComponentStructure* is *KeyFamily* – this is shown later in the Inheritance class  
322 diagram. The *ComponentList(s)* are embedded within the  
323 *ComponentStructure*, and this is indicated by the solid diamond on the *grouping*  
324 association.

325 The *ComponentList* is a list of one or more *Component(s)*. The *ComponentList*  
326 has several concrete descriptor classes based on it: *KeyDescriptor*,  
327 *GroupKeyDescriptor* are two examples. Again, based on the example of the  
328 *KeyFamily* as a concrete class, this would normally have three  
329 *ComponentList(s)*: one for the *Dimensions*, one for *Measures* and one for  
330 *MetadataAttributes* (this is explained later in the key family section). In the case  
331 of a *KeyDescriptor* acting as a *ComponentList*, its *Component(s)* would be  
332 *Dimension(s)*.

333 The *Component* itself is divided into two abstract classes: *CodedComponent(s)* are  
334 qualitative in nature and take their values from a pre-defined code list, and  
335 *UncodedComponent(s)* which are usually either free text or quantitative values.

336 Finally, the *StructureClassifier* class provides a way to classify a  
337 *ComponentStructure* via an *DomainCategory* node of an  
338 *DomainCategoryScheme*. This is described in more detail in the Relationship View  
339 section below.

340

341 Definitions

342

<b>Class</b> <b>Nearest MCV Term</b>	<b>Feature</b>	<b>Description</b>
<i>StructureClassifier</i>	Inherits from: <i>MaintainableArtefact</i> (see figure 10) Direct sub classes are: <i>DataflowDefinition</i>	A specific sub class of Component Structure may be classified against an Item in an Item Scheme. When this happens, a StructureClassifier is created. In concrete terms (sub-classes) an example would be a dataflow definition which allows data to be shared for a particular domain category with a given structure (key family).
	<i>structure</i>	An association to a ComponentStructure specifying the structure of data that has been classified.
<i>ComponentStructure</i> KeyFamily	Inherits from: <i>MaintainableArtefact</i> (see figure 10) Direct sub classes are: <i>KeyFamily</i>	Abstract specification of a list of lists to define a complex tabular structure. In concrete terms (sub-classes) an example would be a key family definition.
	<i>grouping</i>	A composite association to one or more component lists.

<b>Class</b> <b>Nearest MCV Term</b>	<b>Feature</b>	<b>Description</b>
<i>ComponentList</i>	Inherits from: <i>AttachableArtefact</i> Direct sub classes are: <i>KeyDescriptor</i> <i>GroupKeyDescriptor</i> <i>MeasureDescriptor</i> <i>MeasureTypeDescriptor</i> <i>AttributeDescriptor</i>	An abstract definition of a list of components. In more concrete terms, a key descriptor defines the list of dimensions that make up a key for a key family. The inheritance from attachable artefact allows metadata attributes to attach to keys and group keys.
	<i>components</i>	An aggregate association to one or more components which make up the list.
<i>Component</i> Dimension	Inherits from: <i>AttachableArtefact</i> (See figure 10). Direct sub classes are: <i>UncodedComponent</i> <i>CodedComponent</i> <i>MetadataAttribute</i>	A component is an abstract super class used to define qualitative and quantitative data and metadata items that belong to a <i>ComponentList</i> and hence a component structure. <i>Component</i> is refined through its sub-classes.
<i>UncodedComponent</i> Measure	Inherits from: <i>Component</i> Direct sub classes are: <i>Measure</i> <i>UncodedAttribute</i>	An uncoded component is an abstract class used to define quantitative values and free-text data
	<i>maxLength</i>	The maximum length of the component.

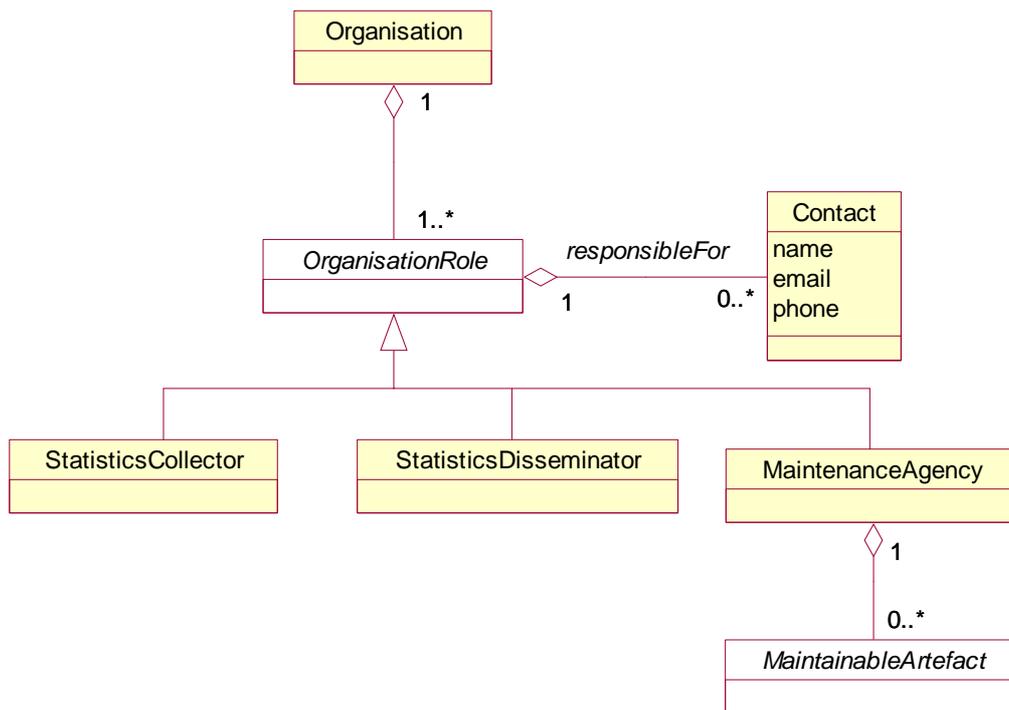
<b>Class</b>	<b>Feature</b>	<b>Description</b>
<b>Nearest MCV Term</b>		
	decimals	The decimal precision of the component if the component is numeric.
	attributeValueType	identifies the type of value expected in the component (values are alpha, alphanumeric, numeric)
<i>CodedComponent</i> Dimension	Inherits from: <i>Component</i> Direct sub classes are: Dimension CodedAttribute	A coded component is an abstract class used to define qualitative values which are drawn from a defined value set.
<i>MetadataAttribute</i> Attribute	Inherits from: <i>Component</i> Direct sub classes are: UncodedAttribute CodedAttribute	Used to define metadata concepts via its sub-classes which are either free-text or coded values.

343

## F. Organisation Pattern

344

### Class Diagram



345

346

**Figure 9: The Organisation class diagram**

347

### Explanation of the diagram

348

#### a) Narrative

349

An *Organisation* can play a number of *OrganisationRole*. Four roles are identified at present: *StatisticsCollector*; *StatisticsDisseminator*; *DataReporter*; *MaintenanceAgency*.. The classes that are associated with the *DataReporter*, *StatisticsCollector*, and *StatisticsDisseminator*, are defined in the package(s) where they are relevant. Note that the *DataReporter* reports a data set and in this model this *OrganisationRole* does not include raw data collection.

356

Each *OrganisationRole* has a set of *Contacts*, who are individuals responsible for an organisation for each role that it plays. So, for example, one set of contacts would be responsible for an organisation in its role as maintenance agency, and a different set of individuals would be responsible for statistics dissemination.

359

360 The MaintenanceAgency can maintain a variety of *MaintainableArtefact*.  
 361 This is an abstract class and the concrete classes are shown in the table below and  
 362 described in the section “Inheritance”.

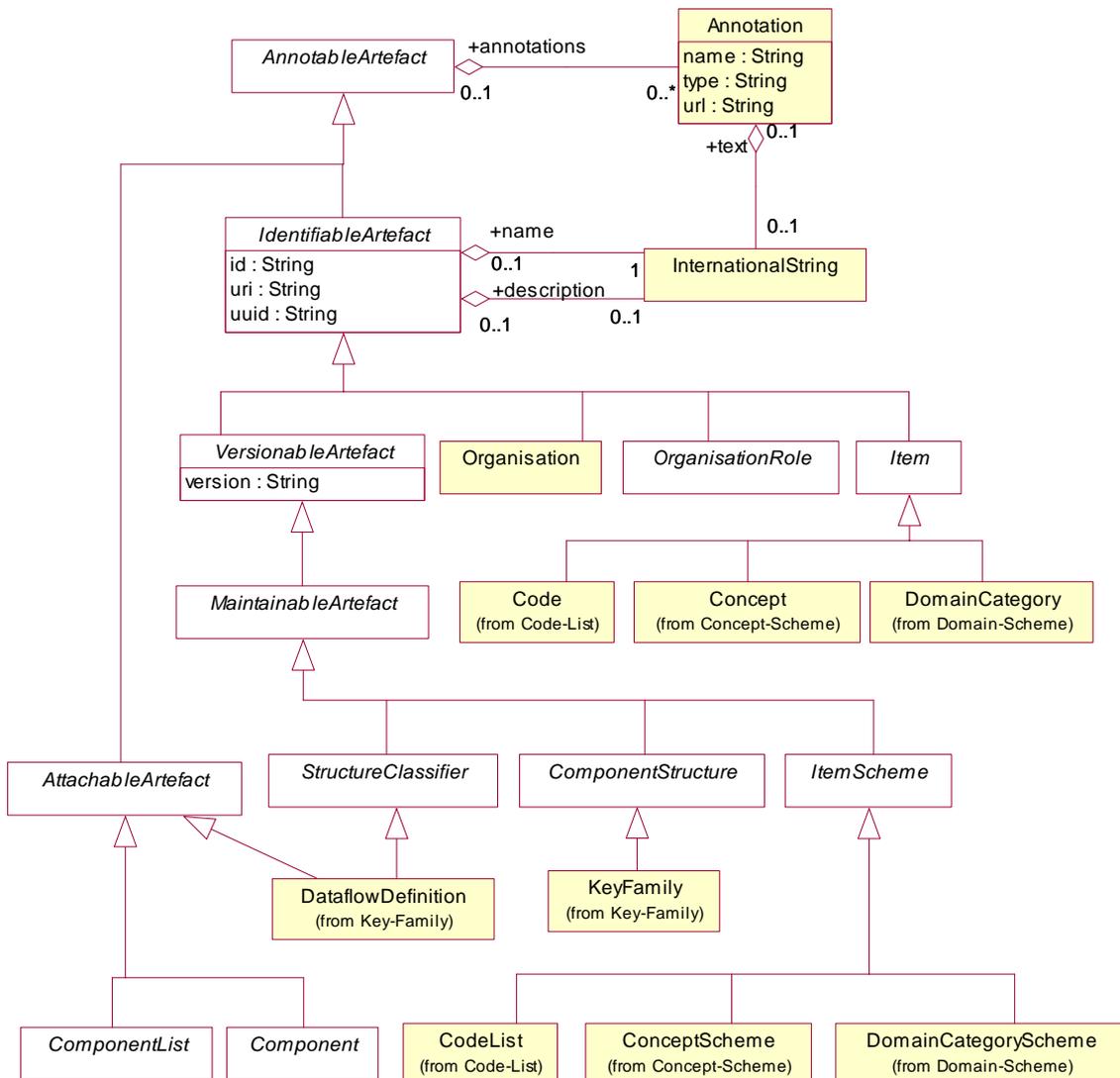
363 b) Definitions

<b>Class</b> <b>Nearest MCV Term</b>	<b>Feature</b>	<b>Description</b>
Organisation	Inherits from <i>IdentifiableArtefact</i>	Source: MCV An organization is a unique framework of authority within which a person or persons act, or are designated to act, towards some purpose.
<i>OrganisationRole</i>	Inherits from <i>IdentifiableArtefact</i>	The role of an organisation in the processes of statistics collection, dissemination, and metadata maintenance.
MaintenanceAgency RegistrationAuthority	Inherits from <i>OrganisationRole</i>	Responsible agency for maintaining artefacts such as statistical classifications, glossaries, key family structural definitions.
StatisticsCollector	Inherits from <i>OrganisationRole</i>	A collector of statistical data or metadata.

Class	Feature	Description
Nearest MCV Term		
StatisticsDisseminator	Inherits from <i>OrganisationRole</i>	A disseminator of statistical data or metadata Dissemination is an activity in the survey life cycle to distribute or transmit statistical data and metadata to its users.
DataReporter	Inherits from <i>OrganisationRole</i>	A reporter of data.
Contact		A person who acts for an Organisation and who is responsible for performing duties with respect to an <i>OrganisationRole</i> .
<i>MaintainableArtefact</i>	Inherits from <i>IdentifiableArtefact</i> Sub classes <i>ComponentStructure</i> <i>StructureClassifier</i> <i>ItemScheme</i>	An abstract class to group together structural metadata artefacts. These artefacts need to be maintained by a Contact acting on behalf of a <i>MaintenanceAgency</i> .

364

## G. Inheritance View

 365 **Class Diagram**


366

367

**Figure 10: Class inheritance in the SDMX Base package**

 368 **Explanation of the diagram**

369

 a) Narrative

370

Those classes in the SDMX metamodel which require annotations inherit from

371

*AnnotableArtefact*. These are:

372       • *IdentifiableArtefact*

373       • *AttachableArtefact*

374 Those classes in the SDMX metamodel which require annotations, global identity,  
375 multilingual name, and an optional multilingual description are derived from  
376 *IdentifiableArtefact*. These are:

377       • *VersionableArtefact*

378       • *OrganisationRole*

379       • *Organisation*

380       • *Item*

381 The class in the SDMX metamodel which requires annotations, global identity,  
382 multilingual name, an optional multilingual description, and versioning is derived from  
383 *VersionableArtefact*. This is:

384       • *MaintainableArtefact*

385 Abstract classes which represent information that is maintained by Maintenance  
386 Agencies all inherit from *MaintainableArtefact*, they also inherit all the features  
387 of a *VersionableArtefact*, and are:

388       • *StructureClassifier*

389       • *ComponentStructure*

390       • *ItemScheme*

391 Those concrete classes in the SDMX metamodel which require to be maintained by  
392 Maintenance Agencies all inherit from *MaintainableArtefact*, these are:

393       • *DataflowDefinition*

394       • *KeyFamily*

395       • *CodeList*

396       • *DomainCategoryScheme*

397       • *ConceptScheme*

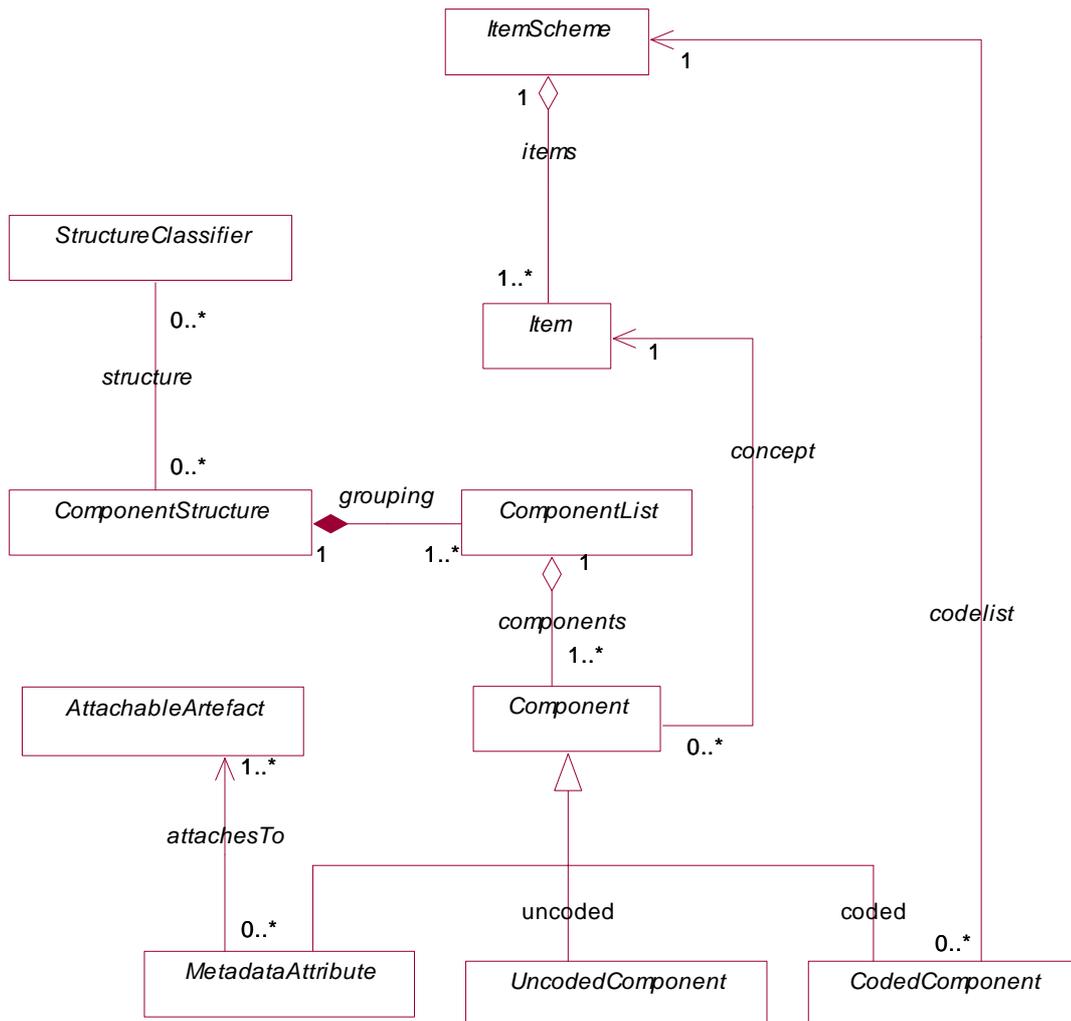
398 The structures that are an arrangement of objects into hierarchies or lists based on  
399 characteristics, and which are maintained as a group inherit from *ItemScheme*, which  
400 is a *MaintainableArtefact*. These are:

- 401 • *CodeList*
- 402 • *ConceptScheme*
- 403 • *DomainCategoryScheme*

404 The component structures that are lists of lists, inherit directly from  
405 *ComponentStructure*. A *ComponentStructure* contains several lists of  
406 components (e.g. a *KeyFamily* contains a list of *Dimensions*, a list of *Measures* and a  
407 list of *Attributes*). At version 1.0 this inheritance is restricted to:

- 408 • *KeyFamily*

409 **H. Relationship View**

 410 **Class Diagram**


411

 412 **Figure 11 Relationships between classes in the SDMX Base package**

 413 **Explanation of the diagram**

 414 a) Narrative

415 This diagram shows how the two fundamental patterns in the SDMX Base package  
 416 relate. The *ItemScheme*, and *Item* provide the basic pattern for creating coding  
 417 schemes which can be used for classification, as previously described. The  
 418 *ComponentStructure*, *Component* and *ComponentList* provide the pattern to

419 define multiple lists of artefacts, also previously described. There are two points of  
 420 contact between the two patterns.

421 1. The association *concept* between *Component* and *Item*. In concrete terms,  
 422 this could be the reference from a *Dimension* to its *Concept*.

423 2. The association from *CodedComponent* to *ItemScheme*. In concrete terms  
 424 this could be the reference from a *Dimension* to its *CodeList*.

425 Finally, *Component* can be sub-classified into *UncodedComponent* and  
 426 *CodedComponent*. A *Measure* is always uncoded, whereas a *Dimension* is always  
 427 coded. This is described earlier in this section. A *MetadataAttribute* can be either  
 428 coded (as in unit of measure) or uncoded (as in a text footnote).

429 The information model allows metadata attributes (see Key Family section) to qualify  
 430 certain classes. Those classes which can be attribute-qualified inherit from the  
 431 abstract class *AttachableArtefact* and are:

- 432 • *DataflowDefinition*
- 433 • *ComponentList*
- 434 • *Component*

435

436 The reason to identify the two patterns (“Component Structure” and “Item Scheme”)  
 437 is that they will be re-used in later work relating to the SDMX Information Model.

438 b) Definitions

439

Class	Feature	Description
Nearest MCV Term		
	<i>concept</i>	An association from a component to an item which allows sub-classes to define what statistical concept this component represents.
	<i>odelist</i>	An association from a coded component to an

Class Nearest MCV Term	Feature	Description
		item scheme which allows sub-classes to define what code list this component takes its values from.
AttachableArtefact	<i>Direct sub classes are:</i> <i>DataflowDefinition</i> <i>ComponentList</i> <i>Component</i>	Sub classes identify which artefacts can be specified as allowing attribute qualification or allowing footnotes to be attached.

## 440 **IV. STRUCTURE DEFINITION METADATA**

### 441 **A. Introduction**

442 Many of the constructs in this layer of the model inherit from the SDMX Base layer.  
443 Therefore, it is necessary to study both the inheritance and the relationship diagrams  
444 to understand the functionality of individual packages. In simple models these are  
445 shown in the same diagram. In more complex models these are shown on separate  
446 diagrams.

### 447 **B. CodeList**

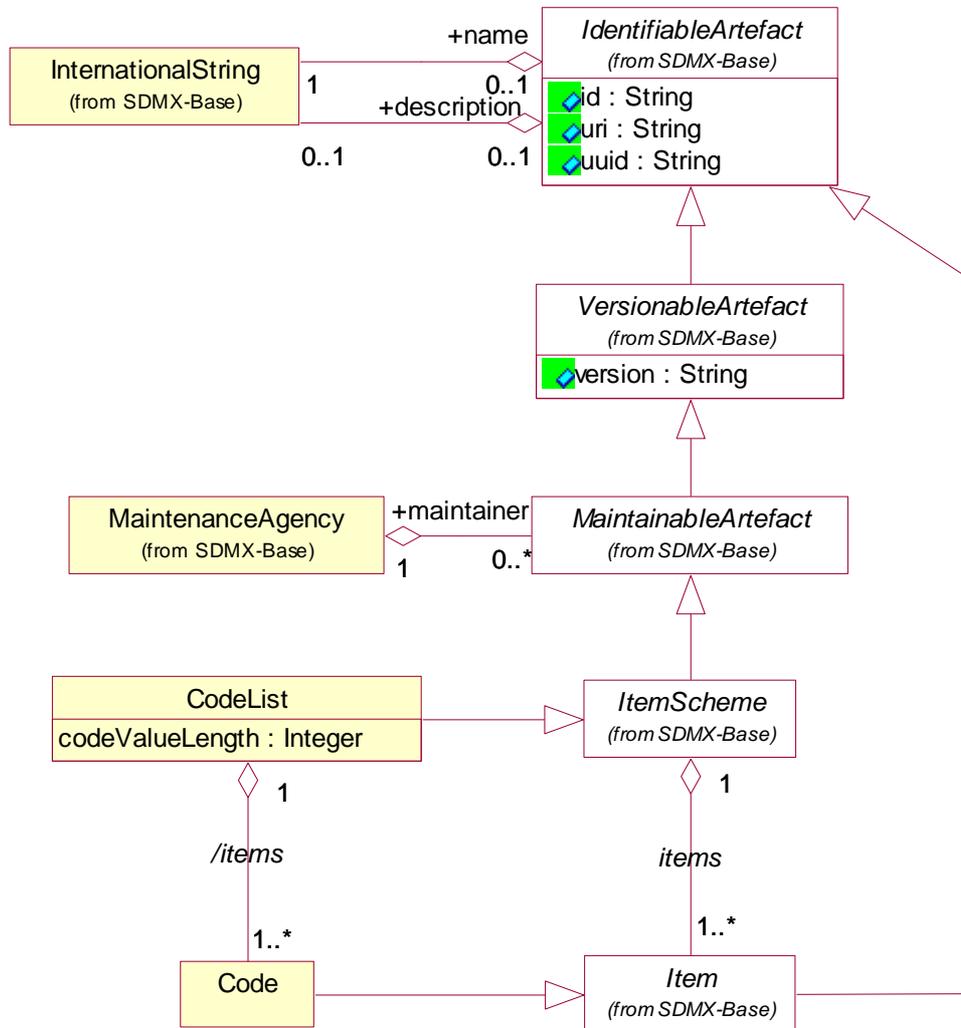
#### 448 **Context**

449 The model supports the following use cases



Maintain Key Family

450

451 **Class diagram**


452

453

**Figure 12: Class diagram of the Code List**

 454 **Explanation of the diagram**

 455 a) Narrative

 456 The `CodeList` inherits from the `ItemScheme` and therefore has the following
 457 attributes:

- 458
- `id`
  - `uri`
- 459

460     • `uuid`

461     • `version`

462 It also has the association to `InternationalString` to support a multi-lingual  
 463 name, an optional multi-lingual description, and an association to `Annotation` to  
 464 support notes.

465 The Code inherits from the *Item* and therefore has the following attributes:

466     • `id`

467     • `uri`

468     • `uuid`

469 It also has the association to `InternationalString` to support a multi-lingual  
 470 name, an optional multi-lingual description, and an association to `Annotation` to  
 471 support notes (not shown).

472    **b) Definitions**

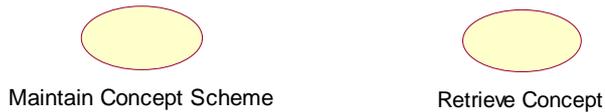
<b>Class</b>	<b>Feature</b>	<b>Description</b>
<b>Nearest MCV Term</b>		
<code>CodeList</code> Code list	Inherits from <i>ItemScheme</i>	Source: MCV A list from which some statistical concepts (coded concepts) take their values.
	<code>codeValueLength</code>	The length of a code (i.e. identifier) in the code list.
	<i>items</i>	Associates the codes.
<code>Code</code>	Inherits from <i>Item</i>	A value in a code list.

473

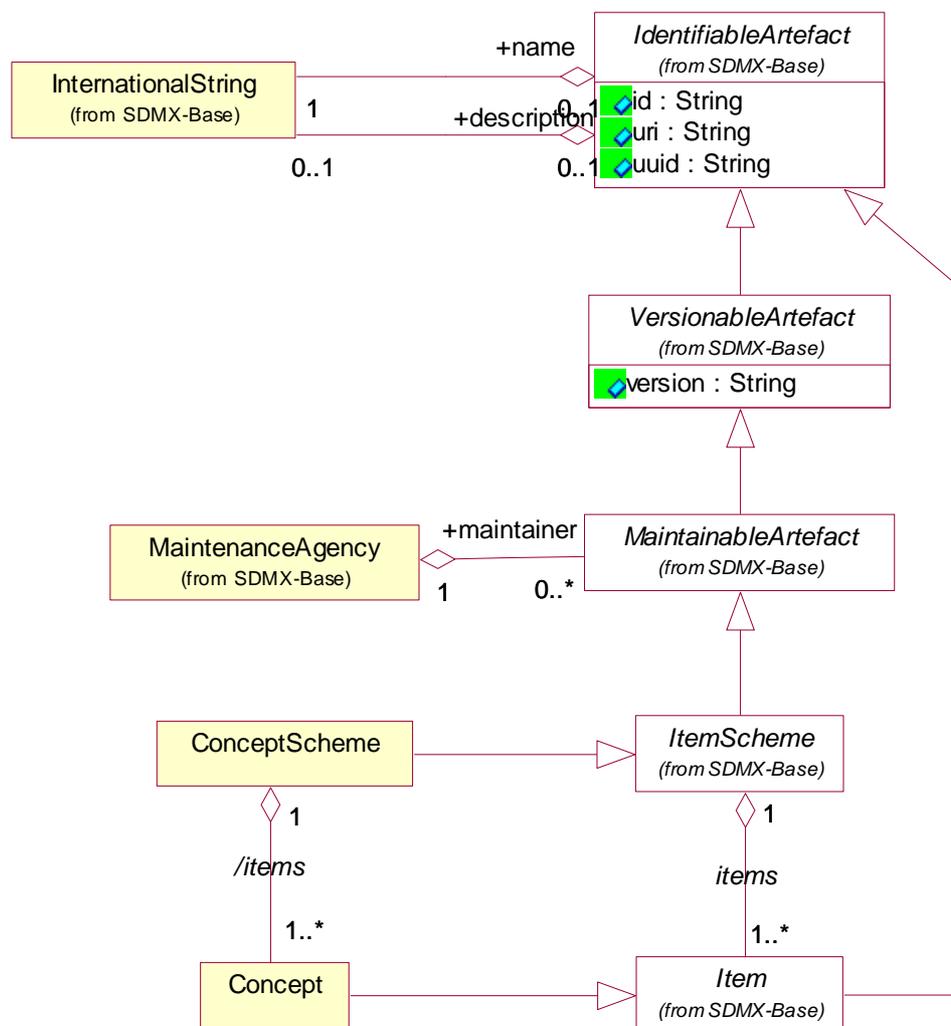
474 **C. ConceptScheme**

 475 **Context**

476 The model supports the following use cases



477

 478 **Class diagram**


479

480

**Figure 13: Class diagram of the Concept Scheme**

481 **Explanation of the diagram**

482 a) Narrative

483 The `ConceptScheme` inherits from the `ItemScheme` and therefore has the following  
484 attributes:

- 485 • `id`
- 486 • `uri`
- 487 • `uuid`
- 488 • `version`

489 It also has the association to `InternationalString` to support a multi-lingual  
490 name, an optional multi-lingual description, and an association to `Annotation` to  
491 support notes.

492 The `Concept` inherits from the `Item` and therefore has the following attributes:

- 493 • `id`
- 494 • `uri`
- 495 • `uuid`

496 It also has the association to `InternationalString` to support a multi-lingual  
497 name, an optional multi-lingual description, and an association to `Annotation` to  
498 support notes (not shown).

499 b) Definitions

Class	Feature	Description
Nearest MCV Term		
<code>ConceptScheme</code>	Inherits from <i><code>ItemScheme</code></i>	The descriptive information for an arrangement or division of concepts into groups based on characteristics, which the objects have in common.
	<i><code>items</code></i>	Associates the metadata

Class	Feature	Description
<b>Nearest MCV Term</b>		
		concept.
Concept Concept	Inherits from <i>Item</i>	A concept is a unit of knowledge created by a unique combination of characteristics.

500

501 **D. DomainCategory**

502 **Context**

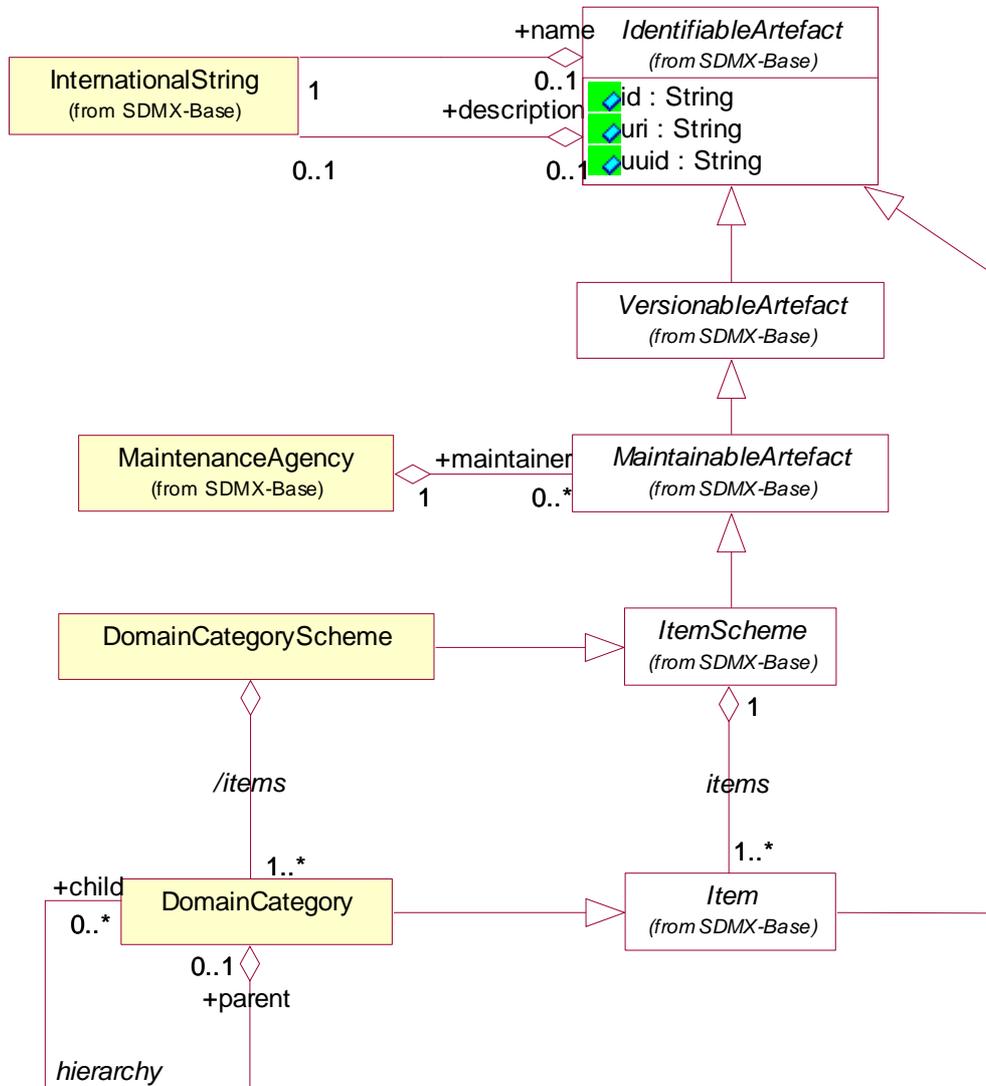
503 This package defines the structure that supports the definition of and relationships  
 504 between domain categories. It is similar to the package for metadata concept  
 505 scheme.

506 The model supports the following use cases.



Maintain Domain Scheme

507

508 **Class diagram**


509

510

**Figure 14: Class diagram of the Domain Category Scheme**

 511 **Explanation of the diagram**

512

 a) Narrative

513

The domain categories are modelled as a hierarchical item scheme. The

514

*DomainCategoryScheme* inherits from the *ItemScheme* and therefore has the

515

following attributes:

516

- `id`

517       • version

518       • uri

519       • uuid

520 It also has the association to `InternationalString` to support a multi-lingual  
521 name, an optional multi-lingual description, and an association to `Annotation` to  
522 support notes.

523 The `DomainCategory` inherits from the `Item` and therefore has the following  
524 attributes:

525       • id

526       • uri

527       • uuid

528 It also has the association to `InternationalString` to support a multi-lingual  
529 name, and optional multi-lingual description, and an association to `Annotation` to  
530 support notes (not shown).

531 The `DomainCategoryScheme` can have one or more `DomainCategory`. A  
532 `DomainCategory` can have zero or more child `DomainCategory`, thus creating a  
533 hierarchy.

534    b)       Definitions

Class	Feature	Description
<b>Nearest MCV Term</b>		
<code>DomainCategoryScheme</code>	Inherits from <i>ItemScheme</i>	The descriptive information for an arrangement or division of domain categories into groups based on characteristics, which the objects have in common.
	<i>Items</i>	Associates the domain category.
<code>DomainCategory</code>	Inherits from	A domain of interest for

Class	Feature	Description
Nearest MCV Term		
	<i>Item</i>	which statistics are collected or disseminated (e.g. balance of payments, external debt).
	<i>hierarchy</i>	Associates the parent and the child domain category.

535

536

### E. Key Family

537

#### Context

538

The key family defines the group of concepts that comprise the key, measures, and associated attributes for which data are collected or disseminated.

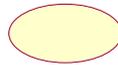
539

540

It supports the following use cases:

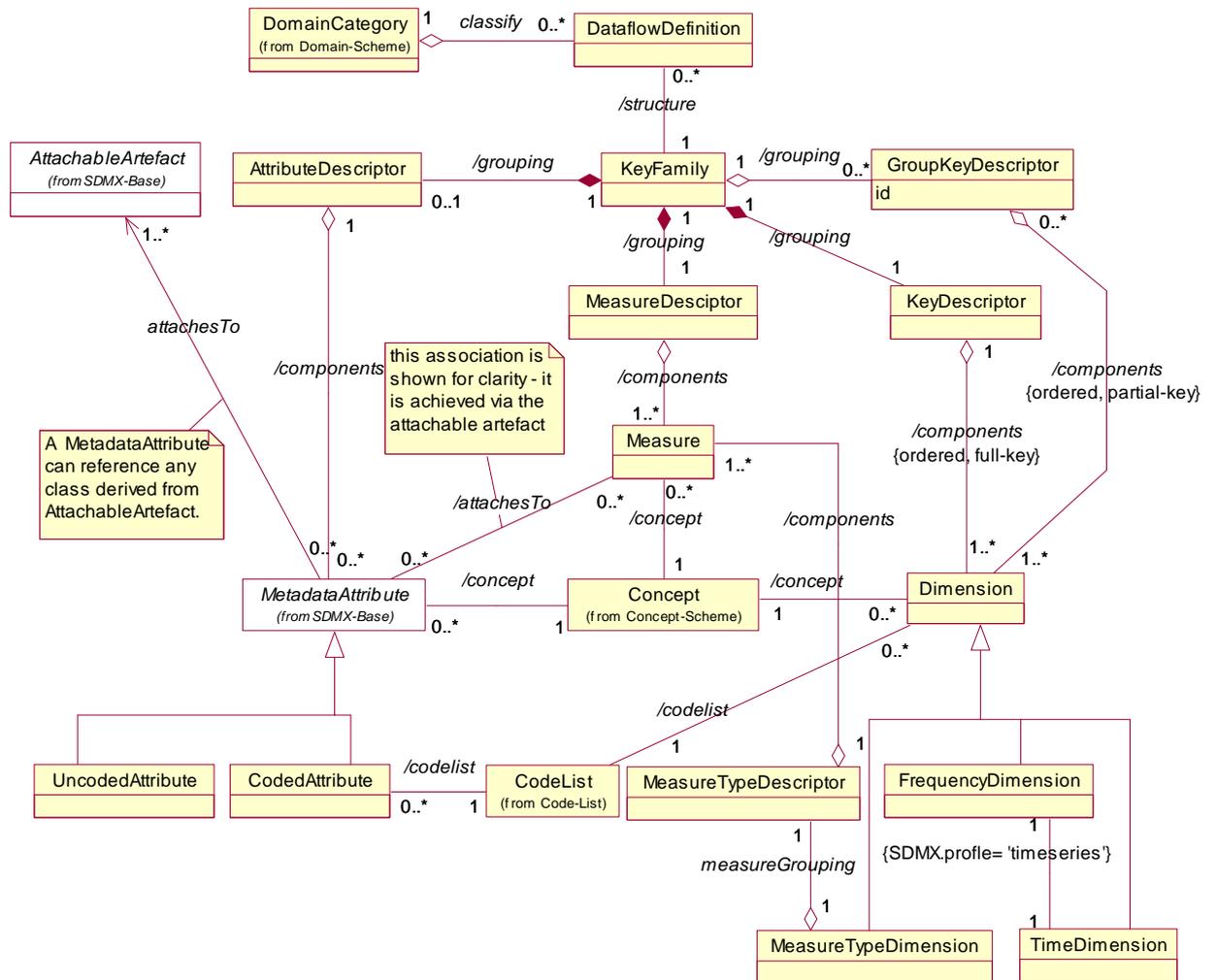


Maintain Key Family



Retrieve Key Family

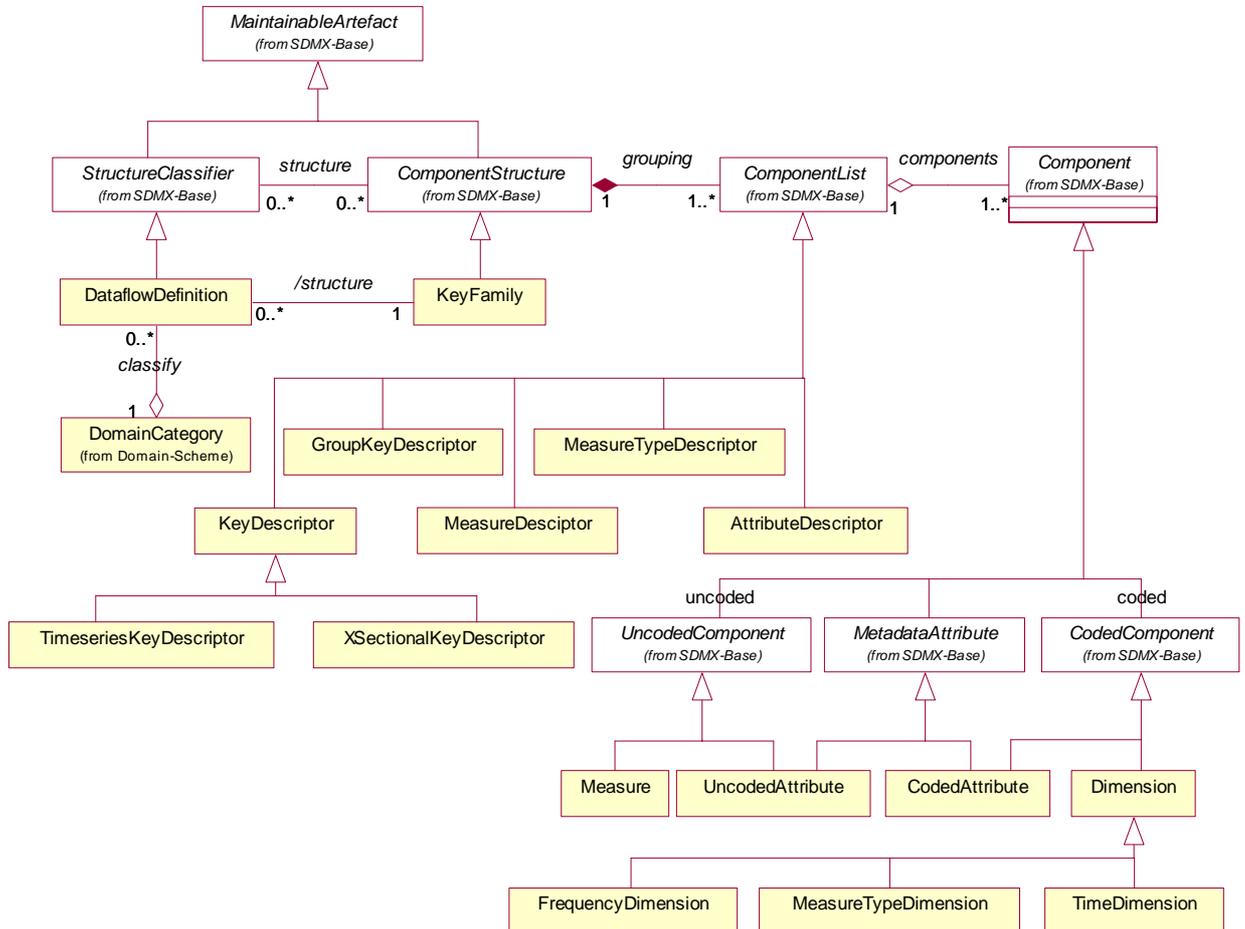
541

542 **Class diagram**


543

544

**Figure 15: Relationship class diagram of the Key Family**



545

546

**Figure 16: Inheritance class diagram of the Key Family**

547

**548 Explanation of the diagrams**
**549 a) Narrative**

550 A *KeyFamily* defines the *Dimensions*, *MetadataAttributes*, and *Measures*,  
 551 and associated *CodeLists*, that comprise the valid structure of data and metadata  
 552 that are contained in a *DataSet* which is defined by a *DataflowDefinition*.

553 Each *DomainCategory* may have many *DataflowDefinitions* specified. The  
 554 *DataflowDefinition* associates a *KeyFamily* with one or more  
 555 *DomainCategory* (possibly from different *DomainCategorySchemes*). This gives  
 556 the model the ability to state which *DataSets* are to be reported/disseminated for a

557 given domain, and which DataSets can be reported using the KeyFamily definition.  
558 The DataflowDefinition may also contain additional information such as its  
559 identifier, and the status of the data reported in a DataSet linked to the  
560 DataflowDefinition. Each DataflowDefinition must have one KeyFamily  
561 specified which defines the structure of any DataSets to be reported/disseminated.  
562 Additionally, the DataflowDefinition holds the metadata that relates to the  
563 DataSets that are reported or disseminated using this definition. Such metadata  
564 comprises information that does not change with each DataSet but is constant  
565 across the DataSets.

566 Dimension, *MetadataAttribute*, and Measure each link to the Concept that  
567 defines its name and semantic. The valid values for a Dimension or  
568 CodedAttribute, when used in this KeyFamily, are defined in a CodeList. For  
569 the timeseries profile it is necessary to identify the FrequencyDimension and the  
570 TimeDimension, and these specialised Dimensions are tightly bound in a one to  
571 one association.

572 The Dimension can be grouped in two ways:

- 573 1. There will always be a KeyDescriptor grouping that identifies all of the  
574 Dimension comprising the full key. Two specialised classes of the  
575 KeyDescriptor are identified: TimeSeriesKeyDescriptor for grouping  
576 Dimensions comprising the key components of a time series and  
577 XSectionalKeyDescriptor for grouping Dimensions comprising the key  
578 components of a cross sectional series
- 579 2. Optionally there may be multiple GroupKeyDescriptors each of which  
580 identifies the group of Dimensions that can form a partial key. The  
581 GroupKeyDescriptor must be identified (*GroupKeyDescriptor.id*) and  
582 is used in the GroupKey of the DataSet to group sets of full keys to which a  
583 *MetadataAttribute* can be attached.

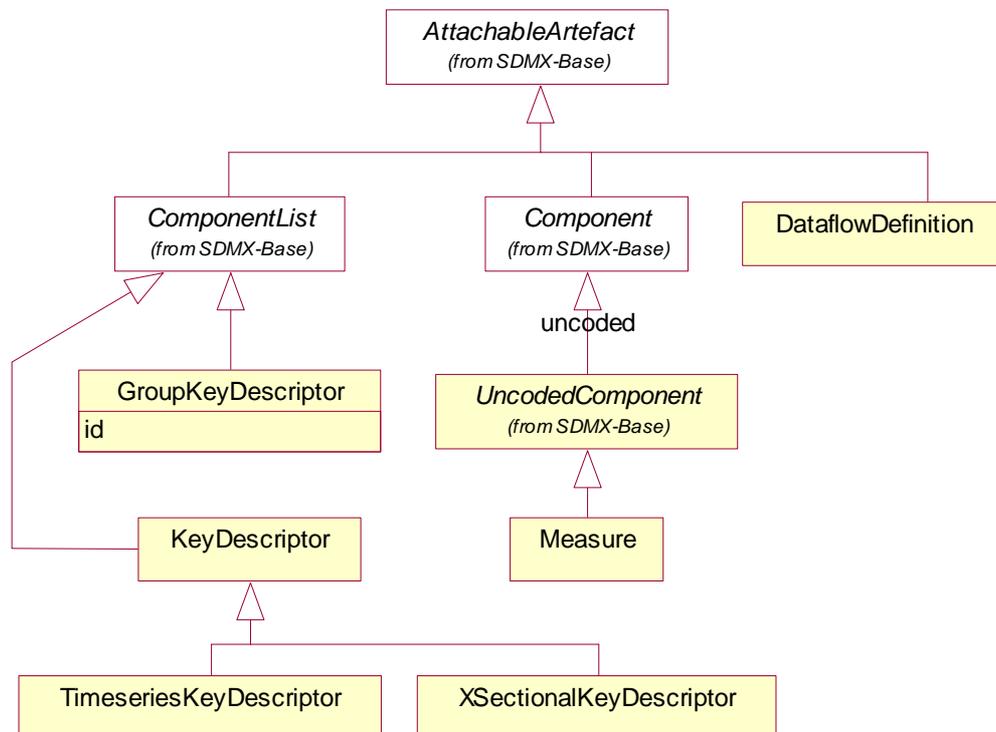
584 The Measure is the observable phenomenon and the set of Measures in the  
585 KeyFamily is grouped by a single MeasureDescriptor.

586 The *MetadataAttribute* defines a characteristic of data that are collected or  
587 disseminated and is grouped in the KeyFamily by a single  
588 AttributeDescriptor. The *MetadataAttribute* can be specified as being  
589 mandatory or optional (*Attribute.usageStatus* - inherited from  
590 *MetadataAttribute.usageStatus*)

591 The *MetadataAttribute* is an abstract class and is either a *CodedAttribute* or  
 592 an *UncodedAttribute*. With the exception of the *Measures* defined in a cross  
 593 sectional *KeyFamily*, each *MetadataAttribute* can be specified as being  
 594 attachable to a single *AttachableArtefact*.

595 The *MeasureTypeDimension* identifies the *Measures* in a cross sectional key  
 596 family, and supports the transformation of a cross sectional data set to a time series  
 597 data set and also vice versa: the *Concepts* that are the *Measures* in a cross  
 598 sectional key family are the codes in the *CodeList* attached to the  
 599 *MeasureDimension*. Furthermore, the *CodeList* attached to each of  
 600 *CodedAttribute* that define the measurement characteristics (such as unit of  
 601 measure) of each of the *Measures* in a cross sectional data set are concatenated  
 602 into a single *CodeList* that define the measurement characteristics of the single  
 603 *Measure* in the time series.

604 The diagram below shows the classes that inherit from *AttachableArtefact*.



605

606 **Figure 17: Class diagram of attachable artefacts in the key family definition**

607

608 The valid AttachableArtefacts are:

- 609 • DataflowDefinition
- 610 • TimeSeriesKeydescriptor
- 611 • XSectionalKeyDescriptor
- 612 • GroupKeyDescriptor (identified by the GroupKeyDescriptor.id)
- 613 • Measure (identified by the Concept that is the Measure)

614 b) Definitions

Class	Feature	Description
<b>Nearest MCV Term</b>		
KeyFamily Key Family		A collection of metadata concepts, their structure and usage when used to collect or disseminate data.
	<i>families</i>	Associates a data set definition to the keyfamily.
	<i>grouping</i>	An association to a set of metadata concepts that have an identified structural role in a key family.
DataflowDefinition		A definition of a data set in terms of its identifier, version, periodicity of reporting, confidentiality etc.
	<i>category</i>	Associates the domain category.
GroupKeyDescriptor	Inherits from	A set metadata concepts

Class Nearest MCV Term	Feature	Description
	ComponentList	that define a partial key of a key family.
	Id	A unique identifier.
	<i>components</i>	An association to a component in a set of components.
keyDescriptor	Inherits from ComponentList Direct sub classes TimeSeriesKeyDescriptor XSectionalKeyDescriptor	A set metadata concepts that define the full key of a key family.
TimeSeriesKeyDescriptor	Inherits from KeyDescriptor	A set metadata concepts that define the full key of a time series key family.
XSectionalKeyDescriptor	Inherits from KeyDescriptor	A set metadata concepts that define the full key of a cross sectional series key family.
	<i>components</i>	An association to a component in a set of components.
AttributeDescriptor	Inherits from ComponentList	A set metadata concepts that define the attributes of a key family
	<i>components</i>	An association to a component in a set of components.
MeasureDescriptor	Inherits from ComponentList	A set metadata concepts that define the measures of a key family.
	<i>components</i>	An association to a

Class	Feature	Description
Nearest MCV Term		
		component in a set of components.
	uniqueId	A unique identifier.
	description	A natural language description.
Dimension Dimension	Inherits from CodedComponent  Sub classes FrequencyDimension TimeDimension MeasureTypeDimension	A metadata concept used to refer to and identify a part of the key in a key scheme, such as a time series scheme.
	<i>concept</i>	An association to the metadata concept which defines the semantic of the component.
FrequencyDimension	Inherits from Dimension	A metadata concept used to refer to and identify the dimension in a time series that is the frequency dimension.
TimeDimension	Inherits from Dimension	A metadata concept used to refer to and identify the dimension in a series which, in its instance in the data set, will contain a discrete TimePeriod to which the instance of the related Measure or Measures (the Observation)

Class Nearest MCV Term	Feature	Description
		pertains.
MeasureTypeDimension	Inherits from Dimension	A metadata concept used to refer to and identify the dimension in a time series that defines the concepts for the Measure when cross sectional data is represented in a time series.
	<i>measureGrouping</i>	Associates the MeasureTypeDescriptor
MeasureTypeDescriptor		Identifies the Measures that are associated with the MeasureTypeDimension.
<i>MetadataAttribute</i> Attribute	Abstract class Sub classes: CodedAttribute UncodedAttribute	MCV A characteristic of an object or entity.
<i>UnCodedAttribute</i> Attribute	Abstract class Inherits from <i>MetadataAttribute</i>	A characteristic of an object or entity that has a free text representation.
<i>CodedAttribute</i> Attribute	Abstract class Inherits from <i>MetadataAttribute</i>	A characteristic of an object or entity that takes its values from a code list.
	assignmentStatus	Defines whether the component is mandatory

Class	Feature	Description
Nearest MCV Term		
		in the key family.
	<i>attachment</i>	Associates the attachable artefacts to which the attribute can be attached when data or metadata are reported or disseminated.
Measure	Inherits from UncodedComponent	A measure is the concept that is the phenomenon to be measured. In a data set the instance of the measure is called the observation.

615

616

## F. Data Set - timeseries

617

### Context

618

A data set comprises the collection of data values and associated metadata that are collected or disseminated according to a known key family definition.

619

620

It supports the following use cases:



Report Data



Publish Data

621



637 The `GroupKey` is a sub unit of the `SeriesKey` that has the same dimensionality as  
 638 the `SeriesKey`, but defines a subset of the `KeyValues` of the `SeriesKey`. Its sub  
 639 dimension structure is defined in the `GroupKeyDescriptor` of the `KeyFamily`  
 640 identified by the same `id` as the `GroupKey`. The `id` identifies a “type” of group and  
 641 the purpose of the `GroupKey` is to identify a set of individual `SeriesKey` so that one  
 642 or more `MetadataAttribute` can be attached at this group level. There can be  
 643 many types of groups in a `DataSet`.  
 644 Each of `DataSet`, `Key`, and `Observation` can have zero or more  
 645 `AttributeValue` that defines some metadata about the object to which it is  
 646 associated.

647 b) Definitions

Class Nearest MCV Term	Feature	Description
<code>DataSet</code> Data Set		Any organised collection of data.
	<code>reportingPeriod</code>	A specific time period in a known system of time periods that identifies the period of a report.
	<code>dataExtractionDate</code>	A specific time period that identifies the date and time that the data are extracted from a data source.
	<i>valueFor</i>	Associates a data set definition and thereby a key family to the data set.
<code>Key</code>	Abstract class Sub classes <code>TimeSeriesKey</code> <code>GroupKey</code>	

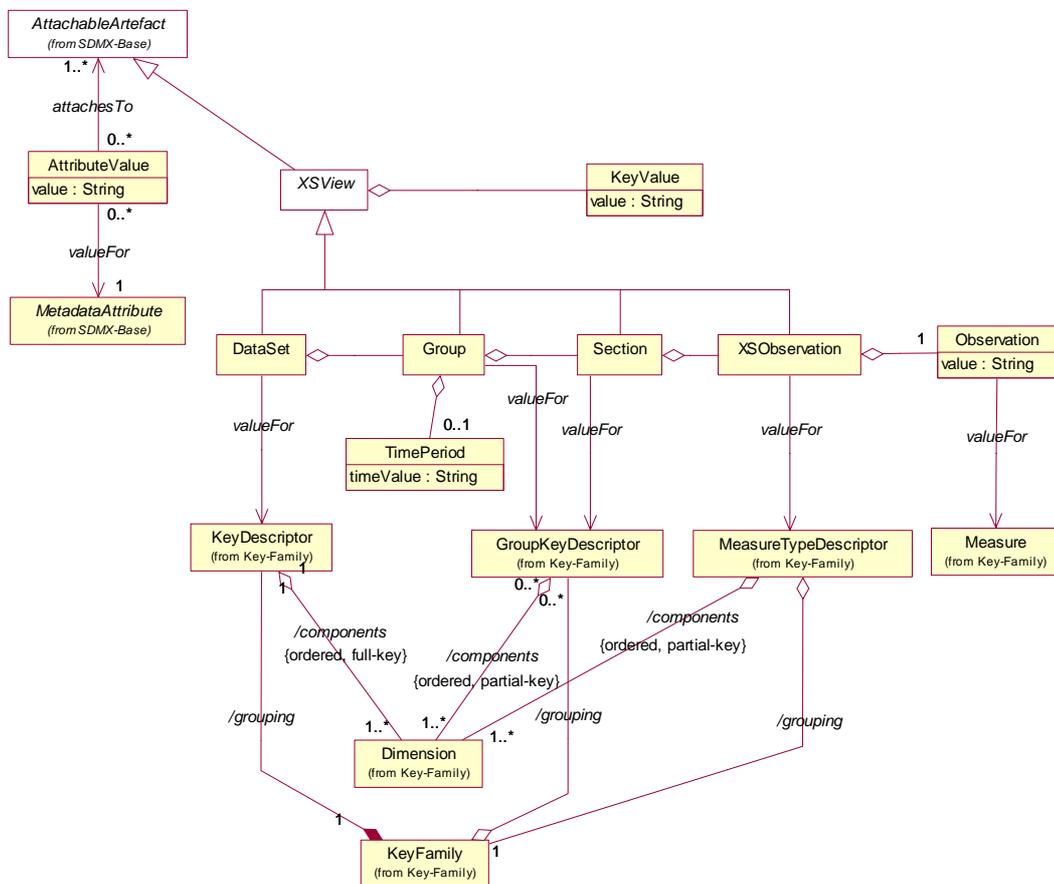
Class	Feature	Description
Nearest MCV Term		
	<i>valueFor</i>	Associates the individual Key Values that comprise the Key.
KeyValue		The value of a component of a Key such as the value of the instance a Dimension in a multidimensional structure, like the key descriptor of a key family.
	value	The value of the key component.
	<i>valueFor</i>	Associates a dimension to the key value, and thereby to the metadata concept that is the semantic of the dimension.
GroupKey	Inherits from Key	A set of key values that comprise a partial key, of the same dimensionality as the series key, and which group together a set of series keys (ie, the scope of the <code>SeriesKeys</code> identified by the <code>GroupKey</code> is defined using the same <code>Dimensions</code> as the <code>SeriesKey</code> ).

Class Nearest MCV Term	Feature	Description
	<i>valueFor</i>	Associates the group key descriptor defined in the key family.
	<i>groups</i>	Associates a set of series key.
TimeSeriesKey	Inherits from Key	The TimeSeriesKey comprises the product of values of all the Dimensions comprising the full key of a series (often called the cartesian product).
TimePeriod		A specific time period in a known system of time periods.
	<i>timeValue</i>	The value of a time period.
Observation Observation		The value, at a particular period, of a particular variable.
	<i>value</i>	The value of the observation.
	<i>valueFor</i>	Associates the measure defined in the key family.
AttributeValue Attribute Instance		The value of an attribute, such as the instance of a coded attribute or of an uncoded attribute in a structure such as a key family.

Class	Feature	Description
Nearest MCV Term		
	value	The value of the attribute instance.
	valueFor	Associates an attribute defined in the key family.
	attachesTo	Associates the attribute to the object to which it is attached.

648

 649 **G. Data Set – cross sectional**

 650 **Class diagram**


651

652

**Figure 19: Class diagram of the cross sectional Data Set**

653

**Explanation of the diagram**

654

 a) Narrative

655

A cross sectional DataSet is a collection of a set of XSObservations that share the same dimensionality, which is specified by a set of unique Dimension defined in the KeyDescriptor of the KeyFamily, together with associated AttributeValues that define specific characteristics about the XSObservation, Section, Group, or DataSet.

660

The Group is an artefact that allows compression of data in that it allows a partial key to be defined (according to the GroupKeyDescriptor in the KeyFamily), and to which attributes can be attached. Importantly, if there is a TimePeriod associated with the cross sectional view, then it is always associated with the Group.

664

A Group can contain a number of Sections, each described by a partial key according to a GroupKeyDescriptor in the KeyFamily. Each Section has one or more XSObservation, each of which comprises an Observation and its related Measure concept. The MeasureTypeDescriptor of the KeyFamily defines the Measures for which Observation values are expected, together with appropriate attached attributes.

670

 b) Definitions

Class	Feature	Description
Nearest MCV Term		
XSVIEW	Abstract class Sub classes DataSet Group Section	
Group	Inherits from XSVIEW	A Section in a cross sectional view

Class	Feature	Description
Nearest MCV Term		
	<i>valueFor</i>	Associates the GroupKeyDescriptor that defines the partial key.
Section	Inherits from XSVIEW	A Section in a cross sectional view
	<i>valueFor</i>	Associates the GroupKeyDescriptor that defines the partial key.
XSObservation	Inherits from XSVIEW	An Observation in a cross view
	<i>valueFor</i>	Associates the MeasureTypeDescriptor or that defines the Measures.

671

672 **V. EXAMPLES**

673 **A. Introduction**

674 UML collaboration diagrams are drawn for the example data and metadata  
 675 shown below. These examples show a consistent set of metadata for  
 676 reporting the example data set. These metadata are neither comprehensive  
 677 nor complete, but are sufficiently complete for this example:

- 678 • Domain scheme
- 679 • Concept scheme
- 680 • Key family

681 **B. Example metadata and data**

682 **Domain scheme**

<b>BIS Domain Scheme</b>		
<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>
Real Sector		
	National Accounts	
	Others	
Fiscal Sector		
	Central Government Debt	
	Others	
Financial Sector		
	Interest Rates	
	Others	
External Sector		
	External Debt	
	International Trade	
		Trade In Goods
		Trade In Services

683

 684 **Metadata concept scheme**

685

<b>BIS Concept Scheme</b>	
<b>Identifier</b>	<b>Label</b>
TIME	Time
FREQ	Frequency
JD_TYPE	Data Type (amounts outstanding net disbursement or charges)
JD_CATEGORY	Debt category
VIS_CTY	Vis-à-vis country
AVAILABILITY	Availability
COLLECTION	Collection indicator
DECIMALS	Decimals
OBS_CONF	Observation confidentiality
OBS_STATUS	Observation status
OBS_PRE_BREAK	Pre-break observation value
UNIT	Unit
UNIT_MULTIPLIER	Unit multiplier
OBS_VALUE	Observation value

686

 687 **Key family**

688     Name: BIS\_JOINT\_DEBT

689     Dataset Definition: CREDITOR\_JOINT\_DEBT

690     Domain Category: EXTERNAL\_DEBT

 691 *Dimensions*

<b>Dimensions - Key</b>		
<b>Type</b>	<b>Concept</b>	<b>Code list</b>

Time Dimension	TIME	
Frequency Dimension	FREQ	CL_FREQ
Dimension	JD_TYPE	CL_JD_TYPE
Dimension	JD-CATEGORY	CL_JD_CATEGORY
Dimension	VIS-CTY	CL_BIS_IF-REF_AREA
<b>Dimensions- Group Key: Sibling</b>		
<b>Type</b>	<b>Concept</b>	<b>Code list</b>
Dimension	JD_TYPE	CL_JD_TYPE
Dimension	JD-CATEGORY	CL_JD_CATEGORY
Dimension	VIS-CTY	CL_BIS_IF-REF_AREA

 692 *Measures*

<i>Concept</i>
OBS_VALUE

693

694 *Attributes*

<b>Cell</b>			
OBS_VALUE			
<b>Attributes</b>			
<b>Concept</b>	<b>Assignment status</b>	<b>Attachment level</b>	<b>Code list</b>
AVAILABILITY	Mandatory	Key	CL_AVAILABILITY
COLLECTION	Mandatory	Sibling group	CL_COLLECTION
DECIMALS	Mandatory	Sibling group	CL_DECIMALS
OBS_CONF	Conditional	Measure	CL_BIS_OBS-CONF
OBS_STATUS	Mandatory	Measure	CL_OBS-STATUS
OBS_PRE_BREAK	Conditional	Measure	
UNIT	Mandatory	Sibling group	CL_BIS_UNIT
UNIT_MULTIPLIER	Mandatory	Sibling group	CL_UNIT_MULT

695

696 **Data set**

697

Dataset Definition: CREDITOR\_JOINT\_DEBT

Dataset Id: JD014

Version: 1.0

Data extraction date = 11 March 2003 09:30

**Key:**

Dimensions: FREQ=M;JD\_TYPE=P;JD\_CATEGORY=A;VIS\_CTY=MX

Attributes: COLLECTION=B

Date/Time	Observation value	Attributes
2001-01-01	3.14	OBS_STATUS=A
2000-02-01	3.14	OBS_STATUS=A
2000-03-01	4.29	OBS_STATUS=A
2000-04-01	6.04	OBS_STATUS=A

698

**Group Key: Sibling**

Dimensions: JD\_TYPE=P;JD\_CATEGORY=A;VIS\_CTY=MX

Attributes:

AVAILABILITY=A

DECIMALS=2

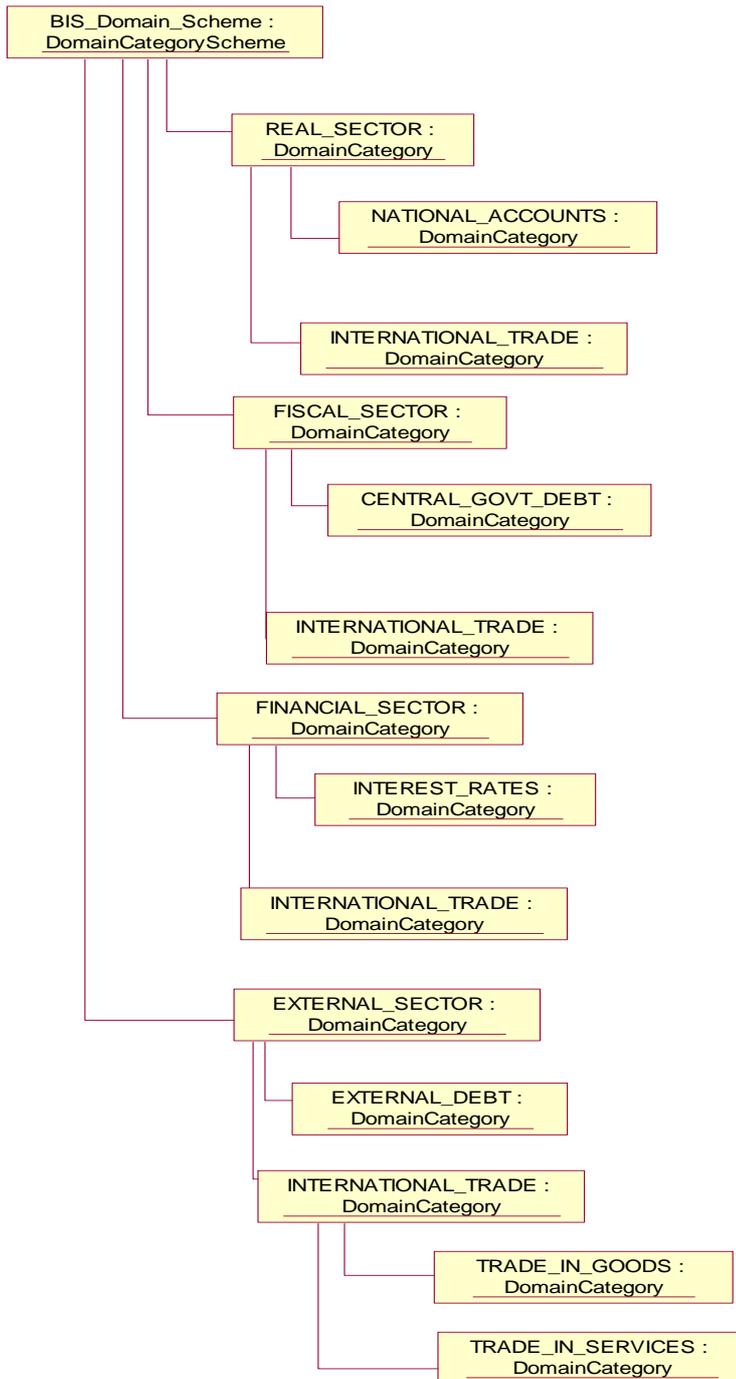
UNIT=USD

UNIT\_MULT=5

699

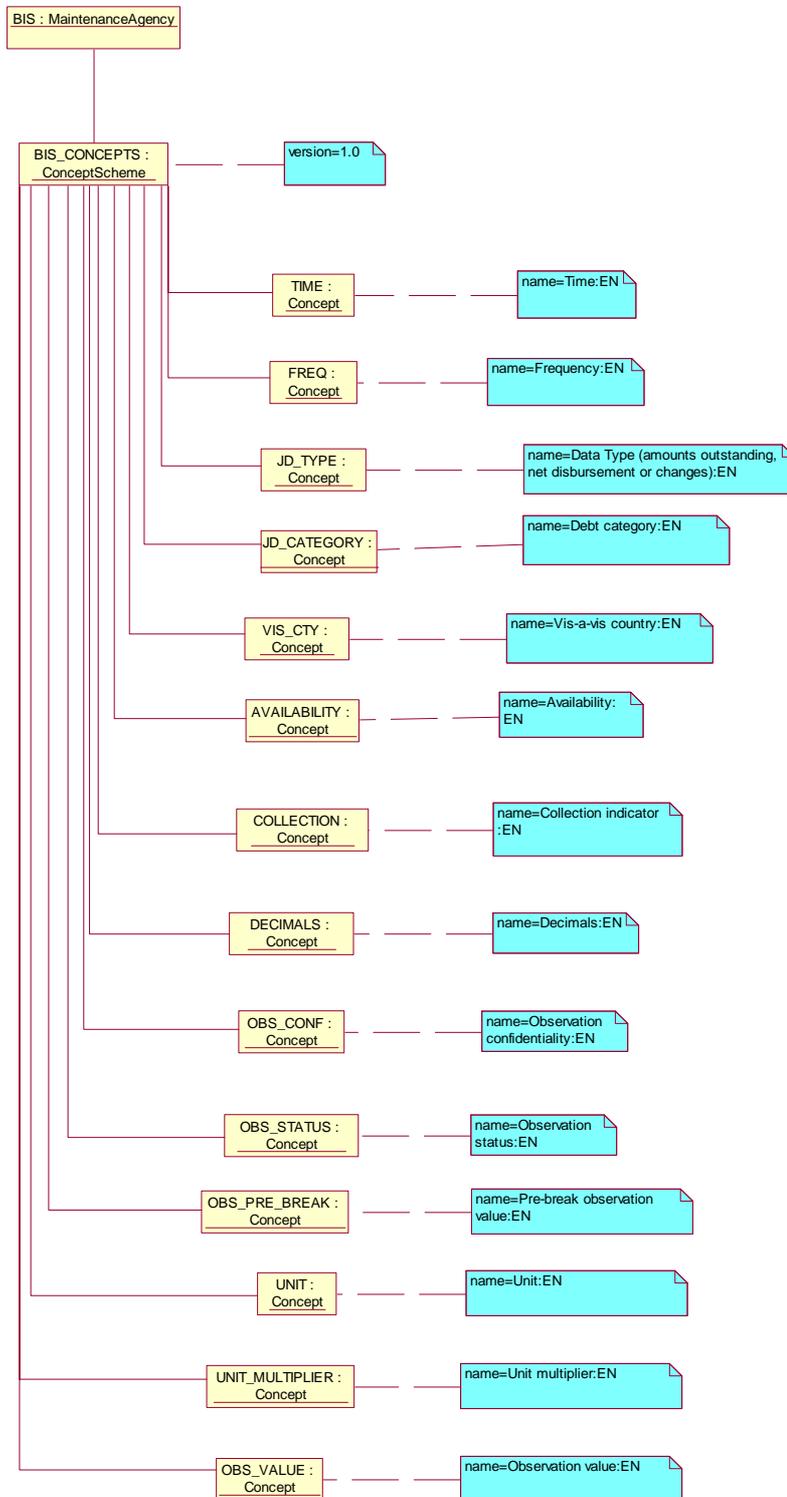
700 **C. Collaboration diagrams**

701 **Domain scheme**

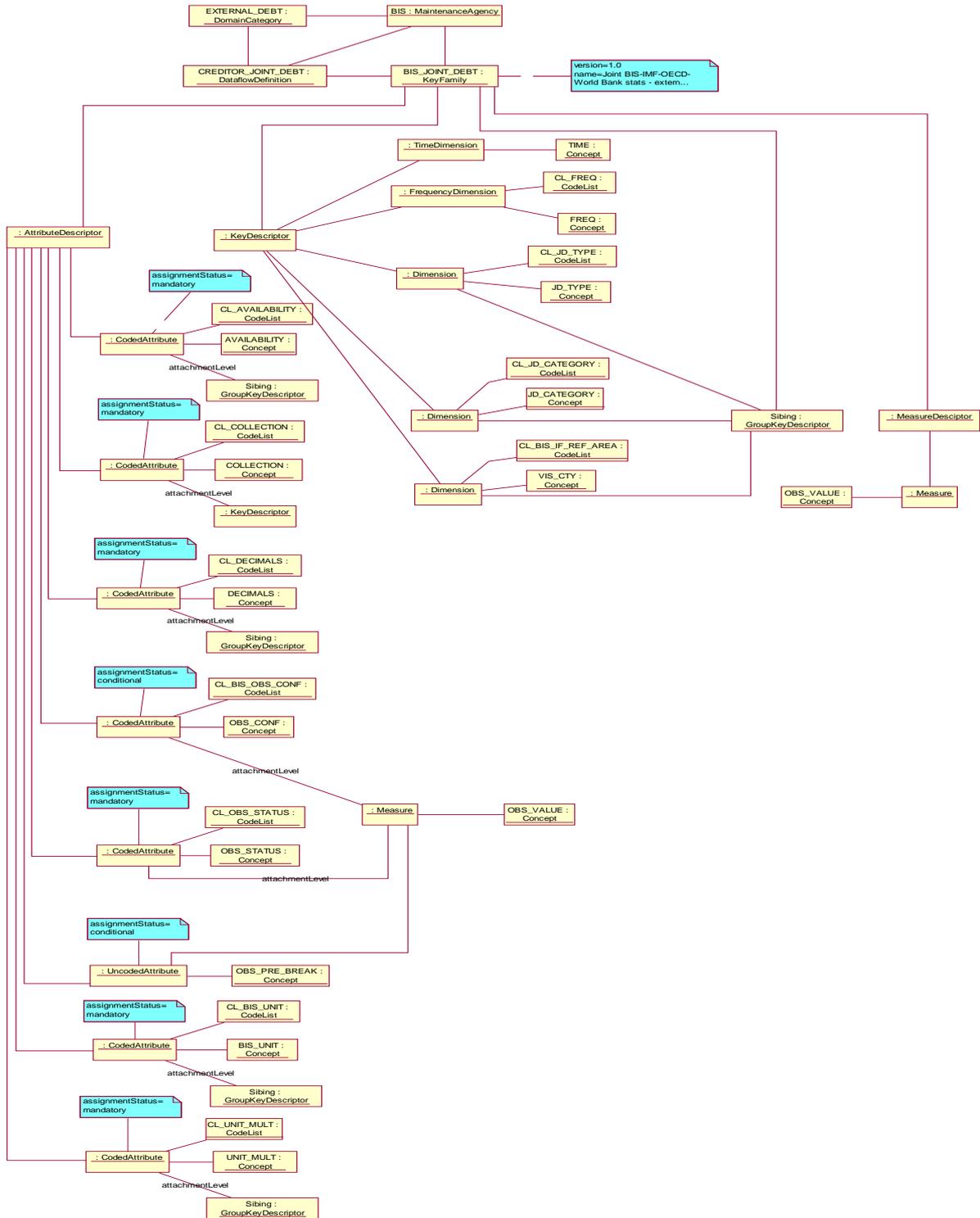


702

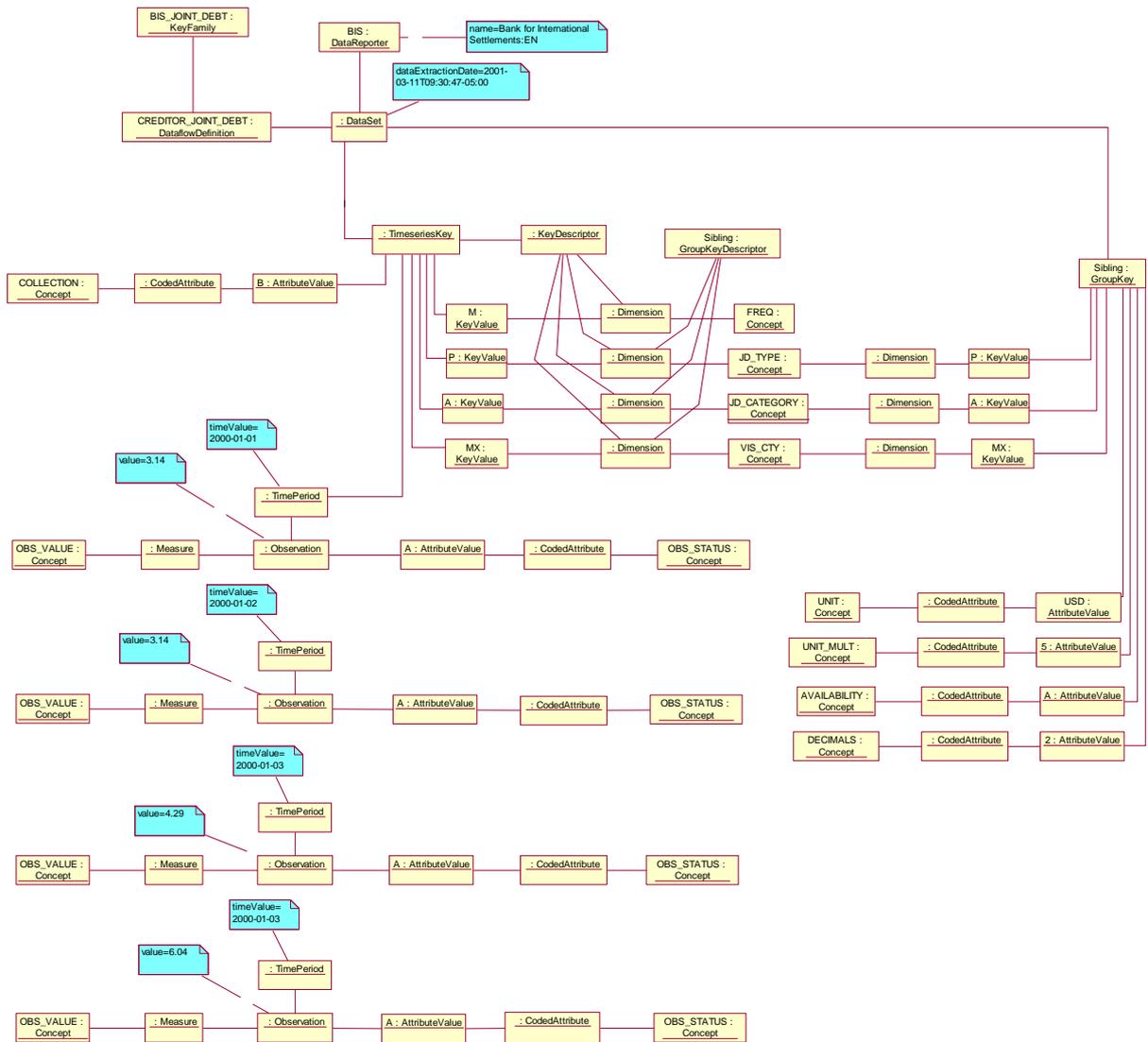
703 Metadata concept scheme



705 Key family



707 Data set



708

709

710

711

712

713

714

715 **VI. APPENDIX I: A SHORT GUIDE TO UML IN THE SDMX INFORMATION MODEL**

716 **A. Scope**

717 The scope of this document is to give a brief overview of the diagram notation used  
718 in UML. The examples used in this document have been taken from the SDMX UML  
719 model.

720 **B. Use cases**

721 In order to develop the data models it is necessary to understand the functions that  
722 require to be supported. These are defined in a use case model. The use case model  
723 comprises actors and use cases and these are defined below.

724 The **actor** can be defined as follows:

725 *“An actor defines a coherent set of roles that users of the system can play when*  
726 *interacting with it. An actor instance can be played by either an individual or an*  
727 *external system”*

728 The actor is depicted as a stick man as shown below.



Data Reporter

729

730 **Figure 20: Actor**

731 The **use case** can be defined as follows:

732 *“A use case defines a set of use-case instances, where each instance is a*  
733 *sequence of actions a system performs that yields an observable result of value*  
734 *to a particular actor”*



Report Data

735

736 **Figure 21: Use case**

737 Actors and use cases are joined by an association.

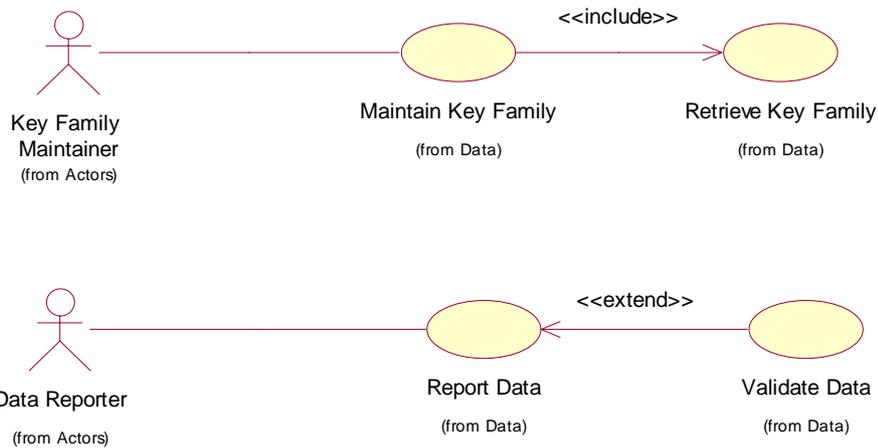


738

739

**Figure 22: Actor and use case**

740 Some use cases can be invoked directly by other use cases, either as an extension  
 741 (optional), or as an inclusion (always occurs). These are documented as <<name>>  
 742 on the use case association.



743

744

**Figure 23: Extend and include use cases**

745

### C. Classes and attributes

746

#### General

747

A class is something of interest to the user. The equivalent name in an entity-

748

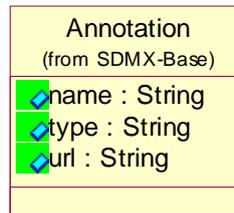
relationship model (E-R model) is the entity and the attribute. In fact, if the UML is

749

used purely as a means of modelling data, then there is little difference between a

750

class and an entity.



751

752

**Figure 24: Class and its attributes**

753 Figure 5 shows that a class is represented by a rectangle split into three  
 754 compartments. The top compartment is for the class name, the second is for  
 755 attributes and the last is for operations. Only the first compartment is mandatory. The  
 756 name of the class is `Annotation`, and it belongs to the package `SDMX-Base`. It is  
 757 common to group related artefacts (classes, use-cases, etc.) together in packages. .  
 758 `Annotation` has three “String” attributes – `name`, `type`, and `url`. The full  
 759 identity of the attribute includes its class e.g. the `name` attribute is  
 760 `Annotation.name`.

761 Note that by convention the class names use `UpperCamelCase` – the words are  
 762 concatenated and the first letter of each word is capitalized. An attribute uses  
 763 `lowerCamelCase` - the first letter of the first (or only) word is not capitalized, the  
 764 remaining words have capitalized first letters.

### 765 **Abstract class**

766 An abstract class is drawn because it is a useful way of grouping classes, and avoids  
 767 drawing a complex diagram with lots of association lines, but where it is not foreseen  
 768 that the class serves any other purpose (i.e. it is always implemented as one of its  
 769 sub classes). In the diagram in this document an abstract class is depicted with its  
 770 name in italics, and coloured white.



771

772

**Figure 25: Abstract and concrete classes**

773

## **D. Associations**

774

### **General**

775 In an E-R model these are known as relationships. A UML model can give more  
 776 meaning to the associations than can be given in an E-R relationship. Furthermore,

777 the UML notation is fixed (i.e. there is no variation in the way associations are  
 778 drawn). In an E-R diagram, there are many diagramming techniques, and it is the  
 779 relationship in an E-R diagram that has many forms, depending on the particular E-R  
 780 notation used.

### 781 **Simple association**



782

783 **Figure 26: A simple association**

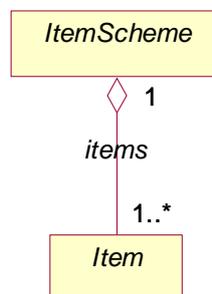
784 Here the `Dimension` class has an association with the `Concept` class. The diagram  
 785 shows that a `Dimension` can have an association with only one `Concept` (1) and  
 786 that a `Concept` can be linked to many `Dimensions` (0..\*). The association is  
 787 sometimes named to give more semantics.

788 In UML it is possible to specify a variety of “multiplicity” rules. The most common  
 789 ones are:

- 790 • Zero or one (0..1)
- 791 • Zero or many (0..\*)
- 792 • One or many (1..\*)
- 793 • Many (\*)
- 794 • Unspecified (blank)

### 795 **Aggregation**

796 *Simple Aggregation*



797

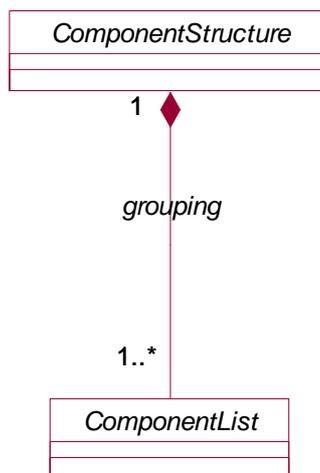
798 **Figure 27: A simple aggregate association**

799 An association with an aggregation relationship indicates that one class is a  
 800 subordinate class (or a part) of another class. In an aggregation relationship, the

801 child class instance can outlive its parent class. To represent an aggregation  
 802 relationship, draw a solid line from the parent class to the subordinate class, and  
 803 draw an unfilled diamond shape on the parent class's association end. Figure 8  
 804 shows an example of an aggregation relationship between an `ItemScheme` and an  
 805 `Item`.

806 *Composition aggregation*

807 The composition aggregation relationship is just another form of the aggregation  
 808 relationship, but the child class's instance lifecycle is dependent on the parent class's  
 809 instance lifecycle. In Figure 9, which shows a composition relationship between a  
 810 `ComponentStructure` class and a `ComponentList` class, notice that the  
 811 composition relationship is drawn like the aggregation relationship, but this time the  
 812 diamond shape is filled.

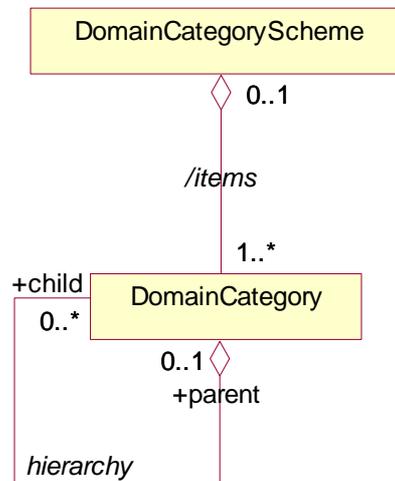


813

814 **Figure 28: An aggregate association by composition**

815 **Association names and association-end (role) names**

816 It can be useful to name associations as this gives some more semantic meaning to  
 817 the model i.e. the purpose of the association. It is possible for two classes to be  
 818 joined by two (or more) associations, and in this case it is extremely useful to name  
 819 the purpose of the association. Figure 10 shows a simple aggregation between  
 820 `DomainCategoryScheme` and `DomainCategory` called *items*, and another  
 821 between `DomainCategory` called *hierarchy*.



822

823

**Figure 29: Association names and end names**

824 Furthermore, it is possible to give role names to the association-ends to give more  
825 semantic meaning – such as parent and child in a tree structure association.

### 826 **Navigability**

827 Associations are navigable in both directions. For a data model it is not necessary to  
828 give any more semantic than this. However, if there is an intent to implement the  
829 model in a database or message structure, it can be useful to identify when the  
830 association is not navigable (i.e. there is no intention or necessity to implement a  
831 navigation in a particular direction).



832

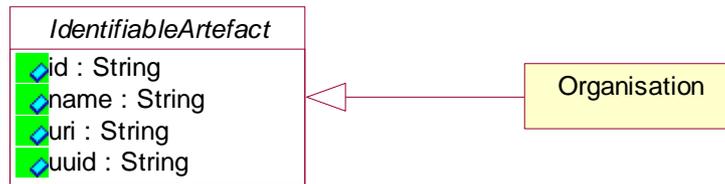
833

**Figure 30: One way association**

834 Here it is possible to navigate from A to B, but there is no need (e.g. no functional  
835 need) to navigate from B to A using this association.

### 836 **Inheritance**

837 Sometimes it is useful to group common attributes and associations together in a  
838 super class. This is useful if many classes share the same associations with other  
839 classes, and have many (but not necessarily all) attributes in common. Inheritance is  
840 shown as a triangle at the super class.



841

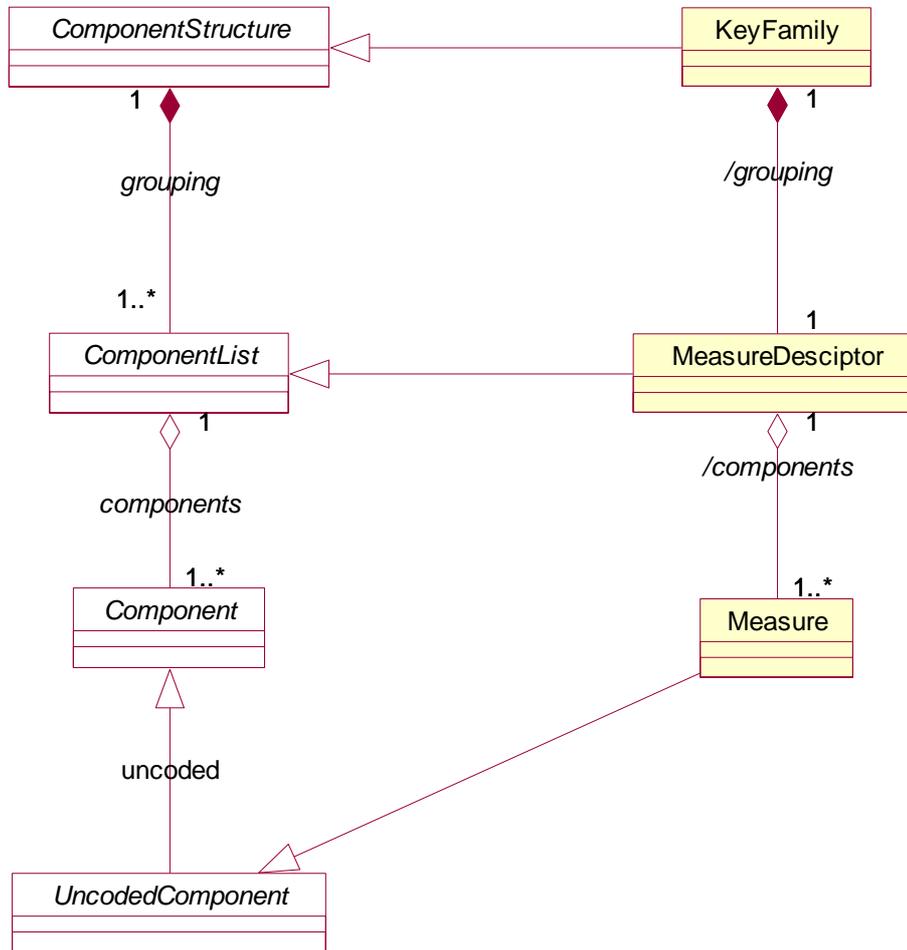
842

**Figure 31: Inheritance**

843 Here the `Organisation` is derived from *IdentifiableArtefact*, which is an  
 844 abstract superclass. This class inherits the attributes and associations of the super  
 845 class. Such a super class can be a concrete class (i.e. it actually exists), or an  
 846 abstract class.

847 **Derived association**

848 It is often useful in a relationship diagram to show associations between sub classes  
 849 that are derived from the associations of the super classes from which the sub  
 850 classes inherit. A derived association is shown by “/” preceding the association name  
 851 e.g. */name*.



852

853

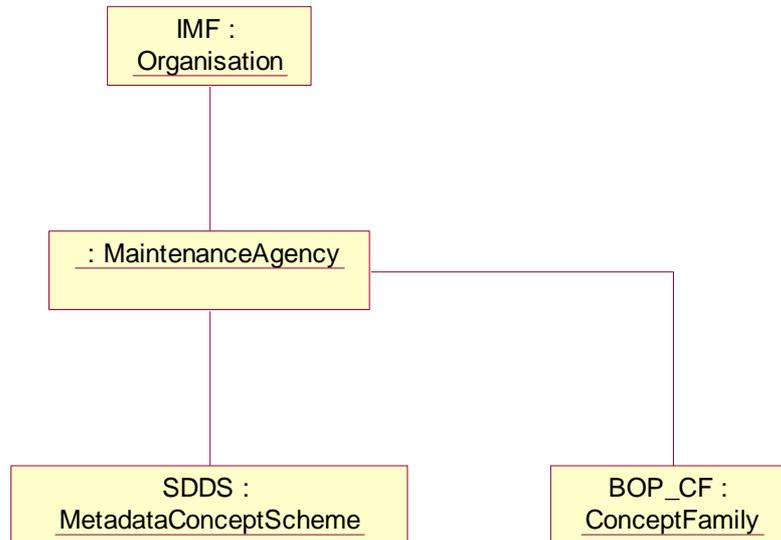
**Figure 32: Derived associations**

854 Note that the multiplicity at the association ends can be made more restrictive in the  
 855 derived association. In the example above the *grouping* association is 1..\* whereas  
 856 the */grouping* association is 1.

857

### E. Collaboration diagram

858 A collaboration diagram shows an example of an instance of the classes (an instance  
 859 of a class is called an object). An instance of a class is class with a unique name.



860

861

**Figure 33: Collaboration diagram**

862 Here there is an object of the `Organisation` class called `IMF`. In its role as  
 863 `MaintenanceAgency` the `IMF` maintains a `MetadataConceptScheme` called  
 864 `SDDS` and `ConceptFamily` called `BOP_CF`.

865 Sometimes it is not useful to give a name to an object. Here the object is still an  
 866 instance of the class (e.g. `MaintenanceAgency`) but there is no name – so it  
 867 means “any” or “it does not matter which name”.

868 Objects are joined together using an object link.

869

870

871

872 **VII. APPENDIX II: KEY FAMILIES - A TUTORIAL**

873 **A. Introduction**

874 This document is intended to explain "key families" to those who are completely  
875 unfamiliar with the concept. Key families are an important part of the SDMX family of  
876 standards for exchanging statistical data, and they are modelled and explained in  
877 much greater detail in other documents. However, those documents are not written to  
878 explain the basics, and will make difficult reading for those new to the idea. This  
879 document provides a basic tutorial, to help provide the basic level of understanding  
880 needed to make sense of the SDMX standards.

881 **B. What is a Key Family?**

882 In order to answer this question, we need to look at statistical data. Statistical data is  
883 represented with numbers, such as:

884 17369

885 If you are presented with a number - as above - you will have no idea of what it  
886 actually represents. You know that it is a piece of statistical data, and therefore is a  
887 measurement of some phenomenon - also known as an "observation" - but you can't  
888 tell from the number alone what it is a measurement of. A number of questions come  
889 immediately to mind:

- 890 - What is the subject of the measurement?
- 891 - What units does it measure in?
- 892 - What country or geographical region, if any, does it apply to?
- 893 - When was the measurement made?

894 The list of questions is potentially endless. Behind each of these questions is a  
895 particular idea, or "concept", which is used to describe the data. In our questions  
896 above, these descriptor concepts are Subject, Unit of measure, Country, and Time. If  
897 I tell you the answers to these questions, the data will begin to make sense:

- 898 - the Subject is "total population"
- 899 - the Unit of measure is "thousands of people"
- 900 - the Country is "Country ABC"
- 901 - the Time is "1 January 2001"

902 This is a simplified and fictional example, but it does demonstrate how we can begin  
903 to make sense of statistical data with a set of descriptor concepts. We now know that  
904 our number represents the fact that the total population of Country ABC on 1  
905 January, 2001, was 17,369,000.

906 The simplest explanation of a key family is that it is a set of descriptor concepts,  
907 associated with a set of data, which allow us to understand what that data means.  
908 There is more to it, however.

### 909 **C. Grouping Data**

910 Numbers are often grouped together in various ways, to serve as useful packages of  
911 information. One very common approach is to have a set of observations - known as  
912 a "series", or a "time series" - made over time. This allows us to see trends in the  
913 phenomenon being measured. Thus, if I measure the total population in Country ABC  
914 on 1 January of every year, I can see whether the population is growing or declining.

915 A time series always has a "frequency". This is a descriptor concept which describes  
916 the intervals of time between observations. Usually, this is a regular interval, so that  
917 the frequency can be expressed as "annual" or "monthly" or "weekly". Sometimes,  
918 the intervals are irregular. Notice that a single observation does not have a frequency  
919 - only series of observations have frequencies. Frequency is an example of a  
920 descriptor concept which only applies to series of data.

921 There are other, higher-level groupings of data as well. A number of series are often  
922 grouped together into a "Group". Traditionally, the Group was known as a "Sibling  
923 Group", and it contained a set of Series which were identical except that they were  
924 measured with different frequencies. Thus, a given phenomenon would be measured  
925 as daily, monthly, and annually, and these Series, taken together, would be a "Sibling  
926 Group".

927 It is possible to have Groups which have variable values for descriptor concepts  
928 other than frequency, however: if I want to express the US daily exchange rate for all  
929 of the world's currencies over the past year, I have a different kind of group. All of the  
930 "frequency" descriptors would be the same - "daily" - but the descriptor concept  
931 which gives the "foreign currency" would be different for each series.

932 There is also a higher level of package known as a "Data Set". This represents a set  
933 of data that may be made up of several Groups. Typically, it is maintained and  
934 published by an agency, so that it becomes a known source of statistical data.

935 A basic structure is emerging: We have Observations, grouped into Series, which are  
936 grouped into Groups, which are grouped into Data Sets.

937 **Note:** It should be mentioned that there is another way of packaging Observations,  
938 which we call "cross-sectional" data. In cross-sectional data, a large number of  
939 related Observations are presented for a single point or period in time. This  
940 organization of data is very similar to Time Series data in the way a set of descriptor  
941 concepts can be associated with it. A Key Family can be used to describe both cross-  
942 sectional and time series data. For the purposes of this part of the tutorial, however,  
943 we will focus on time series data. Once we have described the Key Family for time  
944 series data, we will go back and see how cross-sectional data are structured.

945

---

946 ***What is a key family? (Answer #1)***

947 A key family is a way of associating a set of descriptor concepts with a specific set of  
948 statistical data, as well as a technique for packaging or structuring that set of data  
949 into groups and sub-groups. This is only one way of understanding the structure and  
950 meaning of statistical data, but it provides us with a solid, generic model.

---

951

952 **D. Attachment Levels**

953 Some descriptor concepts are not meaningful at the Observation level, but only at a  
954 higher level. The example we saw earlier was frequency, which means nothing for a  
955 single Observation, but has meaning when applied to a Series of Observations. This  
956 is because it represents the interval of time between Observations. Time, on the  
957 other hand, is meaningful at the Observation level - every Observation is associated  
958 with a specific point or period in Time. Key families provide information about the  
959 level at which a particular descriptor concept is attached: at the Observation level,  
960 the Series level, the Group level, or the Data Set level. This is known as the  
961 "attachment level" of the descriptor concept.

962

963 If we think about Groups, particularly, we can see how this works. Within a group,  
964 some descriptor concepts have values that are the same for all Series within the  
965 Group, while other descriptor concepts are changeable. For the Group described  
966 above, of all US exchange rates measured daily for all of the world's currencies, the  
967 descriptor concepts of Subject ("US exchange rate") and Frequency ("daily") will be

968 the same for all members of the Group. The descriptor concept "Foreign Currency",  
969 however, will change for each Series within the group: there will be a Series for  
970 "Swiss Francs," a Series for the "Euro," a Series for "New Zealand dollars," etc.

971 The rule is that descriptor concepts are "attached" to the grouping level where they  
972 become variable. Thus, if, within a single set of data, all the contents of a Series  
973 share a single value for a descriptor concept, then that descriptor concept should be  
974 attached at the Series level. This rule also assumes that the chosen level is the  
975 highest structural level where all sub-groups will share the same value. (While it is  
976 true that all Series in a Group where the country is "Switzerland" share a single  
977 value, if every Group in the Data Set would always also have the value "Switzerland"  
978 for country, then the attachment level should be the Data Set, not the Group.)

979 Attachment levels of descriptor concepts are always at least at the level where the  
980 concept is meaningful: thus, you cannot attach the descriptor concept frequency at  
981 the Observation level, because as a concept it only operates at the level of Series  
982 (that is, with multiple Observations made over time).

### 983 **E. Keys**

984 A "key family" is so called because of the term "key". "Key" refers to the values for  
985 the descriptor concepts which describe and *identify* a particular set of data. Let's take  
986 a simple example:

987 I have a set of statistical data which uses the following descriptor concepts:

- 988 - Time
- 989 - Frequency
- 990 - Topic
- 991 - Country

992 Time is always attached at the Observation level - the value for Time is the time at  
993 which the Observation was made. Time - because it is a concept connected to all  
994 statistical data - does not form part of the key. The other descriptor concepts -  
995 frequency, topic, and country - are all attached at the series level. For any given  
996 Series of Observations, they will all have a single value.

997 If we have a Series of data which is the monthly measurement of the total population  
998 of Country ABC, we will have a key made up of the following values for each  
999 descriptor concept:

1000       Frequency = "monthly"

1001           Topic = "total population"

1002           Country = "Country ABC"

1003   This set of values - "Monthly - total population - Country ABC" is the "key" for this  
1004   data Series: it identifies what the data is.

1005   Keys are most often associated with data at the Series level, but they also exist at  
1006   other levels. For example, we could enlarge our example to be a Group including the  
1007   monthly total population data for all of the countries in the world. At the Group level,  
1008   Frequency would have a value of "monthly", and Topic would have a value of "total  
1009   population", but we would not specify the Country descriptor concept, because it  
1010   would change from Series to Series. The key for the Group is known as a "Group  
1011   Key" - it identifies what the Group is, rather than identifying the Series. (In order to  
1012   completely understand the Group, of course, we also need to know which descriptor  
1013   concepts are changeable - in this case, Country.)

1014   The key values are attached at the Series level, and are given in a fixed sequence.  
1015   Frequency is the first descriptor concept, and the other concepts are assigned an  
1016   order for that particular data set. This makes it much easier to share and understand  
1017   statistical data.

1018   If you look back to our initial use of this example, you will notice that we have not  
1019   been discussing the "Unit of measure" descriptor concept. This is because the "key"  
1020   only contains values for those descriptor concepts which identify the data. If we have  
1021   the measurements made in thousands or in millions, the data are the same - they  
1022   can be derived from one another by simply multiplying the numbers in the data by the  
1023   appropriate conversion factor.

1024   This points out a major distinction between the two types of descriptor concepts: the  
1025   ones which both identify and describe the data are called "dimensions", and those  
1026   which are purely descriptive are called "attributes". Only "dimensions" - that is, the  
1027   descriptor concepts which also identify the data - are used in the "key", because the  
1028   "key" is fundamentally a way of identifying a set of data.

## 1029           **F. Code Lists and Other Representations**

1030   In order to be able to exchange and understand data, a key family tells us what the  
1031   possible values for each dimension are. This list of possible values is known as a  
1032   "code list." Each value on that list is given a language-independent abbreviation - a  
1033   "code" - and a language-specific description. This helps us avoid problems of

1034 translation in describing our data: the code can be translated into descriptions in any  
1035 language without having to change the code associated with the data itself.  
1036 Wherever possible, the values for code lists are taken from international standards,  
1037 such as those provided by ISO for countries and currencies.

1038 As stated, dimensions are always represented with codes. Attributes are sometimes  
1039 represented with codes, but sometimes represented by numeric or free-text values.  
1040 This is allowed because the attributes do not serve an identification function, but  
1041 merely describe the data.

1042

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1043 ***What is a key family? (Answer #2)***

1044 We now have a more sophisticated understanding of a what a key family does: it  
1045 specifies a set of concepts which describe and identify a set of data. It tells us which  
1046 concepts are dimensions (identification and description), and which are attributes  
1047 (just description), and it gives us an attachment level for each of these concepts,  
1048 based on the packaging structure (Data Set, Group, Series, Observation). It also tells  
1049 us which code lists provide possible values for the dimensions, and gives us the  
1050 possible values for the attributes, either as code lists or as numeric or free text fields.

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1051

1052 **G. Cross-Sectional Data Structures**

1053 Given the explanation of Key Families thus far, we understand that a Key Family  
1054 associates descriptor concepts with data, some of which also serve to identify the  
1055 data – the “dimension” concepts which make up the Key.

1056 Cross-sectional data structures do not apply a different set of concepts to the data:  
1057 the same concepts still apply in describing and identifying the data. It attaches the  
1058 concepts to the data differently, to create a different presentation of the data.

1059 If we go back to our earlier example, we had the following concepts:

- 1060 - Time
- 1061 - Frequency
- 1062 - Topic
- 1063 - Country

1064 If we want to take a set of data which is described and identified by this set of  
1065 concepts, and present it in a cross-sectional fashion, we would not change these

1066 concepts – we would merely change the way in which they are represented – that is,  
1067 attached – to the data structure.

1068 Take, as an example, the total population of each country in the world on January 1,  
1069 2001 as a set of data. In our earlier example, we measured the population of Country  
1070 ABC over a period of years – that is, over time. *Time* was the concept we used to  
1071 organize our data in a sequence of observations.

1072 If we organize our data to reflect only a single point in time – in this case, January 1,  
1073 2001 – then organizing our data over time makes less sense. It is still a possible way  
1074 to structure the data, but we may wish to view it as a cross-section.

1075 Think about the term “cross-section” – it can be understood to mean a group of  
1076 parallel series over time, from which a *section* is taken, *across* time. Thus, a cross-  
1077 section is created.

1078 In our example, it is easy to see how this applies: instead of organizing our data over  
1079 time – that is, using the time concept - we are choosing to organize it over the  
1080 Country concept. Thus, instead of having a single value for Frequency, Topic, and  
1081 Country for all Observations in our series, with a Time value associated with each  
1082 Observation, we will have a Country value associated with each Observation, and a  
1083 single value for Frequency, Topic, and Time. Instead of calling the group of  
1084 Observations a “Series”, we now use the term “Section”.

1085 In our earlier example, we had a key which existed mostly at the Series level:

1086       Frequency = "monthly"  
1087       Topic = "total population"  
1088       Country = "Country ABC"

1089 Time – our remaining concept, was associated with the Observations, with a different  
1090 value for each one. Thus, we could have a Series which looks like this:

1091 January 1, 2001 – 17369  
1092 February 1, 2001 – 17370  
1093 March 1, 2001 – 17405

1094 For our cross-sectional presentation, we would have most of our key at the Section  
1095 level (or, potentially, at a higher level of grouping):

1096       Frequency = "monthly"  
1097       Topic = "total population"  
1098       Time = "January 1, 2001"

1099 With each Observation, we now have a Country value, instead of a Time value:

1100 Country ABC = "17369"

1101 Country XYZ = "24982"

1102 Country HIJ = "37260"

1103 In this cross-sectional presentation of our data set, we have chosen to present each  
1104 Observation paired with a Country value, taken from our Codelist of values for the  
1105 concept Country. Other dimensions could as easily produce a cross-sectional view,  
1106 by attaching their values at The Observation level, instead of the values for Country,  
1107 as in our example.

1108 Because the concepts themselves do not change, but only the way in which they are  
1109 attached to the data structure, a single key family can be used to describe both time-  
1110 series and cross-sectional presentations.

1111 In the version 1.0 SDMX standards, formats are capable of presenting cross-  
1112 sectional data for any single dimension concept, as well as presenting the data as a  
1113 time series. It is up to the key family creator to select which non-Time concept, used  
1114 as a dimension, will serve to organize a cross-sectional presentation. In future  
1115 versions, it is possible that more complete support for the possible cross-sectional  
1116 views for a key family will be provided.