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**Mapping Integration Definition for  
Information Modeling (IDEF1X)  
Model into CASE Data Interchange  
Format (CDIF) Transfer File**

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Gaithersburg, MD 20899

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## Structure of this Document:

This document is organized into the following sections:

### Section 1: Background

This gives some background information on IDEF1X, CDIF, and the idea of a general information exchange between different tools.

### Section 2: Introduction

This introduces the audience to this document and gives some more information about CDIF.

### Section 3: CDIF - Case Data Interchange Format

This explains the CDIF structure and shows how CDIF can be used as a standard means for exchanging information between IDEF tools.

### Section 4: Description of the Mapping of IDEF1X Models into CDIF Transfer Files

This gives the full description of the mapping of IDEF1X graphical models (diagrams) into CDIF transfer files.

### Section 5: Example

This presents an example of the mapping an IDEF1X model into a CDIF transfer file.

### Appendix A: IDEF1X Categorization Mapping

This shows the problem of mapping an IDEF1X categorization relationship into a CDIF transfer file and explains how this problem can be solved.

### Appendix B: Helpful Diagrams

This provides a couple of helpful diagrams for those who wish to "walk through" the example mapping of an IDEF1X model into a CDIF transfer file (Sect. 5).

### Glossary

This gives some CDIF definitions of terms used within this document.

### References

This provides the references to the documents used in creating this report.

## Conventions:

The conventions defined below are used throughout the Section 4 of this document:

- \* [Italics] is used for all CDIF meta-entities and meta-relationships (e.g., *ForeignKey*)
- \* [Bolded Italics] is used for all CDIF meta-attributes (e.g., ***SequenceNo***)
- \* [Underline] is used for values for CDIF meta-attributes (e.g., *EntityType* = Kernel)





# 1. BACKGROUND

The Integration Definition for Information Modeling (IDEF1X) is a standard modeling technique used in the logical definition of an organization's data resources. The standard defines the syntax and semantics of the language constructs used in creating an information model. With the acceptance of the standard, more vendors are providing support for this technique.

One serious limitation to the standard is the lack of a formal standard mechanism for transferring information between different IDEF tools and between IDEF tools and other tools for different modeling techniques. This leaves the users of IDEF tools at a great disadvantage. A user is restricted to using a particular tool provided by a particular vendor thus seriously hindering the reusability of the information represented in a model. This may also force an organization to mandate the use of a specific tool. This infringes on a users freedom to use a tool that best supports both the work and the users particular style.

One solution is the use of a standard method to exchange data between tools. The CASE Data Interchange Format (CDIF) Family of Standards is primarily designed to be used as a description of a mechanism for transferring information between CASE tools.

Vendors who support the CDIF standards need only define the exchange mechanism once for their particular tool. This would allow the exchange of information developed using a particular vendor's tool with other vendors' tools that support the CDIF standards. Not only would the use of these standards allow users of IDEF tools to exchange data between IDEF tools, it could also support the exchange of information captured by an IDEF tool with other CASE tools.

The ability to freely exchange data between tools benefits an organization by promoting the reuse of information resources. It also allows the IDEF users to focus more on the analysis of business and information problems instead of problems and limitations of tools.

# 2. INTRODUCTION

This document will describe a mapping of an IDEF1X view into the CDIF transfer file. This work will demonstrate that it is possible to use the standard exchange for moving information between different tools.

CDIF has defined a Meta-model which captures the semantics of data used by numerous tools. The Meta-model has a set of different subject areas allowing the vendors to express the contents of their tool repositories using a standard format. This provides a common definition of model data for communicating between different tools.

CDIF can also be used in situations where vendor defined data that does not map to the Meta-model (extensible data) needs to be transferred. The CDIF Family of Standards includes a Framework for Modeling and Extensibility Standard which allows a vendor to define new meta-objects used to capture this extensible data. It also defines the relationships which link the newly defined meta-objects to the existing standard Meta-model.

## 3. CDIF - CASE DATA INTERCHANGE FORMAT

### 3.1 Introduction

CDIF consists of a set of standards referred to as the CDIF Family of Standards which provides a standard means for exchanging information between CASE tools. These standards can move both the syntax and semantics of information captured within a particular tool.

The current set of standards is broken into four sections: Overview, Framework, Integrated Meta-model, and Transfer Format. This report uses information defined in the Integrated Meta-model section.

The Integrated Meta-model is divided into partitions or subject areas. Each subject area defines a meta-model for specific types of information that could be developed using a CASE tool. For example, the Dataflow Subject area defines meta-data for process flow models, the Data Model Subject area defines meta-data captured in data models, and Presentation Location and Connectivity Subject area is used to capture the syntactic data about a particular model.

The components of CDIF that were used for this mapping were Common Subject Area, Data Definition Subject Area, and Data Modeling Subject Area. All three subject areas were necessary for capturing the types of information created by the IDEF1X tools.

The Common Subject Area applies to all of the CDIF Meta-model standards. It is used to capture information relevant to all system development objects. It addresses such items as who created the object, when it was last updated and possible synonyms for the object.

The Data Definition Subject Area is used to define data elements and attribute structures. These elements and structures can be referenced with meta-objects from other subject areas. In the IDEF1X mapping the data content for entities was defined using this subject area.

The Data Modeling Subject Area standard is used to capture information created using an Entity-Relationship-Attribute modeling tool. It uses the concept of a role in a relationship to allow for many variations of relationship modeling. This allows for representation of not only the one-to-many unattributed relationship but also the n-ary attributed one. This subject area also supports key definitions for entities and tables, single and multiple inheritance for entities and relationships, multiple data model views, as well as clusters and subsets.



### 3.2 Using CDIF to transfer IDEF models.

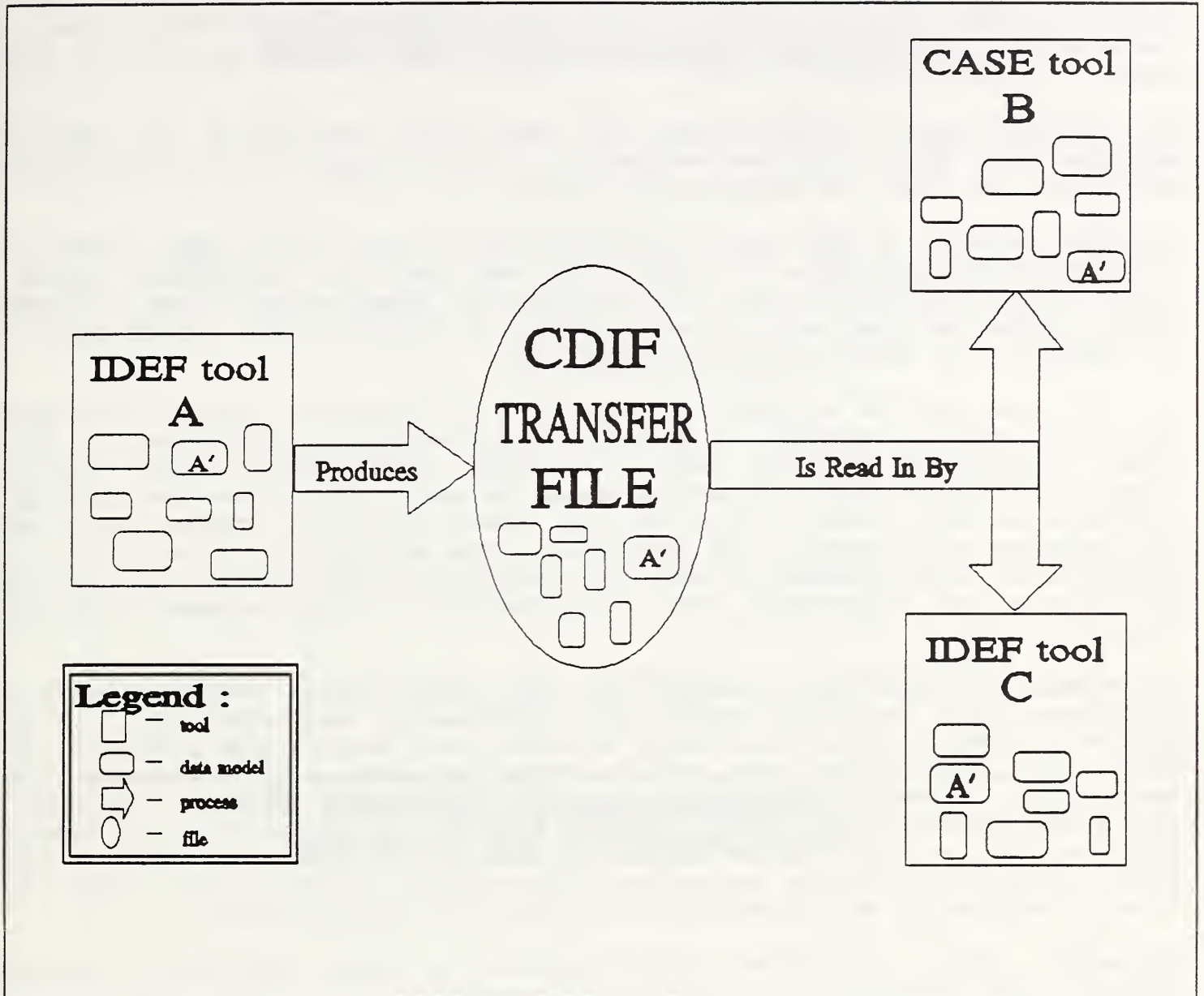


Figure 1

It is very important to understand the basic concepts of a CDIF based transfer. There exists an IDEF tool A with some data models. This tool produces a CDIF transfer file for a particular data model A'. This file can then be read in by another IDEF tool C or a CASE tool B. The CDIF transfer file preserves the concepts of A' through the transfer into the other tools. A' can now be accessed, printed, and modified by a user of tool C or a user of tool B without any influence on the model A' in tool A.

### 3.3 Benefits

Many benefits can be gained from the use of the standard transfer mechanism. One great benefit to the users of IDEF tools is the ability to reuse already created models. Much time and money is currently spent on developing information models, when a lot of the data components of these models already exist.

To promote reuse organizations are developing procedures for managing standardized data. CDIF can be used to assist in this effort by providing the exchange form for standardized data.

Another benefit to the user is the ability to use tools best suited for a particular job. Models created by one user for a project using a particular tool can be read and modified by other users using different tools. This can also save time and money by reducing the effort spent on purchasing and learning new tools.

If an organization chooses to exchange information between different tools it usually invests in customized converters to get the job done. These converters may not work on updated versions of those specific tools. Also additional converters would be needed for expanding this data exchange between other tools. As the number of tools increases so does the problem of managing the transfers. The benefit to using CDIF as a solution to this problem is that CDIF reduces or even eliminates the need for customized converters for the transfer of data between different tools.

A benefit to IDEF tool vendors is that their tools would be able to interface with multiple tools thus increasing marketability. As the figure in section 3.2 indicates, an IDEF tool stores the contents of a model in a file which then can be converted into a CDIF transfer file using the converter developed by the IDEF tool vendor. Through a converter developed by another vendor the CDIF transfer file can then be changed into a file format which is used by the specific CASE or IDEF tool. Since the transfer mechanism is standard, vendors could spend more time on enhancing and developing features for their tools.

Moreover, there is another great benefit to using CDIF as a transfer format. CDIF transfers the syntax and semantics of a model. This is very important to IDEF users because more than the diagrams are transferred between tools. It would be incorrect to simply map a box from an IDEF (or CASE) tool to a box in some other CASE tool without checking the semantics for a box in both tools because those boxes may have different meanings. For example, in the following two pages an IDEF1X relationship is mapped to an ER relationship using CDIF. CDIF stores the relationship content in its meta-model form. CDIF uses different meta-entities to store the contents of the IDEF1X relationship "contains." A CASE tool would then extract this information and represent it in the graphical form.

### 3.4 Example: transferring an IDEF1X relationship into E/R relationship

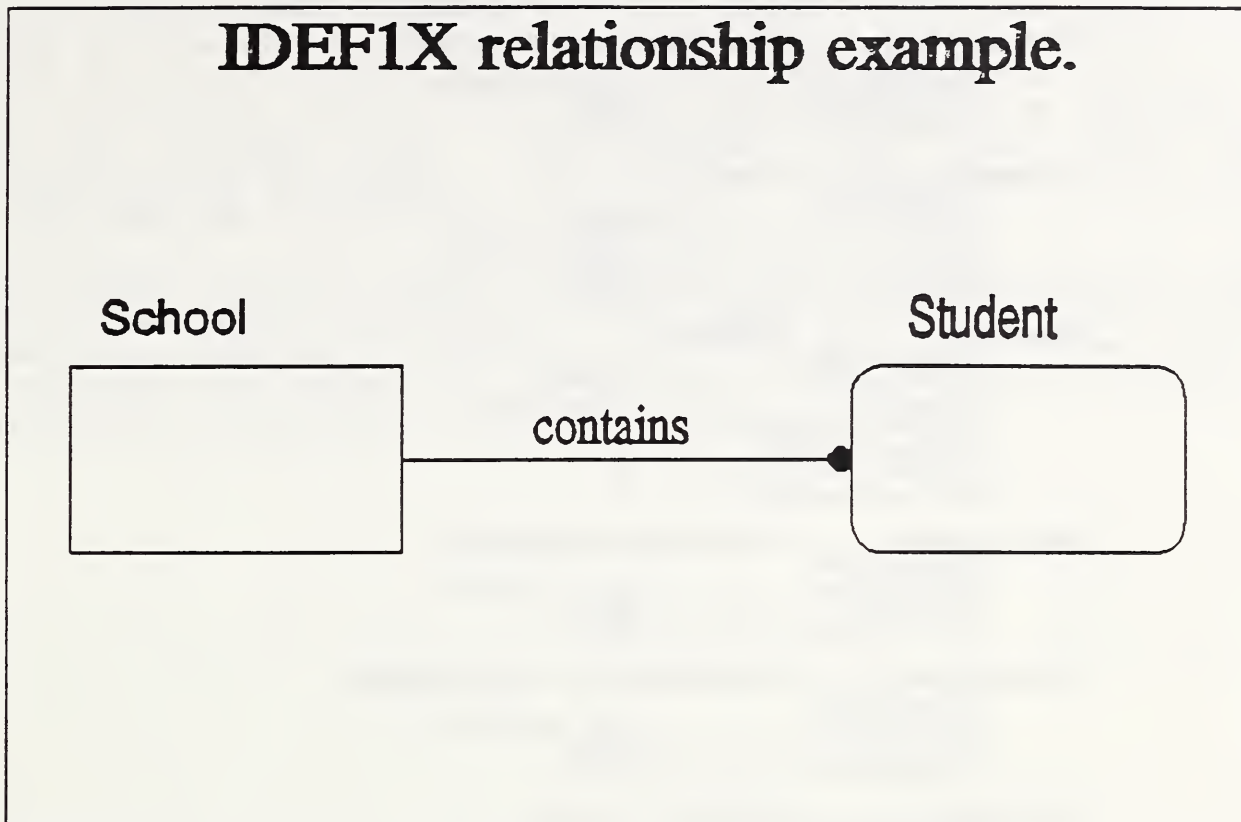


Figure 2

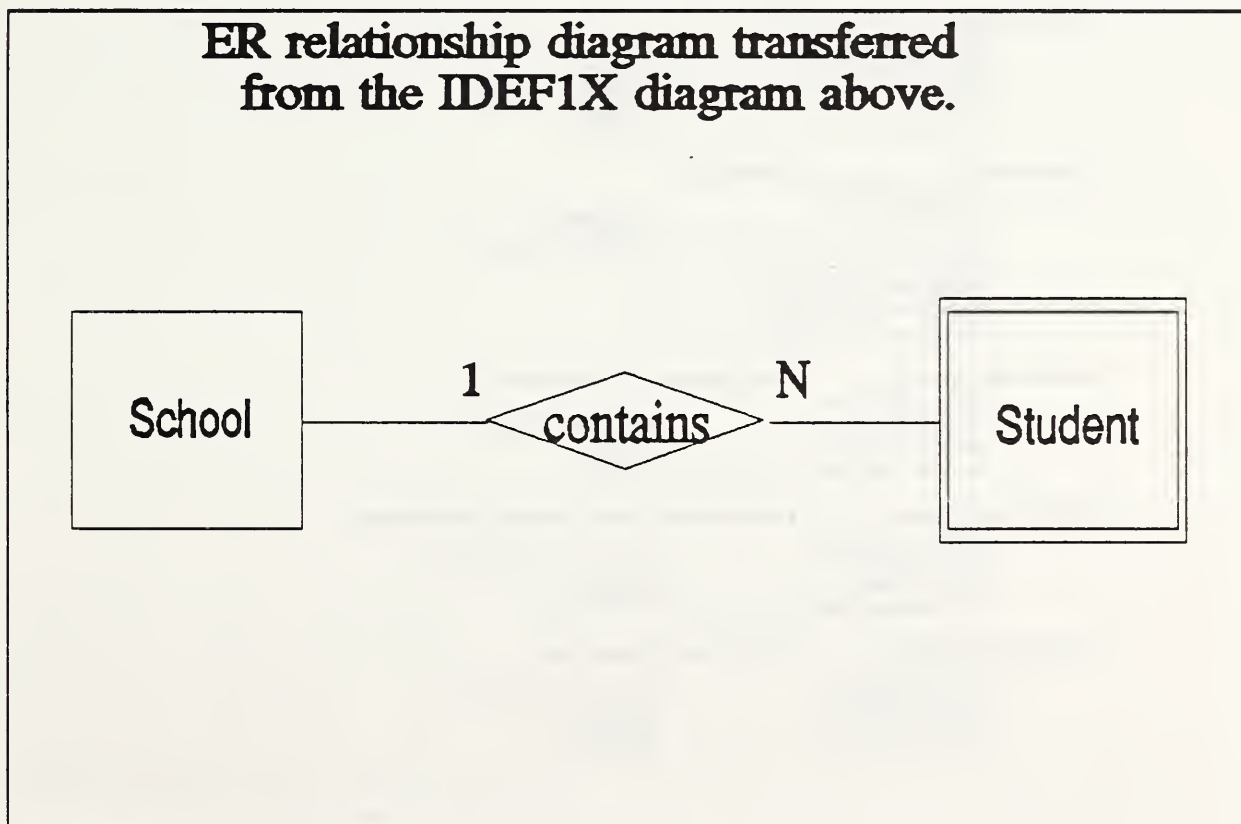


Figure 3



CDIF transfer form for the relationship "contains."

**Meta-entity.....Relationship**  
Meta-attributes  
CDIFIdentifier.....REL01  
Name....."contains"  
BriefDescription....."This relationship relates a school to its students."

**Meta-relationship.....DataModel.Collects.DataModelObjects**  
Meta-attributes  
CDIFIdentifier.....DM\_ICO\_DMO01  
SourceEntity.....DM01  
DestinationEntity.....REL01

**Meta-entity.....Role**  
Meta-attributes  
CDIFIdentifier.....ROL01  
Name....."Parent\_contains"  
IsMaster.....TRUE  
IsSource.....TRUE

**Meta-entity.....RolePlayer**  
Meta-attributes  
CDIFIdentifier.....ROLP01  
Name....."Parent\_contains"  
MinInnerCardinality....."0"  
MaxInnerCardinality....."N"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
Meta-attributes  
CDIFIdentifier.....ROL\_BT\_REL01  
SourceEntity.....ROL01  
DestinationEntity.....REL01

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
Meta-attributes  
CDIFIdentifier.....DMO\_AA\_ROLP01  
SourceEntity.....ENT01  
DestinationEntity.....ROLP01

**Meta-relationship.....RolePlayer.Plays.Role**  
Meta-attributes  
CDIFIdentifier.....ROLP\_P\_ROL01  
SourceEntity.....ROLP01  
DestinationEntity.....ROL01

**Meta-entity.....Role**  
Meta-attributes  
CDIFIdentifier.....ROL02  
Name....."Child\_contains"  
IsMaster.....FALSE  
IsSource.....FALSE

**Meta-entity.....RolePlayer**  
Meta-attributes  
CDIFIdentifier.....ROLP02  
Name....."Child\_contains"  
MinInnerCardinality....."1"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
Meta-attributes  
CDIFIdentifier.....ROL\_BT\_REL02  
SourceEntity.....ROL02  
DestinationEntity.....REL01

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
Meta-attributes  
CDIFIdentifier.....DMO\_AA\_ROLP02  
SourceEntity.....ENT02  
DestinationEntity.....ROLP02

**Meta-relationship.....RolePlayer.Plays.Role**  
Meta-attributes  
CDIFIdentifier.....ROLP\_P\_ROL02  
SourceEntity.....ROLP02  
DestinationEntity.....ROL02

### 3.5 Issues

One issue of transfer formats is that there is no guarantee for 100% transfer of data. This occurs because one tool might not support all the concepts of another tool, in which case some information may be lost. Another situation would be if a tool handles multiple meanings of a concept of another tool. For example, one tool might have a classification of an entity as dependent or independent, while another tool just defines the concept of entity.

Another issue is that vendors currently are not implementing the CDIF Family of Standards. The reason is that most of the CDIF work has yet to be approved as official standards. Also tool vendors may have a difficult time realizing the benefit of using CDIF. Users of tools should stress the importance of having a standard transfer format.



## 4. DESCRIPTION OF MAPPING IDEF1X VIEW INTO CDIF TRANSFER FILE.

### 4.1 Data Model

For each IDEF1X data model it is necessary to define an instance of the CDIF meta-entity *DataModel*. In all cases throughout section 4 the reader should remember that all CDIF meta-entities and meta relationships must include the appropriate mandatory meta-attribute(s). In addition to the mandatory meta-attribute<sup>1</sup> the following optional inherited and local meta-attributes should be taken in consideration:

*Name*  
*BriefDescription*  
*FullDescription*  
*DateCreated*  
*DateUpdated*  
*TimeCreated*  
*TimeUpdated*  
*LongName*  
*ModelType*.

---

<sup>1</sup>The mandatory meta-attribute *CDIFIdentifier* should be applied to ALL CDIF meta-entities and meta-relationships.

## 4.2 Entities

Define instances of the CDIF meta-entity *Entity*. There are some optional inherited and local meta-attributes which should be taken in consideration:

<u>Inherited</u>	<u>Local</u>
<i>DateCreated</i>	<i>Usage</i>
<i>DateUpdated</i>	<i>LongName</i>
<i>TimeCreated</i>	<i>EntityType</i>
<i>TimeUpdated</i>	
<i>BriefDescription</i>	
<i>FullDescription</i>	
<i>Name</i>	
<i>SpecificationLanguage</i>	
<i>SpecificationText</i>	
<i>IsAbstract.</i>	

In the example only *Name* and *EntityType* are used. The domain for *EntityType* consist of three values: Kernel, Characteristic, and Associative.

### Kernel

This classification is used for an *Entity* whose instances are meaningful without the occurrences of other entities. For example, an instance of the *Entity*, having a name and a description, is significant without the knowledge of the data model to which it belongs. The fact that an *Entity* can be kernel does not imply that it can be uniquely identified without other scoping information.

### Characteristic

Each instance of a characteristic *Entity* is logically related to a single instance of another entity. Therefore, the attributes could be considered to belong to the related entity, where the owning entity is related to the characteristic entity with a relationship with cardinality of 1:1.

### Associative

This classification is used for an *Entity* whose existence is dependent upon the existence of two or more other entities. *Entity* instances cannot exist without the existence of instances of the related entity types.

Each instance of an *Entity* should be related to the data model to which it belongs. This is done using instances of the Meta-relationship *DataModel.Collects.DataModelObject*, where *DataModelObject* is just a supertype of *Entity*.

### 4.2.1 Identifier-Independent Entities

The CDIF local meta-attribute *EntityType* of *Entity* should be set to Kernel.

### 4.2.2 Identifier-Dependent Entities

The CDIF local meta-attribute *EntityType* of *Entity* should be set to Characteristic if each instance of the *Entity* is logically dependent on a single instance of another *Entity*.

The CDIF local meta-attribute *EntityType* of *Entity* should be set to Associative if each instance of the *Entity* is logically dependent on two or more instance of other *Entities*.

## 4.3 Relationships

Because IDEF1X Relationship is binary and CDIF Relationship is N-ary, we need to involve CDIF Roles (and RolePlayers) into the mapping.

For each IDEF1X Relationship (except Categorization):

- 1) Define an instance of the CDIF meta-entity *Relationship*.
- 2) Define an instance of the CDIF meta-relationship *DataModel.Collects.DataModelObject*, where *DataModelObject* is a supertype of *Relationship*.
- 3) Define two instances of the CDIF meta-entity *Role* (one for the child entity and another for the parent entity).
- 4) Define two instances of the CDIF meta-entity *RolePlayer* (one for the child entity and another for the parent entity).
- 5) Define two instances for each of the following CDIF meta-relationships:
  - Role.BelongsTo.Relationship*,
  - DataModelObject.ActsAs.RolePlayer*, and
  - RolePlayer.Plays.Role*.

Each instance of *Role* should have at least the following attributes:

*IsMaster*  
*IsSource*

Each instance of *RolePlayer* should have at least the following attributes:

*MinInnerCardinality*  
*MaxInnerCardinality*  
*MinOuterCardinality*  
*MaxOuterCardinality*

All the other local and inherited meta-attributes are optional:

*DateCreated*  
*DateUpdated*  
*TimeCreated*  
*TimeUpdated*  
*BriefDescription*  
*FullDescription*  
*Name*  
*IsAbstract*



### 4.3.1 Cardinality Mapping

a) All relationships (except Optional Non-Identifying):

Cardinality	Parent		Child	
	MinInner	MaxInner	MinOuter	MaxOuter
 * zero, one, or more	0	N	1	1
	1	1	1	1
one or more P	1	N	1	1
	1	1	1	1
zero or one Z	0	1	1	1
	1	1	1	1
exactly n n	n	n	1	1
	1	1	1	1
from n to m n-m	n	m	1	1
	1	1	1	1
ref. to note (n) where card. is specified (n)	?	?	1	1
	1	1	1	1

---

? This field should be filled out according to the cardinality specified in the note (n). If it is not within the CDIF domain for *Min/MaxInnerCardinality*, put it as a note into *BriefDescription* of the *Role* or *RolePlayer*, or both.

b) Optional Non-Identifying):

	Parent			
	Child			
Cardinality	MinInner	MaxInner	MinOuter	MaxOuter
 * zero, one, or more	0	N	1	1
	0	1	1	1
P one or more	1	N	1	1
	0	1	1	1
Z zero or one	0	1	1	1
	0	1	1	1
n exactly n	n	n	1	1
	0	1	1	1
n-m from n to m	n	m	1	1
	0	1	1	1
(n) ref. to note (n) where card. is specified	?	?	1	1
	0	1	1	1

---

<sup>?</sup> This field should be filled out according to the cardinality specified in the note (n). If it is not within the CDIF domain for *Min/MaxInnerCardinality*, put it as a note into *BriefDescription* of the *Role* or *RolePlayer*, or both.

### 4.3.2 Identifying Connection Relationships (parent-child relationships)

Use the following chart to set the values for *IsMaster* and *IsSource* for each of two roles:

Attribute	Parent Role	Child Role
IsMaster	TRUE	FALSE
IsSource	TRUE	FALSE

### 4.3.3 Non-Identifying Connection Relationships

Use the following chart to set the values for *IsMaster* and *IsSource* for each of two roles:

Attribute	Parent Role	Child Role
IsMaster	TRUE	TRUE
IsSource	TRUE	FALSE

### 4.3.4 Categorization Relationships

CDIF does not provide a straight forward method for handling the IDEF1X concept of generalization/categorization. That's why we need to break this concept into two parts while mapping it to CDIF. The first part will transfer the concept of inheritance/subtyping, and the second part will create new instances of category entities with relationships to original category entities to present the concept of categorization from an IDEF1X point of view<sup>1</sup>.

For each IDEF1X Categorization (Complete and Incomplete) with one generic entity and n category entities:

- 1) Define an instance of the CDIF meta-entity *SubtypeSet*. All CDIF meta-attributes are optional except the boolean attribute *SubtypeListIsClosed*. If a IDEF1X Categorization is complete, set the attribute *SubtypeListIsClosed* to True. Otherwise, set it to False.
- 2) Define an instance of the CDIF meta-relationship *InheritableDataModelObject.IsSupertypeFor.SubtypeSet*, where *InheritableDataModelObject* is the generic entity.

---

<sup>1</sup>Refer to the appendix A for further explanations.



- 3) Introduce and define  $n$  instances of the CDIF meta-entity *Entity* and act as if they were placed in between the generic entity and the category entities. All the attributes of the generic entity are inherited by those new entities.

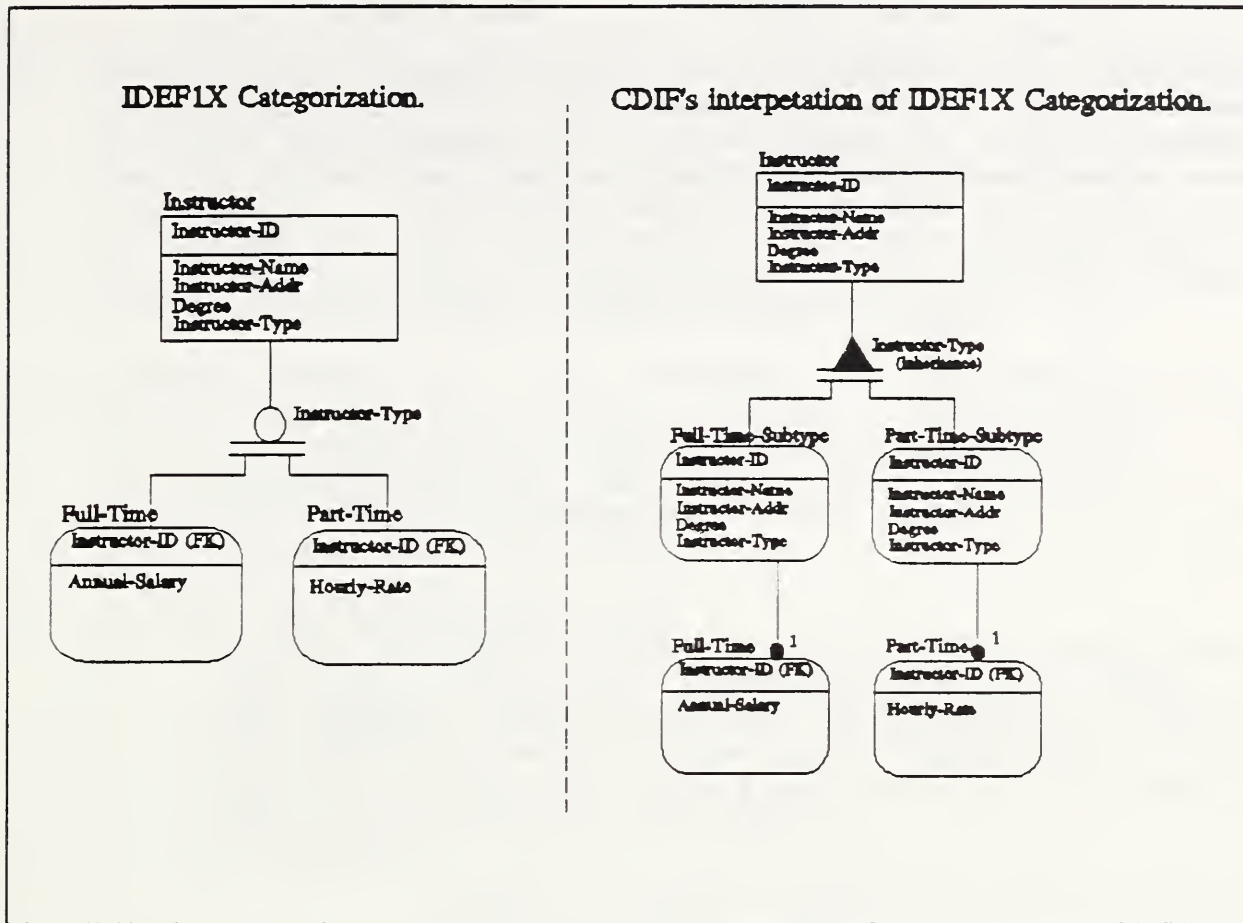


Figure 4

- 4) Define all the attributes of the newly introduced entities following section 4.4.
- 5) Define  $n$  instances of the CDIF meta-relationship *InheritableDataModelObject.IsSubtypeIn.SubtypeSet*, where each *InheritableDataModelObject* is one of the category<sup>1</sup> entities.
- 6) If an IDEF1X Discriminator is defined, define an instance of the CDIF meta-relationship *Attribute.IsDiscriminatorFor.SubtypeSet*.
- 7) Introduce and define all  $n$  relationships (sect. 4.3) from the newly defined entities to the original category entities. Those new relationships should be mandatory.

<sup>1</sup>The newly introduced entities have now become category entities in the categorization, and the original category entities have unnamed relationships to them.

### 4.3.5 Non-Specific Relationships

Use the following chart to set the values for *IsMaster* and *IsSource* for each of two roles:

Attribute	Parent Role	Child Role
IsMaster	TRUE	TRUE
IsSource	TRUE	TRUE

## 4.4 Attributes/Keys

For an entity *E* with *p* attributes in the Primary Key, *f* Foreign Keys, *a* Alternate Keys, and *o* other attributes:

- 1) Define  $p+f+a+o$  instances of the CDIF meta-entity *Attribute*, one for each of the Attributes and Keys. If an attribute happened to be in the intersection of two keys (for example, *ESSN* could be in a primary key and a foreign key simultaneously), only one instance of it should be defined. If this attribute is either a foreign key from some other entity OR a foreign key to some other entity, do not put any value for the attribute *Name*. This value will be stored in *AttributeDefinition*.
- 2) Define  $p+f+a+o$  (or less, if there are intersections of keys) instances of the CDIF meta-relationship *AttributableObject.IsDescribedBy.Attribute*, where *AttributableObject* is just the entity *E*. There is a non-optional attribute *SequenceNo*, which represents the order of attributes within the entity.
- 3) For all the attributes of *E*:
  - \* Check if this attribute is either a foreign key from some other entity OR a foreign key to some other entity. For example, looking at the IDEF1X example diagram, the attribute *Soc-Sec-No* of the entity *Enrollment* is a part of the primary key, but it's also a foreign key from *Student* and a foreign key to *Attendance*.  
If it is:
    - \* Check if there exists an instance of the CDIF meta-entity *AttributeDefinition* for a particular attribute.  
If there is not:
      - \* Create an instance of the CDIF meta-entity *AttributeDefinition* for this attribute. Fill in a value for the CDIF meta-attribute *Name*.
    - Create an instance of the CDIF meta-relationship *Attribute.IsBasedOn.AttributeDefinition* for this attribute.
- 4) Define one instance of the CDIF meta-entity *CandidateKey* for the Primary Key of *E*. The meta-attribute *IsPrimary* should be set to True.
- 5) Define one instance of the CDIF meta-entity *CandidateKey* for all the *a* Alternate Keys of *E* (if *a* is not 0). The meta-attribute *IsPrimary* should be set to False.
- 6) Define an instance of the CDIF meta-relationship *Entity.Contains.Key* for each of the *CandidateKeys*.

- 7) Define *p+a* instance(s) of the CDIF meta-relationship *Attribute.IsComponentOf.Key* for all the *CandidateKeys*. There is a need to have the attribute *SequenceNo*, which will allow you to match components of *ForeignKey* of E to components of *CandidateKey* of E', where E' is a parent in a particular relationship.
- 8) Define an instance of the CDIF meta-entity *ForeignKey* for each relationship the entity E has migrated foreign keys from.
- 9) Define an instance of the CDIF meta-relationship *Entity.Contains.Key* for each instance of *ForeignKey*.
- 10) Define an instance of the CDIF meta-relationship *ForeignKey.References.CandidateKey*, where the *CandidateKey* comes from the parent (source) entity in this relationship.
- 11) Define *f* instances of the CDIF meta-relationship *Attribute.IsComponentOf.Key*. Do not forget to put *SequenceNos* there! Be sure *SequenceNos* match those for the *Attribute.IsComponentOf.Key* of the *Attribute* migrated from, and be sure to put the *Attributes* into the right *ForeignKey*.
- 12) If all the foreign keys from an entity migrated "above the Line," then define an instance of the CDIF meta-relationship *ForeignKey.IsComponentOf.CandidateKey*. And also stick *SequenceNos* there too.



## 4.5 Notes

There are four choices where to put notes. Pick one that best serves your needs.

### A. Relationship Constraint

As a *RoleConstraint* with appropriate relationships with the *RolePlayers*.

- 1) Define an instance of the CDIF meta-entity *RoleConstraint*.
- 2) Define an instance of the CDIF meta-relationship *RoleConstraint.Contains.RolePlayer*, where *RolePlayer* plays *Role* in the relationship which is being constrained.

### B. Domain Constraint

As a *ValueDomainGroup* with appropriate relationships with all (or some) *ValueDomains*.

- 1) Define an instance of the CDIF meta-entity *ValueDomainGroup*.
- 2) Define instance(s) of the CDIF meta-entities *ValueDomainEnumeration*, *ValueDomainRange*, *ValueDomainProcedure*, and *ValueDomainRule* as needed.
- 3) Define instance(s) of the CDIF meta-relationship *ValueDomainGroup.Contains.ValueDomain*, where *ValueDomain* is a supertype of all the *ValueDomains* above in 2).
- 4) Define instance(s) of the CDIF meta-relationship *ValueDomainGroup.Contains.ValueDomainGroup* if needed.

The Domains are specified in the CDIF Integrated Meta-model - Data Definition Subject Area, not in the Data Modeling Subject Area. To integrate between those areas some steps should be added to the mapping.

- 5) Define an instance of the CDIF meta-entity *DataElementType*.
- 6) Define an instance of the CDIF meta-relationship *Attribute.IsOccurrenceOf.DataElementType*, where *Attribute* is the *Attribute* with this Domain Constraint.
- 7) Define an instance of the CDIF meta-relationship *DataElementType.TakesValuesFrom.ValueDomainGroup* to finish the link between these Subject Areas.

### C. Textual Constraint

- 1) Define an instance of the CDIF meta-entity *TextualConstraint*.
- 2) Define an instance of the CDIF meta-relationship *TextualConstraint.IsConstraintOn* . *SemanticInformationObject* , where *SemanticInformationObject* is a supertype of an *Attribute*.

### D. Descriptive Constraint (Note)

Put this Constraint (note) in the meta-attribute *FullDescription* of a particular *Entity*.

## 5. EXAMPLE

### 5.1 Summary

This portion of the document is an example transfer of the contents of an IDEF1X model using CDIF Meta-model with the draft standard CDIF subject areas: Common, Data Modeling, and Data Definition. The chosen IDEF diagram contains the following IDEF1X semantic examples: Entity, Relationship (Identifying and Non-Identifying), Attributes, Key (Primary, Foreign), Categorization Relationship (Complete only), Cardinality, and Role. Most of the contents mapped relatively easy.

The one minor problem was transferring IDEF1X categorization relationship. Because CDIF does not implicitly support categorization, it had to be handled as CDIF subtyping in conjunction with additional relationships. IDEF categorization is different from the CDIF subtyping. CDIF subtyping does not have an instance of the generic entity, while IDEF1X categorization does. This means that the CDIF category entity physically inherits all the attributes and keys from its generic entity, while the IDEF category entity has the foreign keys migrated just from the primary keys of its generic entity.



## 5.2 IDEF1X model.

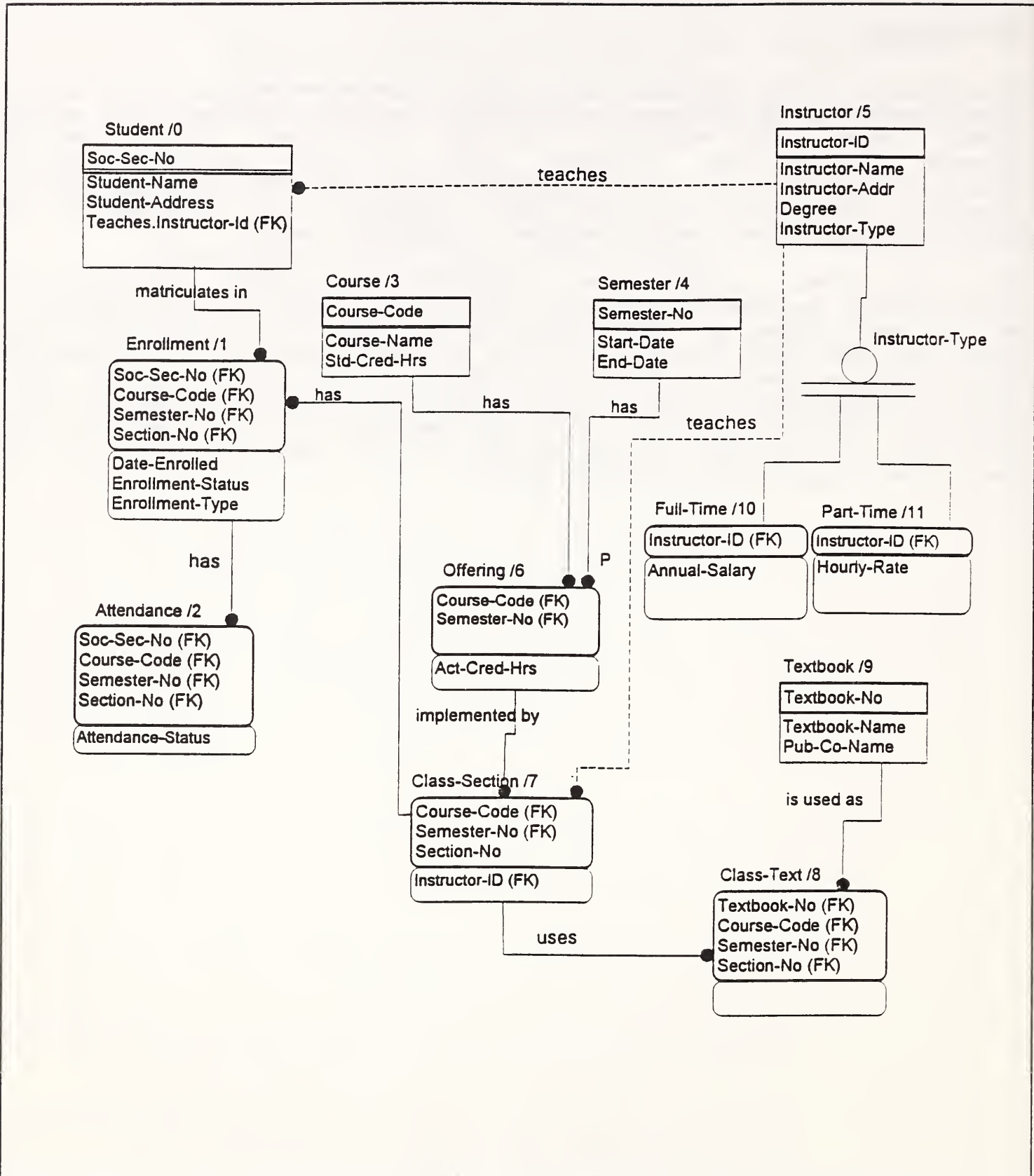


Figure 5

## 5.3 Data Model

**Meta-entity.....DataModel**

Meta-attributes

CDIFIdentifier.....SIM1\_0

Name....."School-System"

BriefDescription....."The first example Data  
Model."

DateCreated.....01-13-1994

TimeCreated.....11:59:59

## 5.4 Entities

```
Meta-entity.....Entity
  Meta-attributes
  CDIFIdentifier.....SIM2_0
  Name....."Student"
  EntityType.....Kernel

Meta-entity.....Entity
  Meta-attributes
  CDIFIdentifier.....SIM2_1
  Name....."Enrollment"
  EntityType.....Associative

Meta-entity.....Entity
  Meta-attributes
  CDIFIdentifier.....SIM2_2
  Name....."Attendance"
  EntityType.....Characteristic

Meta-entity.....Entity
  Meta-attributes
  CDIFIdentifier.....SIM2_3
  Name....."Course"
  EntityType.....Kernel

Meta-entity.....Entity
  Meta-attributes
  CDIFIdentifier.....SIM2_4
  Name....."Semester"
  EntityType.....Kernel

Meta-entity.....Entity
  Meta-attributes
  CDIFIdentifier.....SIM2_5
  Name....."Instructor"
  EntityType.....Kernel

Meta-entity.....Entity
  Meta-attributes
  CDIFIdentifier.....SIM2_6
  Name....."Offering"
  EntityType.....Associative

Meta-entity.....Entity
  Meta-attributes
  CDIFIdentifier.....SIM2_7
  Name....."Class-Section"
  EntityType.....Characteristic
```

**Meta-entity.....Entity**  
 Meta-attributes  
 CDIFIdentifier.....SIM2\_8  
 Name....."Class-Text"  
 EntityType.....Associative

**Meta-entity.....Entity**  
 Meta-attributes  
 CDIFIdentifier.....SIM2\_9  
 Name....."Textbook"  
 EntityType.....Kernel

**Meta-entity.....Entity**  
 Meta-attributes  
 CDIFIdentifier.....SIM2\_10  
 Name....."Full-Time-Subtype"  
 EntityType.....Kernel

**Meta-entity.....Entity**  
 Meta-attributes  
 CDIFIdentifier.....SIM2\_11  
 Name....."Part-Time-Subtype"  
 EntityType.....Kernel

Both entities "Full-Time-Subtype" and "Part-Time-Subtype" are needed to present the whole meaning of the categorization.<sup>1</sup>

**Meta-entity.....Entity**  
 Meta-attributes  
 CDIFIdentifier.....SIM2\_12  
 Name....."Full-Time"  
 EntityType.....Characteristic

**Meta-entity.....Entity**  
 Meta-attributes  
 CDIFIdentifier.....SIM2\_13  
 Name....."Part-Time"  
 EntityType.....Characteristic

Each of the entities needs to be related to the data model to which it belongs. This is done using instances of the Meta-relationship *DataModel.Collects.DataModelObject*, which is inherited because *Entity* is a descendant of *DataModelObject*.

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM3\_0  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM2\_0

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM3\_1  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM2\_1

---

<sup>1</sup>Small font is used for comments throughout this section.



**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM3\_2  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM2\_2

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM3\_3  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM2\_3

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM3\_4  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM2\_4

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM3\_5  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM2\_5

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM3\_6  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM2\_6

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM3\_7  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM2\_7

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM3\_8  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM2\_8

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM3\_9  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM2\_9

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM3\_10  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM2\_10

**Meta-relationship.....DataModel.Collects.DataModelObject**  
Meta-attributes  
CDIFIdentifier.....SIM3\_11  
SourceEntity.....SIM1\_0  
DestinationEntity.....SIM2\_11

**Meta-relationship.....DataModel.Collects.DataModelObject**  
Meta-attributes  
CDIFIdentifier.....SIM3\_12  
SourceEntity.....SIM1\_0  
DestinationEntity.....SIM2\_12

**Meta-relationship.....DataModel.Collects.DataModelObject**  
Meta-attributes  
CDIFIdentifier.....SIM3\_13  
SourceEntity.....SIM1\_0  
DestinationEntity.....SIM2\_13

## 5.5 Subtyping (as a part of categorization)

```
Meta-entity.....SubtypeSet
  Meta-attributes
  CDIFIdentifier.....SIM4_1
  Name....."Instructor-TypeSet"
  SubtypeListIsClosed.....True
  BriefDescription....."This defines the subtyping
                        of Instructor"

Meta-relationship.....InheritableDataModelObject.IsSupertypeFor
                        .SubtypeSet
  Meta-attributes
  CDIFIdentifier.....SIM4_11
  SourceEntity.....SIM2_5
  DestinationEntity.....SIM4_1

Meta-relationship.....InheritableDataModelObject.IsSubtypeIn
                        .SubtypeSet
  Meta-attributes
  CDIFIdentifier.....SIM4_12
  SourceEntity.....SIM2_10
  DestinationEntity.....SIM4_1

Meta-relationship.....InheritableDataModelObject.IsSubtypeIn
                        .SubtypeSet
  Meta-attributes
  CDIFIdentifier.....SIM4_13
  SourceEntity.....SIM2_11
  DestinationEntity.....SIM4_1

Meta-relationship.....Attribute.IsDiscriminatorFor.SubtypeSet
  Meta-attributes
  CDIFIdentifier.....SIM4_14
  SourceEntity.....SIM6_33 /*Instruction-Type*/
  DestinationEntity.....SIM4_1
```



## 5.6 Relationships

```
Meta-entity.....Relationship
  Meta-attributes
  CDIFIdentifier.....SIM5_0
  Name....."matriculates in"
  BriefDescription....."This relates a Student to
                        the Enrollment of this
                        Student."

Meta-relationship.....DataModel.Collects.DataModelObject
  Meta-attributes
  CDIFIdentifier.....SIM5_01
  SourceEntity.....SIM1_0
  DestinationEntity.....SIM5_0

Meta-entity.....Role
  Meta-attributes
  CDIFIdentifier.....SIM5_02A
  Name....."Parent_matriculates_in_0"
  IsMaster.....True
  IsSource.....True

Meta-entity.....RolePlayer
  Meta-attributes
  CDIFIdentifier.....SIM5_03A
  Name....."Student-Parent"
  MinInnerCardinality....."0"
  MaxInnerCardinality....."N"
  MinOuterCardinality....."1"
  MaxOuterCardinality....."1"

Meta-relationship.....Role.BelongsTo.Relationship
  Meta-attributes
  CDIFIdentifier.....SIM5_04A
  SourceEntity.....SIM5_02A
  DestinationEntity.....SIM5_0

Meta-relationship.....DataModelObject.ActsAs.RolePlayer
  Meta-attributes
  CDIFIdentifier.....SIM5_05A
  SourceEntity.....SIM2_0
  DestinationEntity.....SIM5_03A

Meta-relationship.....RolePlayer.Plays.Role
  Meta-attributes
  CDIFIdentifier.....SIM5_06A
  SourceEntity.....SIM5_03A
  DestinationEntity.....SIM5_02A
```

**Meta-entity.....Role**

Meta-attributes

CDIFIdentifier.....SIM5\_02B

Name....."Child\_matriculates\_in\_0"

IsMaster.....False

IsSource.....False

**Meta-entity.....RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_03B

Name....."Enrollment-Child"

MinInnerCardinality....."1"

MaxInnerCardinality....."1"

MinOuterCardinality....."1"

MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes

CDIFIdentifier.....SIM5\_04B

SourceEntity.....SIM5\_02B

DestinationEntity.....SIM5\_0

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_05B

SourceEntity.....SIM2\_1

DestinationEntity.....SIM5\_03B

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes

CDIFIdentifier.....SIM5\_06B

SourceEntity.....SIM5\_03B

DestinationEntity.....SIM5\_02B

**Meta-entity.....Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_1  
 Name....."has"  
 BriefDescription....."This relates a Class-Section  
 to the Enrollment."

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_11  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM5\_1

**Meta-entity.....Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_12A  
 Name....."Parent\_has\_1"  
 IsMaster.....True  
 IsSource.....True

**Meta-entity.....RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_13A  
 Name....."Class-Section\_Parent"  
 MinInnerCardinality....."0"  
 MaxInnerCardinality....."N"  
 MinOuterCardinality....."1"  
 MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_14A  
 SourceEntity.....SIM5\_12A  
 DestinationEntity.....SIM5\_1

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_15A  
 SourceEntity.....SIM2\_7  
 DestinationEntity.....SIM5\_13A

**Meta-relationship.....RolePlayer.Plays.Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_16A  
 SourceEntity.....SIM5\_13A  
 DestinationEntity.....SIM5\_12A

**Meta-entity.....Role**

Meta-attributes

CDIFIdentifier.....SIM5\_12B  
Name....."Child\_has\_1"  
IsMaster.....False  
IsSource.....False

**Meta-entity.....RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_13B  
Name....."Enrollment\_Child"  
MinInnerCardinality....."1"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes

CDIFIdentifier.....SIM5\_14B  
SourceEntity.....SIM5\_12B  
DestinationEntity.....SIM5\_1

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_15B  
SourceEntity.....SIM2\_1  
DestinationEntity.....SIM5\_13B

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes

CDIFIdentifier.....SIM5\_16B  
SourceEntity.....SIM5\_13B  
DestinationEntity.....SIM5\_12B



**Meta-entity.....Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_2  
 Name....."has"  
 BriefDescription....."This relates an Enrollment  
 to the Attendance."

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_21  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM5\_2

**Meta-entity.....Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_22A  
 Name....."Parent\_has\_2"  
 IsMaster.....True  
 IsSource.....True

**Meta-entity.....RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_23A  
 Name....."Enrollment\_Parent"  
 MinInnerCardinality....."0"  
 MaxInnerCardinality....."N"  
 MinOuterCardinality....."1"  
 MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_24A  
 SourceEntity.....SIM5\_22A  
 DestinationEntity.....SIM5\_2

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_25A  
 SourceEntity.....SIM2\_1  
 DestinationEntity.....SIM5\_23A

**Meta-relationship.....RolePlayer.Plays.Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_26A  
 SourceEntity.....SIM5\_23A  
 DestinationEntity.....SIM5\_22A



**Meta-entity.....Role**

Meta-attributes

CDIFIdentifier.....SIM5\_22B  
Name....."Child\_has\_2"  
IsMaster.....False  
IsSource.....False

**Meta-entity.....RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_23B  
Name....."Attendance\_Child"  
MinInnerCardinality....."1"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes

CDIFIdentifier.....SIM5\_24B  
SourceEntity.....SIM5\_22B  
DestinationEntity.....SIM5\_2

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_25B  
SourceEntity.....SIM2\_2  
DestinationEntity.....SIM5\_23B

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes

CDIFIdentifier.....SIM5\_26B  
SourceEntity.....SIM5\_23B  
DestinationEntity.....SIM5\_22B

**Meta-entity.....Relationship**

Meta-attributes

CDIFIdentifier.....SIM5\_3

Name....."has"

BriefDescription....."This relates a Course to the Offering."

**Meta-relationship.....DataModel.Collects.DataModelObject**

Meta-attributes

CDIFIdentifier.....SIM5\_31

SourceEntity.....SIM1\_0

DestinationEntity.....SIM5\_3

**Meta-entity.....Role**

Meta-attributes

CDIFIdentifier.....SIM5\_32A

Name....."Parent\_has\_3"

IsMaster.....True

IsSource.....True

**Meta-entity.....RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_33A

Name....."Course\_Parent"

MinInnerCardinality....."0"

MaxInnerCardinality....."N"

MinOuterCardinality....."1"

MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes

CDIFIdentifier.....SIM5\_34A

SourceEntity.....SIM5\_32A

DestinationEntity.....SIM5\_3

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_35A

SourceEntity.....SIM2\_3

DestinationEntity.....SIM5\_33A

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes

CDIFIdentifier.....SIM5\_36A

SourceEntity.....SIM5\_33A

DestinationEntity.....SIM5\_32A

**Meta-entity.....Role**

Meta-attributes

CDIFIdentifier.....SIM5\_32B  
Name....."Child\_has\_3"  
IsMaster.....False  
IsSource.....False

**Meta-entity.....RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_33B  
Name....."Offering\_Child"  
MinInnerCardinality....."1"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes

CDIFIdentifier.....SIM5\_34B  
SourceEntity.....SIM5\_32B  
DestinationEntity.....SIM5\_3

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_35B  
SourceEntity.....SIM2\_6  
DestinationEntity.....SIM5\_33B

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes

CDIFIdentifier.....SIM5\_36B  
SourceEntity.....SIM5\_33B  
DestinationEntity.....SIM5\_32B

**Meta-entity.....Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_4  
 Name....."has"  
 BriefDescription....."This relates a Semester to  
 the Offering."

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_41  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM5\_4

**Meta-entity.....Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_42A  
 Name....."Parent\_has\_4"  
 IsMaster.....True  
 IsSource.....True

**Meta-entity.....RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_43A  
 Name....."Semester\_Parent"  
 MinInnerCardinality....."1"  
 MaxInnerCardinality....."N"  
 MinOuterCardinality....."1"  
 MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_44A  
 SourceEntity.....SIM5\_42A  
 DestinationEntity.....SIM5\_4

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_45A  
 SourceEntity.....SIM2\_4  
 DestinationEntity.....SIM5\_43A

**Meta-relationship.....RolePlayer.Plays.Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_46A  
 SourceEntity.....SIM5\_43A  
 DestinationEntity.....SIM5\_42A



**Meta-entity.....Role**

Meta-attributes  
CDIFIdentifier.....SIM5\_42B  
Name....."Child\_has\_4"  
IsMaster.....False  
IsSource.....False

**Meta-entity.....RolePlayer**

Meta-attributes  
CDIFIdentifier.....SIM5\_43B  
Name....."Offering\_child"  
MinInnerCardinality....."1"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes  
CDIFIdentifier.....SIM5\_44B  
SourceEntity.....SIM5\_42B  
DestinationEntity.....SIM5\_4

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes  
CDIFIdentifier.....SIM5\_45B  
SourceEntity.....SIM2\_6  
DestinationEntity.....SIM5\_43B

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes  
CDIFIdentifier.....SIM5\_46B  
SourceEntity.....SIM5\_43B  
DestinationEntity.....SIM5\_42B



**Meta-entity.....Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_5  
 Name....."teaches"  
 BriefDescription....."This relates an Instructor  
 to the Student."

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_51  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM5\_5

**Meta-entity.....Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_52A  
 Name....."Parent\_teaches\_6"  
 IsMaster.....True  
 IsSource.....True

**Meta-entity.....RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_53A  
 Name....."Instructor\_Parent"  
 MinInnerCardinality....."0"  
 MaxInnerCardinality....."N"  
 MinOuterCardinality....."1"  
 MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_54A  
 SourceEntity.....SIM5\_52A  
 DestinationEntity.....SIM5\_5

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_55A  
 SourceEntity.....SIM2\_5  
 DestinationEntity.....SIM5\_53A

**Meta-relationship.....RolePlayer.Plays.Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_56A  
 SourceEntity.....SIM5\_53A  
 DestinationEntity.....SIM5\_52A

**Meta-entity.....Role**

Meta-attributes

CDIFIdentifier.....SIM5\_52B  
Name....."Child\_teaches\_6"  
IsMaster.....True<sup>2</sup>  
IsSource.....False

**Meta-entity.....RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_53B  
Name....."Student\_Child"  
MinInnerCardinality....."0"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes

CDIFIdentifier.....SIM5\_54B  
SourceEntity.....SIM5\_52B  
DestinationEntity.....SIM5\_5

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_55B  
SourceEntity.....SIM2\_0  
DestinationEntity.....SIM5\_53B

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes

CDIFIdentifier.....SIM5\_56B  
SourceEntity.....SIM5\_53B  
DestinationEntity.....SIM5\_52B

---

<sup>2</sup>Since this is a Non-Identifying Connection Relationship, both entities do not depend either on the relation nor on each other, so both of them are masters.

**Meta-entity.....Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_6  
 Name....."teaches"  
 BriefDescription....."This relates an Instructor  
 to the Class-Section."

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_61  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM5\_6

**Meta-entity.....Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_62A  
 Name....."Parent\_teaches\_7"  
 IsMaster.....True  
 IsSource.....True

**Meta-entity.....RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_63A  
 Name....."Instructor\_Parent"  
 MinInnerCardinality....."0"  
 MaxInnerCardinality....."N"  
 MinOuterCardinality....."1"  
 MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_64A  
 SourceEntity.....SIM5\_62A  
 DestinationEntity.....SIM5\_6

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_65A  
 SourceEntity.....SIM2\_5  
 DestinationEntity.....SIM5\_63A

**Meta-relationship.....RolePlayer.Plays.Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_66A  
 SourceEntity.....SIM5\_63A  
 DestinationEntity.....SIM5\_62A

**Meta-entity.....Role**

Meta-attributes  
CDIFIdentifier.....SIM5\_62B  
Name....."Child\_teaches\_7"  
IsMaster.....True<sup>1</sup>  
IsSource.....False

**Meta-entity.....RolePlayer**

Meta-attributes  
CDIFIdentifier.....SIM5\_63B  
Name....."Class-Section\_Child"  
MinInnerCardinality....."0"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes  
CDIFIdentifier.....SIM5\_64B  
SourceEntity.....SIM5\_62B  
DestinationEntity.....SIM5\_6

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes  
CDIFIdentifier.....SIM5\_65B  
SourceEntity.....SIM2\_7  
DestinationEntity.....SIM5\_63B

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes  
CDIFIdentifier.....SIM5\_66B  
SourceEntity.....SIM5\_63B  
DestinationEntity.....SIM5\_62B

---

<sup>1</sup>Since this is a Non-Identifying Connection Relationship, both entities do not depend either on the relation nor on each other, so both of them are masters.



**Meta-entity.....Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_7  
 Name....."implemented by"  
 BriefDescription....."This relates an Offering to  
 the Class-Section."

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_71  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM5\_7

**Meta-entity.....Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_72A  
 Name....."Parent\_implemented\_by\_7"  
 IsMaster.....True  
 IsSource.....True

**Meta-entity.....RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_73A  
 Name....."Offering\_Parent"  
 MinInnerCardinality....."0"  
 MaxInnerCardinality....."N"  
 MinOuterCardinality....."1"  
 MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_74A  
 SourceEntity.....SIM5\_72A  
 DestinationEntity.....SIM5\_7

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_75A  
 SourceEntity.....SIM2\_6  
 DestinationEntity.....SIM5\_73A

**Meta-relationship.....RolePlayer.Plays.Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_76A  
 SourceEntity.....SIM5\_73A  
 DestinationEntity.....SIM5\_72A

**Meta-entity.....Role**

Meta-attributes  
CDIFIdentifier.....SIM5\_72B  
Name....."Child\_implemented\_by\_7"  
IsMaster.....False  
IsSource.....False

**Meta-entity.....RolePlayer**

Meta-attributes  
CDIFIdentifier.....SIM5\_73B  
Name....."Class-Section\_Child"  
MinInnerCardinality....."1"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes  
CDIFIdentifier.....SIM5\_74B  
SourceEntity.....SIM5\_72B  
DestinationEntity.....SIM5\_7

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes  
CDIFIdentifier.....SIM5\_75B  
SourceEntity.....SIM2\_7  
DestinationEntity.....SIM5\_73B

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes  
CDIFIdentifier.....SIM5\_76B  
SourceEntity.....SIM5\_73B  
DestinationEntity.....SIM5\_72B

```

Meta-entity.....Relationship
  Meta-attributes
  CDIFIdentifier.....SIM5_8
  Name....."uses"
  BriefDescription....."This relates a Class-Section
                        to the Class-Text."

Meta-relationship.....DataModel.Collects.DataModelObject
  Meta-attributes
  CDIFIdentifier.....SIM5_81
  SourceEntity.....SIM1_0
  DestinationEntity.....SIM5_8

Meta-entity.....Role
  Meta-attributes
  CDIFIdentifier.....SIM5_82A
  Name....."Parent_uses_8"
  IsMaster.....True
  IsSource.....True

Meta-entity.....RolePlayer
  Meta-attributes
  CDIFIdentifier.....SIM5_83A
  Name....."Class-Section_Parent"
  MinInnerCardinality....."0"
  MaxInnerCardinality....."N"
  MinOuterCardinality....."1"
  MaxOuterCardinality....."1"

Meta-relationship.....Role.BelongsTo.Relationship
  Meta-attributes
  CDIFIdentifier.....SIM5_84A
  SourceEntity.....SIM5_82A
  DestinationEntity.....SIM5_8

Meta-relationship.....DataModelObject.ActsAs.RolePlayer
  Meta-attributes
  CDIFIdentifier.....SIM5_85A
  SourceEntity.....SIM2_7
  DestinationEntity.....SIM5_83A

Meta-relationship.....RolePlayer.Plays.Role
  Meta-attributes
  CDIFIdentifier.....SIM5_86A
  SourceEntity.....SIM5_83A
  DestinationEntity.....SIM5_82A

```

**Meta-entity.....Role**

Meta-attributes

CDIFIdentifier.....SIM5\_82B  
Name....."Child\_uses\_8"  
IsMaster.....False  
IsSource.....False

**Meta-entity.....RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_83B  
Name....."Class-Text\_Child"  
MinInnerCardinality....."1"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes

CDIFIdentifier.....SIM5\_84B  
SourceEntity.....SIM5\_82B  
DestinationEntity.....SIM5\_8

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_85B  
SourceEntity.....SIM2\_8  
DestinationEntity.....SIM5\_83B

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes

CDIFIdentifier.....SIM5\_86B  
SourceEntity.....SIM5\_83B  
DestinationEntity.....SIM5\_82B



**Meta-entity.....Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_9  
 Name....."is used as"  
 BriefDescription....."This relates a Textbook to  
 the Class-Text."

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_91  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM5\_9

**Meta-entity.....Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_92A  
 Name....."Parent\_is\_used\_as\_9"  
 IsMaster.....True  
 IsSource.....True

**Meta-entity.....RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_93A  
 Name....."Textbook\_Parent"  
 MinInnerCardinality....."0"  
 MaxInnerCardinality....."N"  
 MinOuterCardinality....."1"  
 MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_94A  
 SourceEntity.....SIM5\_92A  
 DestinationEntity.....SIM5\_9

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_95A  
 SourceEntity.....SIM2\_9  
 DestinationEntity.....SIM5\_93A

**Meta-relationship.....RolePlayer.Plays.Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_96A  
 SourceEntity.....SIM5\_93A  
 DestinationEntity.....SIM5\_92A

**Meta-entity.....Role**  
Meta-attributes  
CDIFIdentifier.....SIM5\_92B  
Name....."Child\_is\_used\_as\_9"  
IsMaster.....False  
IsSource.....False

**Meta-entity.....RolePlayer**  
Meta-attributes  
CDIFIdentifier.....SIM5\_93B  
Name....."Class-Text\_Child"  
MinInnerCardinality....."1"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
Meta-attributes  
CDIFIdentifier.....SIM5\_94B  
SourceEntity.....SIM5\_92B  
DestinationEntity.....SIM5\_9

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
Meta-attributes  
CDIFIdentifier.....SIM5\_95B  
SourceEntity.....SIM2\_8  
DestinationEntity.....SIM5\_93B

**Meta-relationship.....RolePlayer.Plays.Role**  
Meta-attributes  
CDIFIdentifier.....SIM5\_96B  
SourceEntity.....SIM5\_93B  
DestinationEntity.....SIM5\_92B

The following relationships are used to represent the full meaning of categorization.

**Meta-entity.....Relationship**  
Meta-attributes  
CDIFIdentifier.....SIM5\_10  
Name.....  
BriefDescription....."additional relationship  
between Full-Time-Subtype  
and Full-Time"

**Meta-relationship.....DataModel.Collects.DataModelObject**  
Meta-attributes  
CDIFIdentifier.....SIM5\_101  
SourceEntity.....SIM1\_0  
DestinationEntity.....SIM5\_10

**Meta-entity.....Role**  
Meta-attributes  
CDIFIdentifier.....SIM5\_102A  
Name....."parent\_full-time-subtype"  
IsMaster.....True  
IsSource.....True

**Meta-entity.....RolePlayer**  
Meta-attributes  
CDIFIdentifier.....SIM5\_103A  
Name....."parent\_full-time-subtype"  
MinInnerCardinality....."1"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
Meta-attributes  
CDIFIdentifier.....SIM5\_104A  
SourceEntity.....SIM5\_102A  
DestinationEntity.....SIM5\_10

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
Meta-attributes  
CDIFIdentifier.....SIM5\_105A  
SourceEntity.....SIM2\_10  
DestinationEntity.....SIM5\_103A

**Meta-relationship.....RolePlayer.Plays.Role**  
Meta-attributes  
CDIFIdentifier.....SIM5\_106A  
SourceEntity.....SIM5\_103A  
DestinationEntity.....SIM5\_102A

**Meta-entity.....Role**

Meta-attributes

CDIFIdentifier.....SIM5\_102B  
Name....."Child\_full-time"  
IsMaster.....False  
IsSource.....False

**Meta-entity.....RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_103B  
Name....."Child\_full-time"  
MinInnerCardinality....."1"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes

CDIFIdentifier.....SIM5\_104B  
SourceEntity.....SIM5\_102B  
DestinationEntity.....SIM5\_10

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_105B  
SourceEntity.....SIM2\_12  
DestinationEntity.....SIM5\_103B

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes

CDIFIdentifier.....SIM5\_106B  
SourceEntity.....SIM5\_103B  
DestinationEntity.....SIM5\_102B



**Meta-entity.....Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_11  
 Name.....  
 BriefDescription....."additional relationship  
 between Part-Time-Subtype  
 and Part-Time"

**Meta-relationship.....DataModel.Collects.DataModelObject**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_111  
 SourceEntity.....SIM1\_0  
 DestinationEntity.....SIM5\_11

**Meta-entity.....Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_112A  
 Name....."parent\_part-time-subtype"  
 IsMaster.....True  
 IsSource.....True

**Meta-entity.....RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_113A  
 Name....."parent\_part-time-subtype"  
 MinInnerCardinality....."1"  
 MaxInnerCardinality....."1"  
 MinOuterCardinality....."1"  
 MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_114A  
 SourceEntity.....SIM5\_112A  
 DestinationEntity.....SIM5\_11

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_115A  
 SourceEntity.....SIM2\_11  
 DestinationEntity.....SIM5\_113A

**Meta-relationship.....RolePlayer.Plays.Role**  
 Meta-attributes  
 CDIFIdentifier.....SIM5\_116A  
 SourceEntity.....SIM5\_113A  
 DestinationEntity.....SIM5\_112A

**Meta-entity.....Role**

Meta-attributes

CDIFIdentifier.....SIM5\_112B  
Name....."Child\_part-time"  
IsMaster.....False  
IsSource.....False

**Meta-entity.....RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_113B  
Name....."Child\_part-time"  
MinInnerCardinality....."1"  
MaxInnerCardinality....."1"  
MinOuterCardinality....."1"  
MaxOuterCardinality....."1"

**Meta-relationship.....Role.BelongsTo.Relationship**

Meta-attributes

CDIFIdentifier.....SIM5\_114B  
SourceEntity.....SIM5\_112B  
DestinationEntity.....SIM5\_11

**Meta-relationship.....DataModelObject.ActsAs.RolePlayer**

Meta-attributes

CDIFIdentifier.....SIM5\_115B  
SourceEntity.....SIM2\_13  
DestinationEntity.....SIM5\_113B

**Meta-relationship.....RolePlayer.Plays.Role**

Meta-attributes

CDIFIdentifier.....SIM5\_116B  
SourceEntity.....SIM5\_113B  
DestinationEntity.....SIM5\_112B

## 5.7 Attributes

First, the four attributes for the entity "Student" are defined.

Soc-Sec-No:

```
Meta-entity.....Attribute
  Meta-attributes
  CDIFIdentifier.....SIM6_0
  BriefDescription....."The unique identifier of a
                        Student."
```

```
Meta-entity.....Attribute
  Meta-attributes
  CDIFIdentifier.....SIM6_1
  Name....."Student-Name"
  BriefDescription....."Identifier of a Student."
```

```
Meta-entity.....Attribute
  Meta-attributes
  CDIFIdentifier.....SIM6_2
  Name....."Student-Address"
  BriefDescription....."The place where a Student
                        lives."
```

```
Meta-entity.....Attribute
  Meta-attributes
  CDIFIdentifier.....SIM6_4
  Name....."Teaches_Instructor-Id"
  BriefDescription....."The unique identifier of the
                        Instructor that teaches a
                        Student (FK)."
```

Each is then related to the entity.

```
Meta-relationship.....AttributableObject.IsDescribedBy.Attribute
  Meta-attributes
  CDIFIdentifier.....SIM7_0
  SourceEntity.....SIM2_0
  DestinationEntity.....SIM6_0
  SequenceNo.....1
```

```
Meta-relationship.....AttributableObject.IsDescribedBy.Attribute
  Meta-attributes
  CDIFIdentifier.....SIM7_1
  SourceEntity.....SIM2_0
  DestinationEntity.....SIM6_1
  SequenceNo.....2
```

```
Meta-relationship.....AttributableObject.IsDescribedBy.Attribute
  Meta-attributes
  CDIFIdentifier.....SIM7_2
  SourceEntity.....SIM2_0
  DestinationEntity.....SIM6_2
  SequenceNo.....3
```

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_4  
 SourceEntity.....SIM2\_0  
 DestinationEntity.....SIM6\_4  
 SequenceNo.....4

There is a need to link all foreign keys with primary keys by a meaning of the same definition.

**Meta-entity.....AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM15\_0  
 Name....."Soc-Sec-No"

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM16\_0  
 SourceEntity.....SIM6\_0  
 DestinationEntity.....SIM15\_0

**Meta-entity.....AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM15\_1  
 Name....."Instructor-ID"

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM16\_1  
 SourceEntity.....SIM6\_4  
 DestinationEntity.....SIM15\_1

The same is done for the attributes of "Enrollment".

Soc-Sec-No:  
**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_5  
 BriefDescription....."Social Security Number of the enrolled student."

Course-Code:  
**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_6  
 BriefDescription....."The code for a particular course."

Semester-No:  
**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_7  
 BriefDescription....."The number for a particular semester."

Section-No:  
**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_8  
 BriefDescription.....



**Meta-entity.....Attribute**

Meta-attributes  
CDIFIdentifier.....SIM6\_9  
Name....."Date-Enrolled"  
BriefDescription....."The date the enrollment took place."

**Meta-entity.....Attribute**

Meta-attributes  
CDIFIdentifier.....SIM6\_10  
Name....."Enrollment-Status"  
BriefDescription....."Part/Full time"

**Meta-entity.....Attribute**

Meta-attributes  
CDIFIdentifier.....SIM6\_11  
Name....."Enrollment-Type"  
BriefDescription.....

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes  
CDIFIdentifier.....SIM7\_5  
SourceEntity.....SIM2\_1  
DestinationEntity.....SIM6\_5  
SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes  
CDIFIdentifier.....SIM7\_6  
SourceEntity.....SIM2\_1  
DestinationEntity.....SIM6\_6  
SequenceNo.....2

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes  
CDIFIdentifier.....SIM7\_7  
SourceEntity.....SIM2\_1  
DestinationEntity.....SIM6\_7  
SequenceNo.....3

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes  
CDIFIdentifier.....SIM7\_8  
SourceEntity.....SIM2\_1  
DestinationEntity.....SIM6\_8  
SequenceNo.....4

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes  
CDIFIdentifier.....SIM7\_9  
SourceEntity.....SIM2\_1  
DestinationEntity.....SIM6\_9  
SequenceNo.....5

Meta-relationship.....AttributableObject.IsDescribedBy.Attribute  
Meta-attributes  
CDIFIdentifier.....SIM7\_10  
SourceEntity.....SIM2\_1  
DestinationEntity.....SIM6\_10  
SequenceNo.....6

Meta-relationship.....AttributableObject.IsDescribedBy.Attribute  
Meta-attributes  
CDIFIdentifier.....SIM7\_11  
SourceEntity.....SIM2\_1  
DestinationEntity.....SIM6\_11  
SequenceNo.....7

Meta-entity.....AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM15\_2  
Name....."Course-Code"

Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM16\_2  
SourceEntity.....SIM6\_6  
DestinationEntity.....SIM15\_2

Meta-entity.....AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM15\_3  
Name....."Semester-No"

Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM16\_3  
SourceEntity.....SIM6\_7  
DestinationEntity.....SIM15\_3

Meta-entity.....AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM15\_4  
Name....."Section-No"

Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM16\_4  
SourceEntity.....SIM6\_8  
DestinationEntity.....SIM15\_4

Soc-Sec-No:

Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM16\_5  
SourceEntity.....SIM6\_5  
DestinationEntity.....SIM15\_0

Attributes of "Instructor".

Instructor-ID:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_12

BriefDescription....."The unique identifier of the  
Instructor."

Instructor-Name:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_13

BriefDescription....."The name of the Instructor."

Instructor-Addr:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_14

BriefDescription....."The address of the  
Instructor."

Degree:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_15

BriefDescription....."Instructor's degree."

Instructor-Type:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_16

BriefDescription....."A discriminator: Full/Part  
time."

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_12

SourceEntity.....SIM2\_5

DestinationEntity.....SIM6\_12

SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_13

SourceEntity.....SIM2\_5

DestinationEntity.....SIM6\_13

SequenceNo.....2

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_14

SourceEntity.....SIM2\_5

DestinationEntity.....SIM6\_14

SequenceNo.....3



Meta-relationship.....AttributableObject.IsDescribedBy.Attribute  
Meta-attributes  
CDIFIdentifier.....SIM7\_15  
SourceEntity.....SIM2\_5  
DestinationEntity.....SIM6\_15  
SequenceNo.....4

Meta-relationship.....AttributableObject.IsDescribedBy.Attribute  
Meta-attributes  
CDIFIdentifier.....SIM7\_16  
SourceEntity.....SIM2\_5  
DestinationEntity.....SIM6\_16  
SequenceNo.....5

Instructor-ID:

Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM16\_6  
SourceEntity.....SIM6\_12  
DestinationEntity.....SIM15\_1

Meta-entity.....AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM15\_5  
Name....."Instructor-Name"

Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM16\_7  
SourceEntity.....SIM6\_13  
DestinationEntity.....SIM15\_5

Meta-entity.....AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM15\_6  
Name....."Instructor-Addr"

Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM16\_8  
SourceEntity.....SIM6\_14  
DestinationEntity.....SIM15\_6

Meta-entity.....AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM15\_7  
Name....."Degrée"

Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition  
Meta-attributes  
CDIFIdentifier.....SIM16\_9  
SourceEntity.....SIM6\_15  
DestinationEntity.....SIM15\_7



**Meta-entity.....AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM15\_8  
 Name....."Instructor-Type"

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM16\_10  
 SourceEntity.....SIM6\_16  
 DestinationEntity.....SIM15\_8

These attributes are needed for transferring specialization.

Part-Time-Subtype:

Instructor-ID:  
**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_17  
 BriefDescription....."The unique identifier of  
 Part-Time-Subtype."

**Meta-relationship.....Attribute.IsInheritedFrom.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6A\_17  
 SourceEntity.....SIM6\_17  
 DestinationEntity.....SIM6\_12

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_18  
 BriefDescription....."The name of the instructor."

**Meta-relationship.....Attribute.IsInheritedFrom.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6A\_18  
 SourceEntity.....SIM6\_18  
 DestinationEntity.....SIM6\_13

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_19  
 BriefDescription....."Address of instructor."

**Meta-relationship.....Attribute.IsInheritedFrom.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6A\_19  
 SourceEntity.....SIM6\_19  
 DestinationEntity.....SIM6\_14

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_191  
 BriefDescription....."Degree of instructor."

**Meta-relationship.....Attribute.IsInheritedFrom.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6A\_191  
SourceEntity.....SIM6\_191  
DestinationEntity.....SIM6\_15

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_192  
BriefDescription....."Type of instructor  
(full/part)."

**Meta-relationship.....Attribute.IsInheritedFrom.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6A\_192  
SourceEntity.....SIM6\_192  
DestinationEntity.....SIM6\_16

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_17  
SourceEntity.....SIM2\_11  
DestinationEntity.....SIM6\_17  
SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_18  
SourceEntity.....SIM2\_11  
DestinationEntity.....SIM6\_18  
SequenceNo.....2

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_19  
SourceEntity.....SIM2\_11  
DestinationEntity.....SIM6\_19  
SequenceNo.....3

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_191  
SourceEntity.....SIM2\_11  
DestinationEntity.....SIM6\_191  
SequenceNo.....4

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_192  
SourceEntity.....SIM2\_11  
DestinationEntity.....SIM6\_192  
SequenceNo.....5

Instructor-ID:  
**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_11  
SourceEntity.....SIM6\_17  
DestinationEntity.....SIM15\_1

Instructor-Name:  
**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_12  
SourceEntity.....SIM6\_18  
DestinationEntity.....SIM15\_5

Instructor-Addr:  
**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_13  
SourceEntity.....SIM6\_19  
DestinationEntity.....SIM15\_6

Degree:  
**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_14  
SourceEntity.....SIM6\_191  
DestinationEntity.....SIM15\_7

Instructor-Type:  
**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_15  
SourceEntity.....SIM6\_192  
DestinationEntity.....SIM15\_8

Attributes of "Course".

Course-Code:  
**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_20  
BriefDescription....."The unique identifier of  
Course."

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_21  
Name....."Course-Name"  
BriefDescription....."The name of the course."

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_22  
Name....."Std-Cred-Hrs"  
BriefDescription.....



**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_20  
SourceEntity.....SIM2\_3  
DestinationEntity.....SIM6\_20  
SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_21  
SourceEntity.....SIM2\_3  
DestinationEntity.....SIM6\_21  
SequenceNo.....2

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_22  
SourceEntity.....SIM2\_3  
DestinationEntity.....SIM6\_22  
SequenceNo.....3

Course-Code:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_16  
SourceEntity.....SIM6\_20  
DestinationEntity.....SIM15\_2

Attributes of "Offering".

Course-Code:

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_23  
BriefDescription....."Foreign key from Course."

Semester-No:

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_24  
BriefDescription....."Foreign key from Semester."

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_25  
Name....."Act-Cred-Hrs"  
BriefDescription.....

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_23  
SourceEntity.....SIM2\_6  
DestinationEntity.....SIM6\_23  
SequenceNo.....1



**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_24  
SourceEntity.....SIM2\_6  
DestinationEntity.....SIM6\_24  
SequenceNo.....2

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_25  
SourceEntity.....SIM2\_6  
DestinationEntity.....SIM6\_25  
SequenceNo.....3

Course-Code:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_17  
SourceEntity.....SIM6\_23  
DestinationEntity.....SIM15\_2

Semester-No:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_18  
SourceEntity.....SIM6\_24  
DestinationEntity.....SIM15\_3

Attributes of "Semester".

Semester-No:

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_26  
BriefDescription....."The unique identifier of Semester."

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_27  
Name....."Start-Date"  
BriefDescription....."The date when the course starts."

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_28  
Name....."End-Date"  
BriefDescription....."The date when the course ends."

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_26  
 SourceEntity.....SIM2\_4  
 DestinationEntity.....SIM6\_26  
 SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_27  
 SourceEntity.....SIM2\_4  
 DestinationEntity.....SIM6\_27  
 SequenceNo.....2

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_28  
 SourceEntity.....SIM2\_4  
 DestinationEntity.....SIM6\_28  
 SequenceNo.....3

Semester-No:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM16\_19  
 SourceEntity.....SIM6\_26  
 DestinationEntity.....SIM15\_3

These attributes are needed here to transfer the complete meaning of IDEF1X categorization.

Full-Time-Subtype:

Instructor-ID:

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_29  
 BriefDescription....."The unique identifier of Full-Time-Subtype."

**Meta-relationship.....Attribute.IsInheritedFrom.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6A\_29  
 SourceEntity.....SIM6\_29  
 DestinationEntity.....SIM6\_12

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_30  
 BriefDescription....."The name of the instructor."

**Meta-relationship.....Attribute.IsInheritedFrom.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6A\_30  
 SourceEntity.....SIM6\_30  
 DestinationEntity.....SIM6\_13

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_31  
 BriefDescription....."Address of instructor."

**Meta-relationship.....Attribute.IsInheritedFrom.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6A\_31  
 SourceEntity.....SIM6\_31  
 DestinationEntity.....SIM6\_14

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_32  
 BriefDescription....."Instructor's Degree."

**Meta-relationship.....Attribute.IsInheritedFrom.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6A\_32  
 SourceEntity.....SIM6\_32  
 DestinationEntity.....SIM6\_15

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_33  
 BriefDescription....."Type of instructor  
 (full/part)."

**Meta-relationship.....Attribute.IsInheritedFrom.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6A\_33  
 SourceEntity.....SIM6\_33  
 DestinationEntity.....SIM6\_16

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_29  
 SourceEntity.....SIM2\_10  
 DestinationEntity.....SIM6\_29  
 SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_30  
 SourceEntity.....SIM2\_10  
 DestinationEntity.....SIM6\_30  
 SequenceNo.....2

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_31  
 SourceEntity.....SIM2\_10  
 DestinationEntity.....SIM6\_31  
 SequenceNo.....3



**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_32  
SourceEntity.....SIM2\_10  
DestinationEntity.....SIM6\_32  
SequenceNo.....4

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_33  
SourceEntity.....SIM2\_10  
DestinationEntity.....SIM6\_33  
SequenceNo.....5

Instructor-ID:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_20  
SourceEntity.....SIM6\_29  
DestinationEntity.....SIM15\_1

Instructor-Name:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_21  
SourceEntity.....SIM6\_30  
DestinationEntity.....SIM15\_5

Instructor-Addr:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_22  
SourceEntity.....SIM6\_31  
DestinationEntity.....SIM15\_6

Degree:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_23  
SourceEntity.....SIM6\_32  
DestinationEntity.....SIM15\_7

Instructor-Type:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_24  
SourceEntity.....SIM6\_33  
DestinationEntity.....SIM15\_8

Attributes of "Full-Time".

Instructor-ID:

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_34  
BriefDescription.....



**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_35  
 Name....."Annual-Salary"  
 BriefDescription....."The Instructor's salary for  
 the whole year."

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_34  
 SourceEntity.....SIM2\_12  
 DestinationEntity.....SIM6\_34  
 SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_35  
 SourceEntity.....SIM2\_12  
 DestinationEntity.....SIM6\_35  
 SequenceNo.....2

Instructor-ID  
**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM16\_25  
 SourceEntity.....SIM6\_34  
 DestinationEntity.....SIM15\_1

Attributes of "Part-Time".

Instructor-ID:  
**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_36  
 BriefDescription.....

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_37  
 Name....."Hourly-Rate"  
 BriefDescription....."The Instructor's wages per  
 hour."

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_36  
 SourceEntity.....SIM2\_13  
 DestinationEntity.....SIM6\_36  
 SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_37  
 SourceEntity.....SIM2\_13  
 DestinationEntity.....SIM6\_37  
 SequenceNo.....2

Instructor-ID:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM16\_26  
 SourceEntity.....SIM6\_36  
 DestinationEntity.....SIM15\_1

Attributes of "Class-Section".

Course-Code:

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_38  
 BriefDescription....."A foreign key from  
 Offering."

Semester-No:

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_39  
 BriefDescription....."A foreign key from  
 Semester."

Section-No:

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_40  
 BriefDescription....."The unique identifier of  
 Class-Section."

Instructor-ID:

**Meta-entity.....Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM6\_41  
 BriefDescription....."A foreign key from  
 Instructor."

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_38  
 SourceEntity.....SIM2\_7  
 DestinationEntity.....SIM6\_38  
 SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_39  
 SourceEntity.....SIM2\_7  
 DestinationEntity.....SIM6\_39  
 SequenceNo.....2

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_40  
 SourceEntity.....SIM2\_7  
 DestinationEntity.....SIM6\_40  
 SequenceNo.....3

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
 Meta-attributes  
 CDIFIdentifier.....SIM7\_41  
 SourceEntity.....SIM2\_7  
 DestinationEntity.....SIM6\_41  
 SequenceNo.....4

Course-Code:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM16\_27  
 SourceEntity.....SIM6\_38  
 DestinationEntity.....SIM15\_2

Semester-No:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM16\_28  
 SourceEntity.....SIM6\_39  
 DestinationEntity.....SIM15\_3

Section-No:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM16\_29  
 SourceEntity.....SIM6\_40  
 DestinationEntity.....SIM15\_4

Instructor-ID:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
 Meta-attributes  
 CDIFIdentifier.....SIM16\_30  
 SourceEntity.....SIM6\_41  
 DestinationEntity.....SIM15\_1

Attributes of "Textbook".

Textbook-No:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_42

BriefDescription....."The unique identifier of  
Textbook."

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_43

Name....."Textbook-Name"

BriefDescription....."The name of the textbook."

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_44

Name....."Pub-Co-Name"

BriefDescription....."The name of the publishing  
company."

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_42

SourceEntity.....SIM2\_9

DestinationEntity.....SIM6\_42

SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_43

SourceEntity.....SIM2\_9

DestinationEntity.....SIM6\_43

SequenceNo.....2

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_44

SourceEntity.....SIM2\_9

DestinationEntity.....SIM6\_44

SequenceNo.....3

**Meta-entity.....AttributeDefinition**

Meta-attributes

CDIFIdentifier.....SIM15\_9

Name....."Textbook\_No"

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**

Meta-attributes

CDIFIdentifier.....SIM16\_31

SourceEntity.....SIM6\_42

DestinationEntity.....SIM15\_9

Attributes of "Attendance".



Soc-Sec-No:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_45

BriefDescription....."A foreign key from Enrollment."

Course-Code:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_46

BriefDescription....."A foreign key from Enrollment."

Semester-No:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_47

BriefDescription....."A foreign key from Enrollment."

Section-No:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_48

BriefDescription....."A foreign key from Enrollment."

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_49

Name....."Attendance-Status"

BriefDescription.....

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_45

SourceEntity.....SIM2\_2

DestinationEntity.....SIM6\_45

SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_46

SourceEntity.....SIM2\_2

DestinationEntity.....SIM6\_46

SequenceNo.....2

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_47

SourceEntity.....SIM2\_2

DestinationEntity.....SIM6\_47

SequenceNo.....3

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_48  
SourceEntity.....SIM2\_2  
DestinationEntity.....SIM6\_48  
SequenceNo.....4

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM7\_49  
SourceEntity.....SIM2\_2  
DestinationEntity.....SIM6\_49  
SequenceNo.....5

Soc-Sec-No:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_32  
SourceEntity.....SIM6\_45  
DestinationEntity.....SIM15\_0

Course-Code:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_33  
SourceEntity.....SIM6\_46  
DestinationEntity.....SIM15\_2

Semester-No:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_34  
SourceEntity.....SIM6\_47  
DestinationEntity.....SIM15\_3

Section-No:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**  
Meta-attributes  
CDIFIdentifier.....SIM16\_35  
SourceEntity.....SIM6\_48  
DestinationEntity.....SIM15\_4

Attributes of "Class-Text".

Textbook-No:

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_50  
BriefDescription....."A foreign key from  
Textbook."

Course-Code:

**Meta-entity.....Attribute**  
Meta-attributes  
CDIFIdentifier.....SIM6\_51  
BriefDescription....."A foreign key from  
Class-Section."

Semester-No:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_52

BriefDescription....."A foreign key from  
Class-Section."

Section-No:

**Meta-entity.....Attribute**

Meta-attributes

CDIFIdentifier.....SIM6\_53

BriefDescription....."A foreign key from  
Class-Section."

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_50

SourceEntity.....SIM2\_8

DestinationEntity.....SIM6\_50

SequenceNo.....1

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_51

SourceEntity.....SIM2\_8

DestinationEntity.....SIM6\_51

SequenceNo.....2

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_52

SourceEntity.....SIM2\_8

DestinationEntity.....SIM6\_52

SequenceNo.....3

**Meta-relationship.....AttributableObject.IsDescribedBy.Attribute**

Meta-attributes

CDIFIdentifier.....SIM7\_53

SourceEntity.....SIM2\_8

DestinationEntity.....SIM6\_53

SequenceNo.....4

Textbook-No:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**

Meta-attributes

CDIFIdentifier.....SIM16\_36

SourceEntity.....SIM6\_50

DestinationEntity.....SIM15\_9

Course-Code:

**Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition**

Meta-attributes

CDIFIdentifier.....SIM16\_37

SourceEntity.....SIM6\_51

DestinationEntity.....SIM15\_2



Semester-No:

```

Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition
  Meta-attributes
  CDIFIdentifier.....SIM16_38
  SourceEntity.....SIM6_52
  DestinationEntity.....SIM15_3

```

Section-No:

```

Meta-relationship.....Attribute.IsBasedOn.AttributeDefinition
  Meta-attributes
  CDIFIdentifier.....SIM16_39
  SourceEntity.....SIM6_53
  DestinationEntity.....SIM15_4

```

For each entity we have to create a candidate key and relate it to it's entity.

```

Meta-entity.....CandidateKey
  Meta-attributes
  CDIFIdentifier.....SIM8_0
  Name....."Student-Key"
  IsPrimary.....True

```

```

Meta-relationship.....Entity.Contains.Key
  Meta-attributes
  CDIFIdentifier.....SIM9_0
  SourceEntity.....SIM2_0
  DestinationEntity.....SIM8_0

```

Since we have already defined CDIF Meta-entities Attribute and CandidateKey, now we are ready to relate them to each other.

```

Meta-relationship.....Attribute.IsComponentOf.Key
  Meta-attributes
  CDIFIdentifier.....SIM10_0
  SourceEntity.....SIM6_0
  DestinationEntity.....SIM8_0
  SequenceNo.....1

```

```

Meta-entity.....CandidateKey
  Meta-attributes
  CDIFIdentifier.....SIM8_1
  Name....."Enrollment-Key"
  IsPrimary.....True

```

```

Meta-relationship.....Entity.Contains.Key
  Meta-attributes
  CDIFIdentifier.....SIM9_1
  SourceEntity.....SIM2_1
  DestinationEntity.....SIM8_1

```



**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_1A  
SourceEntity.....SIM6\_5  
DestinationEntity.....SIM8\_1  
SequenceNo.....1

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_1B  
SourceEntity.....SIM6\_6  
DestinationEntity.....SIM8\_1  
SequenceNo.....2

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_1C  
SourceEntity.....SIM6\_7  
DestinationEntity.....SIM8\_1  
SequenceNo.....3

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_1D  
SourceEntity.....SIM6\_8  
DestinationEntity.....SIM8\_1  
SequenceNo.....4

**Meta-entity.....CandidateKey**  
Meta-attributes  
CDIFIdentifier.....SIM8\_2  
Name....."Full-Time-Subtype-Key"  
IsPrimary.....True

**Meta-relationship.....Entity.Contains.Key**  
Meta-attributes  
CDIFIdentifier.....SIM9\_2  
SourceEntity.....SIM2\_10  
DestinationEntity.....SIM8\_2

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_2A  
SourceEntity.....SIM6\_29  
DestinationEntity.....SIM8\_2  
SequenceNo.....1

**Meta-entity.....CandidateKey**  
Meta-attributes  
CDIFIdentifier.....SIM8\_3  
Name....."Part-Time-Subtype-Key"  
IsPrimary.....True

**Meta-relationship.....Entity.Contains.Key**

Meta-attributes  
CDIFIdentifier.....SIM9\_3  
SourceEntity.....SIM2\_11  
DestinationEntity.....SIM8\_3

**Meta-relationship.....Attribute.IsComponentOf.Key**

Meta-attributes  
CDIFIdentifier.....SIM10\_3A  
SourceEntity.....SIM6\_17  
DestinationEntity.....SIM8\_3  
SequenceNo.....1

**Meta-entity.....CandidateKey**

Meta-attributes  
CDIFIdentifier.....SIM8\_4  
Name....."Attendance-Key"  
IsPrimary.....True

**Meta-relationship.....Entity.Contains.Key**

Meta-attributes  
CDIFIdentifier.....SIM9\_4  
SourceEntity.....SIM2\_2  
DestinationEntity.....SIM8\_4

**Meta-relationship.....Attribute.IsComponentOf.Key**

Meta-attributes  
CDIFIdentifier.....SIM10\_4A  
SourceEntity.....SIM6\_45  
DestinationEntity.....SIM8\_4  
SequenceNo.....1

**Meta-relationship.....Attribute.IsComponentOf.Key**

Meta-attributes  
CDIFIdentifier.....SIM10\_4B  
SourceEntity.....SIM6\_46  
DestinationEntity.....SIM8\_4  
SequenceNo.....2

**Meta-relationship.....Attribute.IsComponentOf.Key**

Meta-attributes  
CDIFIdentifier.....SIM10\_4C  
SourceEntity.....SIM6\_47  
DestinationEntity.....SIM8\_4  
SequenceNo.....3

**Meta-relationship.....Attribute.IsComponentOf.Key**

Meta-attributes  
CDIFIdentifier.....SIM10\_4D  
SourceEntity.....SIM6\_48  
DestinationEntity.....SIM8\_4  
SequenceNo.....4

```

Meta-entity.....CandidateKey
  Meta-attributes
  CDIFIdentifier.....SIM8_5
  Name....."Course-Key"
  IsPrimary.....True

Meta-relationship.....Entity.Contains.Key
  Meta-attributes
  CDIFIdentifier.....SIM9_5
  SourceEntity.....SIM2_3
  DestinationEntity.....SIM8_5

Meta-relationship.....Attribute.IsComponentOf.Key
  Meta-attributes
  CDIFIdentifier.....SIM10_5A
  SourceEntity.....SIM6_20
  DestinationEntity.....SIM8_5
  SequenceNo.....1

Meta-entity.....CandidateKey
  Meta-attributes
  CDIFIdentifier.....SIM8_6
  Name....."Semester-Key"
  IsPrimary.....True

Meta-relationship.....Entity.Contains.Key
  Meta-attributes
  CDIFIdentifier.....SIM9_6
  SourceEntity.....SIM2_4
  DestinationEntity.....SIM8_6

Meta-relationship.....Attribute.IsComponentOf.Key
  Meta-attributes
  CDIFIdentifier.....SIM10_6A
  SourceEntity.....SIM6_26
  DestinationEntity.....SIM8_6
  SequenceNo.....1

Meta-entity.....CandidateKey
  Meta-attributes
  CDIFIdentifier.....SIM8_7
  Name....."Instructor-Key"
  IsPrimary.....True

Meta-relationship.....Entity.Contains.Key
  Meta-attributes
  CDIFIdentifier.....SIM9_7
  SourceEntity.....SIM2_5
  DestinationEntity.....SIM8_7

```



**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_7A  
SourceEntity.....SIM6\_12  
DestinationEntity.....SIM8\_7  
SequenceNo.....1

**Meta-entity.....CandidateKey**  
Meta-attributes  
CDIFIdentifier.....SIM8\_8  
Name....."Offering-Key"  
IsPrimary.....True

**Meta-relationship.....Entity.Contains.Key**  
Meta-attributes  
CDIFIdentifier.....SIM9\_8  
SourceEntity.....SIM2\_6  
DestinationEntity.....SIM8\_8

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_8A  
SourceEntity.....SIM6\_23  
DestinationEntity.....SIM8\_8  
SequenceNo.....1

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_8B  
SourceEntity.....SIM6\_24  
DestinationEntity.....SIM8\_8  
SequenceNo.....2

**Meta-entity.....CandidateKey**  
Meta-attributes  
CDIFIdentifier.....SIM8\_9  
Name....."Class-Section-Key"  
IsPrimary.....True

**Meta-relationship.....Entity.Contains.Key**  
Meta-attributes  
CDIFIdentifier.....SIM9\_9  
SourceEntity.....SIM2\_7  
DestinationEntity.....SIM8\_9

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_9A  
SourceEntity.....SIM6\_38  
DestinationEntity.....SIM8\_9  
SequenceNo.....1



**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_9B  
SourceEntity.....SIM6\_39  
DestinationEntity.....SIM8\_9  
SequenceNo.....2

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_9C  
SourceEntity.....SIM6\_40  
DestinationEntity.....SIM8\_9  
SequenceNo.....3

**Meta-entity.....CandidateKey**  
Meta-attributes  
CDIFIdentifier.....SIM8\_10  
Name....."Class-Text-Key"  
IsPrimary.....True

**Meta-relationship.....Entity.Contains.Key**  
Meta-attributes  
CDIFIdentifier.....SIM9\_10  
SourceEntity.....SIM2\_8  
DestinationEntity.....SIM8\_10

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_10A  
SourceEntity.....SIM6\_50  
DestinationEntity.....SIM8\_10  
SequenceNo.....1

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_10B  
SourceEntity.....SIM6\_51  
DestinationEntity.....SIM8\_10  
SequenceNo.....2

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_10C  
SourceEntity.....SIM6\_52  
DestinationEntity.....SIM8\_10  
SequenceNo.....3

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM10\_10D  
SourceEntity.....SIM6\_53  
DestinationEntity.....SIM8\_10  
SequenceNo.....4

```

Meta-entity.....CandidateKey
  Meta-attributes
  CDIFIdentifier.....SIM8_11
  Name....."Textbook-Key"
  IsPrimary.....True

Meta-relationship.....Entity.Contains.Key
  Meta-attributes
  CDIFIdentifier.....SIM9_11
  SourceEntity.....SIM2_9
  DestinationEntity.....SIM8_11

Meta-relationship.....Attribute.IsComponentOf.Key
  Meta-attributes
  CDIFIdentifier.....SIM10_11A
  SourceEntity.....SIM6_42
  DestinationEntity.....SIM8_11
  SequenceNo.....1

Meta-entity.....CandidateKey
  Meta-attributes
  CDIFIdentifier.....SIM8_12
  Name....."Full-Time-Key"
  IsPrimary.....True

Meta-relationship.....Entity.Contains.Key
  Meta-attributes
  CDIFIdentifier.....SIM9_12
  SourceEntity.....SIM2_12
  DestinationEntity.....SIM8_12

Meta-relationship.....Attribute.IsComponentOf.Key
  Meta-attributes
  CDIFIdentifier.....SIM10_12A
  SourceEntity.....SIM6_34
  DestinationEntity.....SIM8_12
  SequenceNo.....1

Meta-entity.....CandidateKey
  Meta-attributes
  CDIFIdentifier.....SIM8_13
  Name....."Part-Time-Key"
  IsPrimary.....True

Meta-relationship.....Entity.Contains.Key
  Meta-attributes
  CDIFIdentifier.....SIM9_13
  SourceEntity.....SIM2_13
  DestinationEntity.....SIM8_13

```

**Meta-relationship.....Attribute.IsComponentOf.Key**

Meta-attributes  
CDIFIdentifier.....SIM10\_13A  
SourceEntity.....SIM6\_36  
DestinationEntity.....SIM8\_13  
SequenceNo.....1

For some entities we have to create a ForeignKey, relate this key to it's Entity and Attribute, and reference it to the CandidateKey.

**Meta-entity.....ForeignKey**

Meta-attributes  
CDIFIdentifier.....SIM11\_0  
Name....."Student-Enrollment-FK"

**Meta-relationship.....Entity.Contains.Key**

Meta-attributes  
CDIFIdentifier.....SIM12\_0  
SourceEntity.....SIM2\_1  
DestinationEntity.....SIM11\_0

**Meta-relationship.....ForeignKey.References.CandidateKey**

Meta-attributes  
CDIFIdentifier.....SIM13\_0  
SourceEntity.....SIM11\_0  
DestinationEntity.....SIM8\_0

**Meta-relationship.....Attribute.IsComponentOf.Key**

Meta-attributes  
CDIFIdentifier.....SIM14\_0A  
SourceEntity.....SIM6\_5  
DestinationEntity.....SIM11\_0  
SequenceNo.....1

**Meta-entity.....ForeignKey**

Meta-attributes  
CDIFIdentifier.....SIM11\_1  
Name....."Course-Offering-FK"

**Meta-relationship.....Entity.Contains.Key**

Meta-attributes  
CDIFIdentifier.....SIM12\_1  
SourceEntity.....SIM2\_6  
DestinationEntity.....SIM11\_1

**Meta-relationship.....ForeignKey.References.CandidateKey**

Meta-attributes  
CDIFIdentifier.....SIM13\_1  
SourceEntity.....SIM11\_1  
DestinationEntity.....SIM8\_5



**Meta-relationship.....Attribute.IsComponentOf.Key**

Meta-attributes

CDIFIdentifier.....SIM14\_1A

SourceEntity.....SIM6\_23

DestinationEntity.....SIM11\_1

SequenceNo.....1

**Meta-entity.....ForeignKey**

Meta-attributes

CDIFIdentifier.....SIM11\_2

Name....."Semester-Offering-FK"

**Meta-relationship.....Entity.Contains.Key**

Meta-attributes

CDIFIdentifier.....SIM12\_2

SourceEntity.....SIM2\_6

DestinationEntity.....SIM11\_2

**Meta-relationship.....ForeignKey.References.CandidateKey**

Meta-attributes

CDIFIdentifier.....SIM13\_2

SourceEntity.....SIM11\_2

DestinationEntity.....SIM8\_6

**Meta-relationship.....Attribute.IsComponentOf.Key**

Meta-attributes

CDIFIdentifier.....SIM14\_2A

SourceEntity.....SIM6\_24

DestinationEntity.....SIM11\_2

SequenceNo.....1

**Meta-entity.....ForeignKey**

Meta-attributes

CDIFIdentifier.....SIM11\_3

Name....."Instructor-Student-FK"

**Meta-relationship.....Entity.Contains.Key**

Meta-attributes

CDIFIdentifier.....SIM12\_3

SourceEntity.....SIM2\_0

DestinationEntity.....SIM11\_3

**Meta-relationship.....ForeignKey.References.CandidateKey**

Meta-attributes

CDIFIdentifier.....SIM13\_3

SourceEntity.....SIM11\_3

DestinationEntity.....SIM8\_7



```

Meta-relationship.....Attribute.IsComponentOf.Key
  Meta-attributes
  CDIFIdentifier.....SIM14_3A
  SourceEntity.....SIM6_4
  DestinationEntity.....SIM11_3
  SequenceNo.....1

Meta-entity.....ForeignKey
  Meta-attributes
  CDIFIdentifier.....SIM11_4
  Name....."Instructor-Class-Section-FK"

Meta-relationship.....Entity.Contains.Key
  Meta-attributes
  CDIFIdentifier.....SIM12_4
  SourceEntity.....SIM2_7
  DestinationEntity.....SIM11_4

Meta-relationship.....ForeignKey.References.CandidateKey
  Meta-attributes
  CDIFIdentifier.....SIM13_4
  SourceEntity.....SIM11_4
  DestinationEntity.....SIM8_7

Meta-relationship.....Attribute.IsComponentOf.Key
  Meta-attributes
  CDIFIdentifier.....SIM14_4A
  SourceEntity.....SIM6_41
  DestinationEntity.....SIM11_4
  SequenceNo.....1

Meta-entity.....ForeignKey
  Meta-attributes
  CDIFIdentifier.....SIM11_5
  Name....."Class-Section-Enrollment-FK"

Meta-relationship.....Entity.Contains.Key
  Meta-attributes
  CDIFIdentifier.....SIM12_5
  SourceEntity.....SIM2_1
  DestinationEntity.....SIM11_5

Meta-relationship.....ForeignKey.References.CandidateKey
  Meta-attributes
  CDIFIdentifier.....SIM13_5
  SourceEntity.....SIM11_5
  DestinationEntity.....SIM8_9

```

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM14\_5A  
SourceEntity.....SIM6\_6  
DestinationEntity.....SIM11\_5  
SequenceNo.....1

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM14\_5B  
SourceEntity.....SIM6\_7  
DestinationEntity.....SIM11\_5  
SequenceNo.....2

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM14\_5C  
SourceEntity.....SIM6\_8  
DestinationEntity.....SIM11\_5  
SequenceNo.....3

**Meta-entity.....ForeignKey**  
Meta-attributes  
CDIFIdentifier.....SIM11\_6  
Name....."Enrollment-Attendance-FK"

**Meta-relationship.....Entity.Contains.Key**  
Meta-attributes  
CDIFIdentifier.....SIM12\_6  
SourceEntity.....SIM2\_2  
DestinationEntity.....SIM11\_6

**Meta-relationship.....ForeignKey.References.CandidateKey**  
Meta-attributes  
CDIFIdentifier.....SIM13\_6  
SourceEntity.....SIM11\_6  
DestinationEntity.....SIM8\_1

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM14\_6A  
SourceEntity.....SIM6\_45  
DestinationEntity.....SIM11\_6  
SequenceNo.....1

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM14\_6B  
SourceEntity.....SIM6\_46  
DestinationEntity.....SIM11\_6  
SequenceNo.....2

**Meta-relationship.....Attribute.IsComponentOf.Key**  
 Meta-attributes  
 CDIFIdentifier.....SIM14\_6C  
 SourceEntity.....SIM6\_47  
 DestinationEntity.....SIM11\_6  
 SequenceNo.....3

**Meta-relationship.....Attribute.IsComponentOf.Key**  
 Meta-attributes  
 CDIFIdentifier.....SIM14\_6D  
 SourceEntity.....SIM6\_48  
 DestinationEntity.....SIM11\_6  
 SequenceNo.....4

**Meta-entity.....ForeignKey**  
 Meta-attributes  
 CDIFIdentifier.....SIM11\_7  
 Name....."Class-Section-Class-Text-FK"

**Meta-relationship.....Entity.Contains.Key**  
 Meta-attributes  
 CDIFIdentifier.....SIM12\_7  
 SourceEntity.....SIM2\_8  
 DestinationEntity.....SIM11\_7

**Meta-relationship.....ForeignKey.References.CandidateKey**  
 Meta-attributes  
 CDIFIdentifier.....SIM13\_7  
 SourceEntity.....SIM11\_7  
 DestinationEntity.....SIM8\_9

**Meta-relationship.....Attribute.IsComponentOf.Key**  
 Meta-attributes  
 CDIFIdentifier.....SIM14\_7A  
 SourceEntity.....SIM6\_51  
 DestinationEntity.....SIM11\_7  
 SequenceNo.....1

**Meta-relationship.....Attribute.IsComponentOf.Key**  
 Meta-attributes  
 CDIFIdentifier.....SIM14\_7B  
 SourceEntity.....SIM6\_52  
 DestinationEntity.....SIM11\_7  
 SequenceNo.....2

**Meta-relationship.....Attribute.IsComponentOf.Key**  
 Meta-attributes  
 CDIFIdentifier.....SIM14\_7C  
 SourceEntity.....SIM6\_53  
 DestinationEntity.....SIM11\_7  
 SequenceNo.....3



**Meta-entity.....ForeignKey**  
 Meta-attributes  
 CDIFIdentifier.....SIM11\_8  
 Name....."Textbook-Class-Text-FK"

**Meta-relationship.....Entity.Contains.Key**  
 Meta-attributes  
 CDIFIdentifier.....SIM12\_8  
 SourceEntity.....SIM2\_8  
 DestinationEntity.....SIM11\_8

**Meta-relationship.....ForeignKey.References.CandidateKey**  
 Meta-attributes  
 CDIFIdentifier.....SIM13\_8  
 SourceEntity.....SIM11\_8  
 DestinationEntity.....SIM8\_11

**Meta-relationship.....Attribute.IsComponentOf.Key**  
 Meta-attributes  
 CDIFIdentifier.....SIM14\_8A  
 SourceEntity.....SIM6\_50  
 DestinationEntity.....SIM11\_8  
 SequenceNo.....1

**Meta-entity.....ForeignKey**  
 Meta-attributes  
 CDIFIdentifier.....SIM11\_9  
 Name....."Offering-Class-Section-FK"

**Meta-relationship.....Entity.Contains.Key**  
 Meta-attributes  
 CDIFIdentifier.....SIM12\_9  
 SourceEntity.....SIM2\_7  
 DestinationEntity.....SIM11\_9

**Meta-relationship.....ForeignKey.References.CandidateKey**  
 Meta-attributes  
 CDIFIdentifier.....SIM13\_9  
 SourceEntity.....SIM11\_9  
 DestinationEntity.....SIM8\_8

**Meta-relationship.....Attribute.IsComponentOf.Key**  
 Meta-attributes  
 CDIFIdentifier.....SIM14\_9A  
 SourceEntity.....SIM6\_38  
 DestinationEntity.....SIM11\_9  
 SequenceNo.....1

**Meta-relationship.....Attribute.IsComponentOf.Key**  
 Meta-attributes  
 CDIFIdentifier.....SIM14\_9A  
 SourceEntity.....SIM6\_39  
 DestinationEntity.....SIM11\_9  
 SequenceNo.....2



**Meta-entity.....ForeignKey**  
Meta-attributes  
CDIFIdentifier.....SIM11\_10  
Name....."Full-Time-Sbtp-Full-Time-FK"

**Meta-relationship.....Entity.Contains.Key**  
Meta-attributes  
CDIFIdentifier.....SIM12\_10  
SourceEntity.....SIM2\_12  
DestinationEntity.....SIM11\_10

**Meta-relationship.....ForeignKey.References.CandidateKey**  
Meta-attributes  
CDIFIdentifier.....SIM13\_10  
SourceEntity.....SIM11\_10  
DestinationEntity.....SIM8\_2

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM14\_10A  
SourceEntity.....SIM6\_34  
DestinationEntity.....SIM11\_10  
SequenceNo.....1

**Meta-entity.....ForeignKey**  
Meta-attributes  
CDIFIdentifier.....SIM11\_11  
Name....."Part-Time-Sbtp-Part-Time-FK"

**Meta-relationship.....Entity.Contains.Key**  
Meta-attributes  
CDIFIdentifier.....SIM12\_11  
SourceEntity.....SIM2\_13  
DestinationEntity.....SIM11\_11

**Meta-relationship.....ForeignKey.References.CandidateKey**  
Meta-attributes  
CDIFIdentifier.....SIM13\_11  
SourceEntity.....SIM11\_11  
DestinationEntity.....SIM8\_3

**Meta-relationship.....Attribute.IsComponentOf.Key**  
Meta-attributes  
CDIFIdentifier.....SIM14\_11  
SourceEntity.....SIM6\_36  
DestinationEntity.....SIM11\_11  
SequenceNo.....1

# APPENDIX A: IDEF1X CATEGORIZATION MAPPING

## Problem

Almost all things in the world can be classified into different categories according to some common characteristics or functions. We classify humans into males and females; we classify cars into new and used; we classify food into bread and butter. This concept in IDEF1X is called Categorization relationship. "Human" is called generic entity, while "Male" and "Female" are category entities.

If we classify food into bread and butter only, we will have an incomplete categorization because there are lots of other types of food (crabs, cheese, tomatoes, potato chips, etc.). We can say that a categorization is complete if we categorize a generic entity into a finite number of category entities, and each instance of the generic entity is also an instance of one and only one category entity.

Let's look at an IDEF1X categorization of "Instructor." Because full-time instructors and part-time instructors have some common characteristics such as names, addresses, and degrees, we can associate those characteristics with both types of instructors at the same time. We can do this by letting those common attributes be attributes of the generic entity "Instructor." In this case we say that those attributes are inherited from the generic entity "Instructor" by the category entities "Full-Time" and "Part-Time." In the relational database those attributes are stored in the "Instructor" table, and are repeated neither in the "Part-Time" table nor in the "Full-Time" table. Only a primary key - a unique set of one or more attributes that identifies each instance of an entity - is repeated in each of those three tables to identify the entities and preserve the integrity between them. In this case an attribute Instructor-ID (assuming that IDs are unique) can be the primary key of "Instructor," "Full-Time," and "Part-Time."

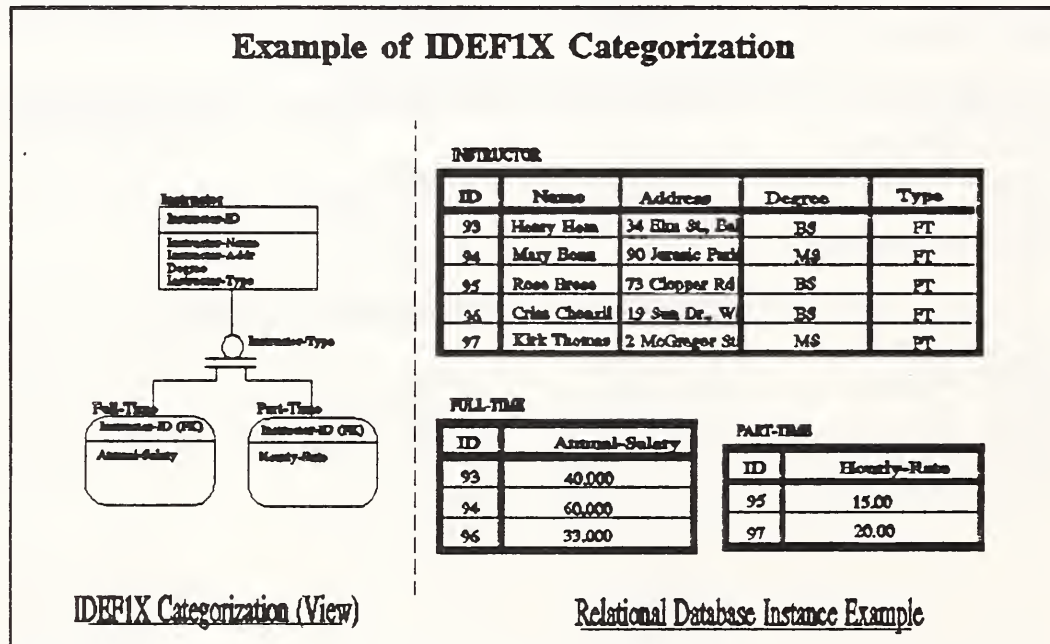


Figure 6



CDIF preserves the meaning of categorization in its super/subtyping. It supports four important characteristics such as coverage, exclusivity, orthogonality, and inheritance. Coverage is used very well in mapping the meaning of completeness. Exclusivity just means that for one instance of a generic entity there should be no more than one instance of a category entity. Orthogonality supports multiple categorizations for a single generic entity, i.e. an instructor can be classified into one set of categories (male/female) according to its gender, or into another set of categories (part-time/full-time) according to its job status. Inheritance associates subtypes with the properties (attributes and relationships) of their supertypes. At each level of the subtyping hierarchy, there should be a local copy of each inherited Attribute. That is where the problem in mapping it to IDEF1X categorization occurs.

IDEF1X does not have a local copy of each inherited attribute at each level of the categorization. Instead, only one copy of those attributes is owned by only one entity - the generic entity. Also, in IDEF1X each instance of a category entity has foreign keys migrated from the corresponding instance of its generic entity, while in CDIF this is not true. In CDIF, at the instance level, there does not have to be an instance of a generic entity for an instance of a corresponding category entity. So, if there are only two types of instructors - full-time and part-time, and there are no other types, then, from the implementation point of view, we do not need to have the "Instructor" table in the relational database because ALL the instances are going to be in either the "Full-Time-Instructor" table or the "Part-Time-Instructor" table.

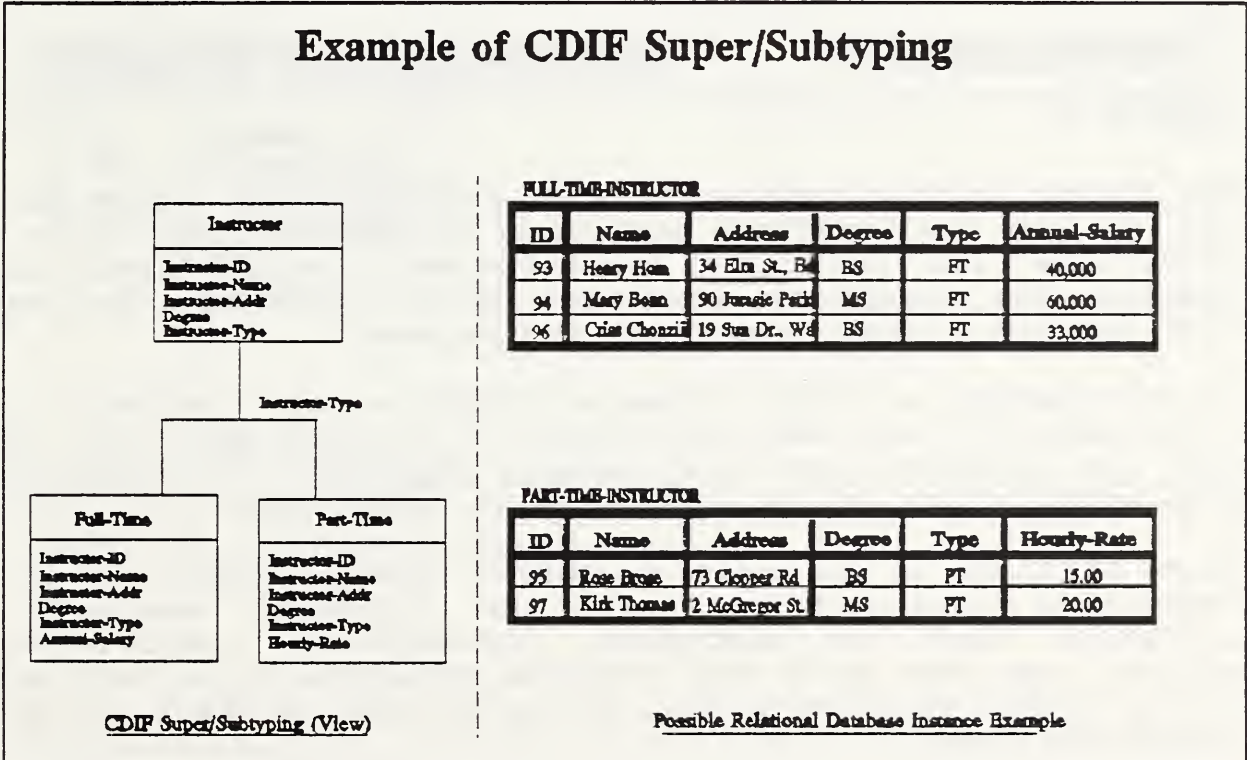


Figure 7

## Solutions

One solution is to treat an IDEF1X categorization, while mapping to CDIF, as a set of one-to-zero-or-one mutually exclusive relationships from the generic entity to the category entities. In this case we will have the same tables (extension and intention) for CDIF and IDEF1X in the relational database.

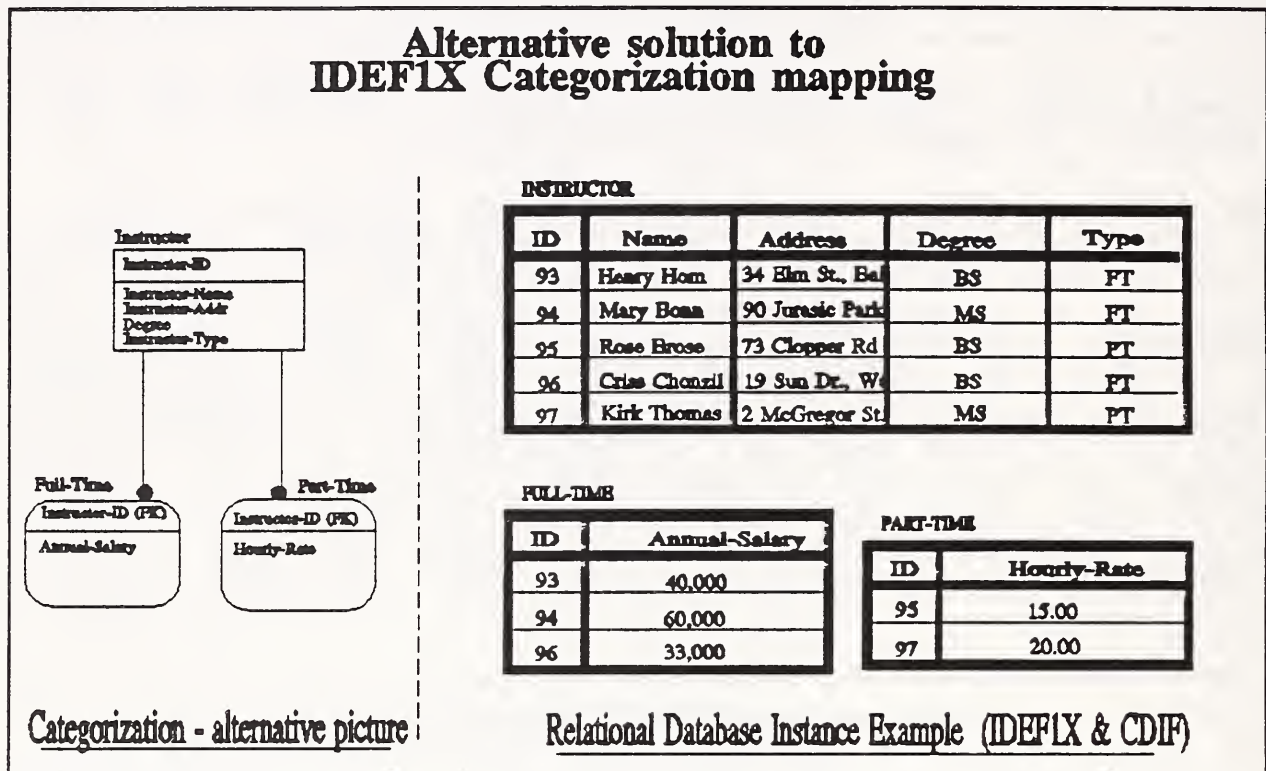


Figure 8

But even though in this case we have the same database scheme for IDEF1X and CDIF, we lose the important meaning of categorization. How do we show that "Full-Time" and "Part-Time" are different types of "Instructor?" We are missing the important construct which contains the means of supertype/subtype, inheritance, and completeness.

The second solution is simply to map an IDEF1X categorization to the CDIF super/subtyping. In this case we probably will preserve all the important means of the concept, but will have a different structure for the instance level, which may be acceptable in some cases.

The third solution is to treat an IDEF1X categorization as a type of super/subtyping construct with all the important meanings of the categorization such as subtyping, inheritance, completeness, and exclusivity<sup>1</sup>, and then force the instance structure to be very much like one for the IDEF1X categorization. We can do this by combining our first and second solutions.

<sup>1</sup>The concept of exclusivity is still open to discussion but looks like it can be easily solved.



Solutions 1 and 2.

Solution 3 as a combination of 1 & 2.

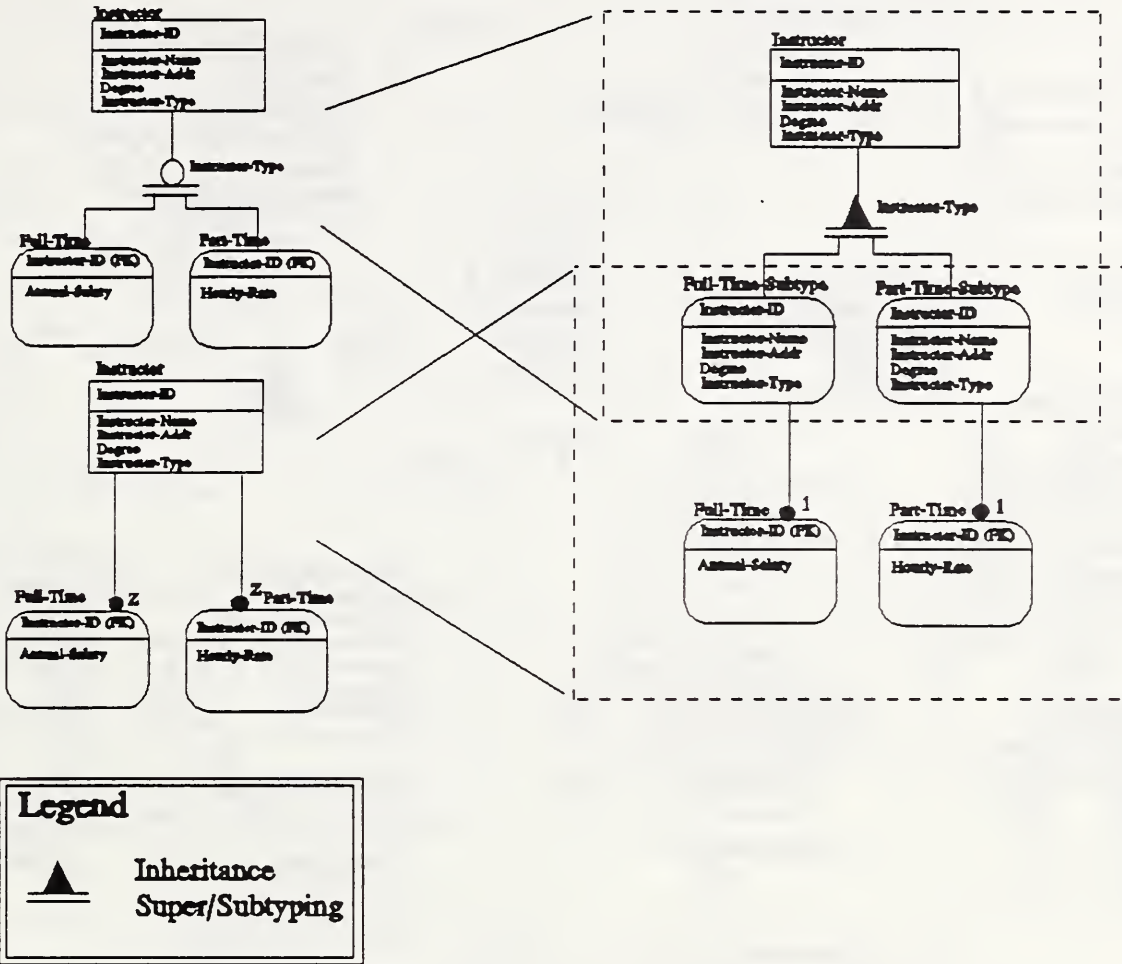



Figure 9

The construct<sup>1</sup>  transfers semantics of IDEF1X categorization, while the set of (2 in this case) exclusive relationships transfers the meaning of instantiation of IDEF1X categorization.

<sup>1</sup>This construct was introduced in its graphical form just to simplify the explanation of the mapping. It represents CDIF subtyping, which includes inheritance, coverage (completeness), orthogonality (two or more categorizations for a generic entity are allowed), and exclusivity.

## APPENDIX B: HELPFUL DIAGRAMS

These diagrams are provided here to help the reader who is trying to "walk through" the mapping example. They contain *CDIFIdentifiers* for most of the CDIF meta-entities and some meta-relationships.

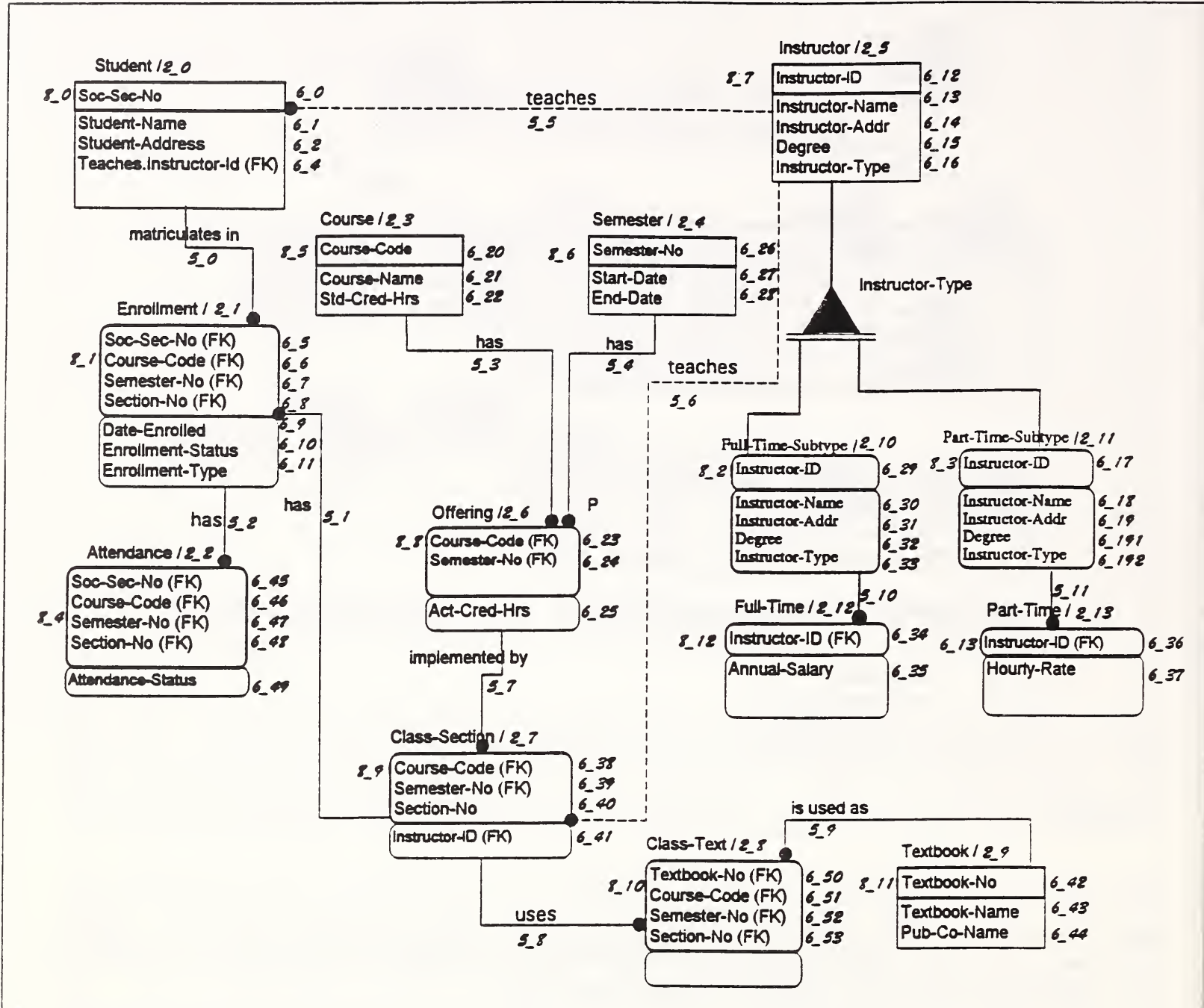


Figure 11

Legend for CDIF IDs:

- 5\_\* Relationship
- 6\_\* Attribute
- 2\_\* CandidateKey
- 2\_\* Entity

Legend for invented symbols:

- Inheritance

APPENDIX B: HELPFUL DIAGRAMS (cont.)

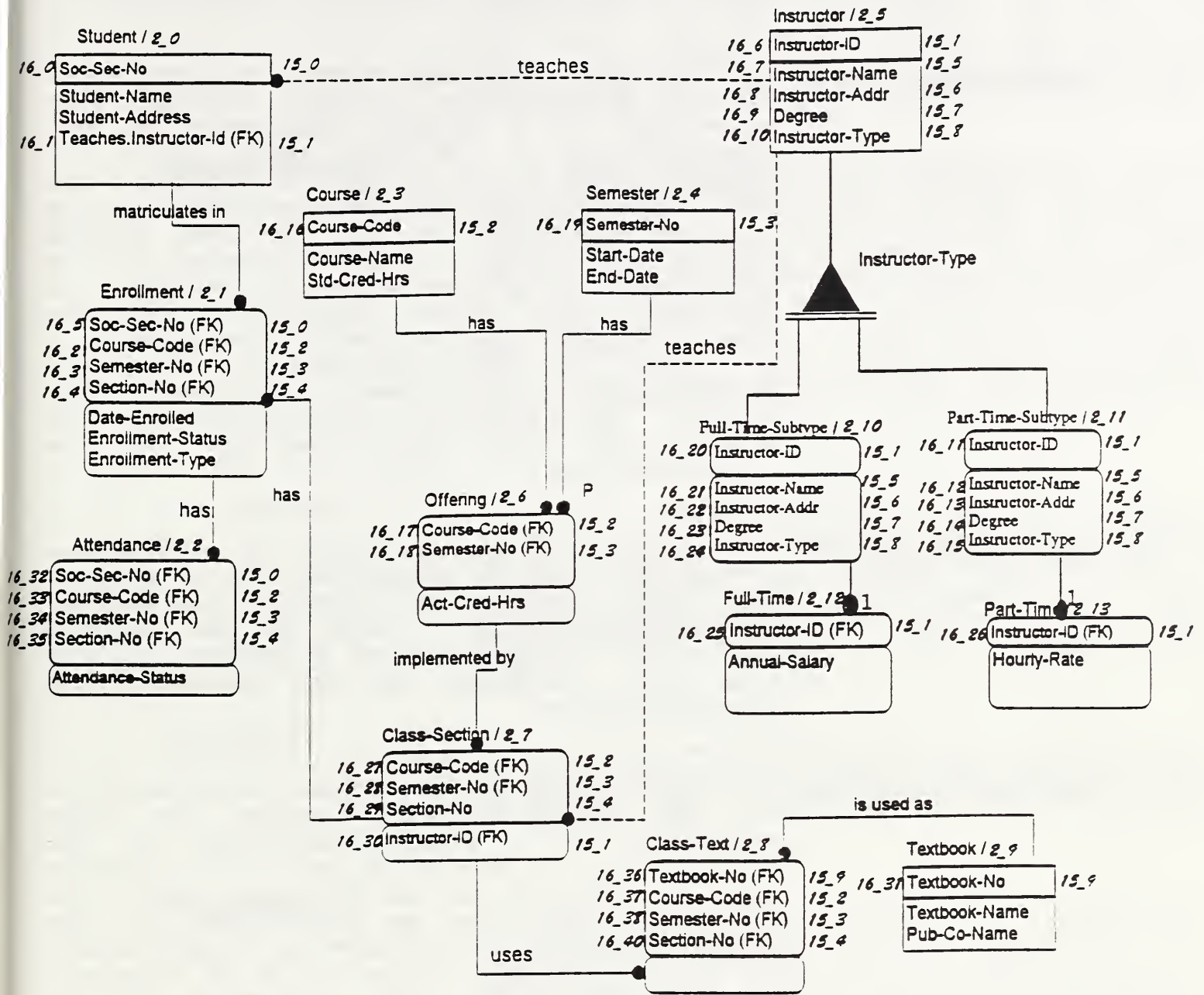



Figure 12

Legend for CDIF IDs:

- 15\_ • AttributeDefinition
- 16\_ • Attribute.IsBasedOn.AttributeDefinition
- / • Entity

Legend for invented symbols:



Inheritance



## GLOSSARY

- CDIFIdentifier** An attribute that uniquely identifies an object in the Model Section of a transfer.
- MinInnerCardinality** Defines the minimum number of occurrences of the *Relationship* related through this *RolePlayer* to a single occurrence of the *DataModelObject*. If the value is 0, it indicates that the *RolePlayer* is Optional, and that therefore there can be occurrences of the *DataModelObject* that do not take part (acting as this *RolePlayer*) in any occurrences of this *Relationship*. If the value is non-zero, it indicates that each occurrence of the *DataModelObject* shall act as this *RolePlayer* in at least as many occurrences of this *Relationship* as the number specified. This defines the minimum cardinality of the *Relationship* from the viewpoint of the *DataModelObject*.
- MaxInnerCardinality** Defines the maximum number of occurrences of the *Relationship* acting as this *RolePlayer* that can be connected to a single occurrence of the *DataModelObject*. This is the maximum cardinality of the owning *Relationship* seen from the viewpoint of the participating *DataModelObject*.
- MinOuterCardinality** Defines the minimum number of occurrences of the *DataModelObject* acting as this *RolePlayer* to a single occurrence of the *Relationship*. If the value is 0, it indicates that the *RolePlayer* is Optional, and that therefore there can be occurrences of the *Relationship* that do not have any object acting as this *RolePlayer*. If the value is non-zero, it indicates that each occurrence of the *Relationship* shall have at least the number specified of related object occurrences in this *RolePlayer*.
- MaxOuterCardinality** Defines the maximum number of occurrences of the *DataModelObject* acting as this *RolePlayer* that can be connected to a single occurrence of the *Relationship*.
- Kernel** This classification is used for an entity



whose instances are meaningful without the occurrences of other entities. For example, an instance of an entity, having a name and a description, is significant without the knowledge of the data model to which it belongs. The fact that an entity can be kernel does not imply that it can be uniquely identified without other scoping information.

### **Characteristic**

Each instance of a characteristic entity is logically related to a single instance of another entity. Therefore, the attributes could be considered to belong to the related entity, where the owning entity is related to the characteristic entity with a relationship of cardinality 1:1. Characteristic entities are usually used to group together related attributes which are optional, and enable the kernel entity to have a smaller fixed set of attributes.

### **Associative**

This classification is used for entities whose existence is dependent upon the existence of two or more other entities; they are used to resolve many-to-many relationships et al. *Entity* instances cannot exist without the existence of instances of the related entity types.

### **IsPrimary**

A local meta-attribute of a *CandidateKey*. If *TRUE*, this defines a particular *CandidateKey* as having been selected as the primary key for an *Entity*.

### **SequenceNo**

A local meta-attribute of a *DataObject* *.IsDescribedBy.SemanticInformationObject*. This defines the place of the object within the set which occur within the parent *DataObject*. Constraints: No two components within the same *DataObject* should have the same value for *SequenceNo*.

## REFERENCES

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4. EIA, CDIF - CASE Data Interchange Format - Overview, EIA/IS-106, January 1994.
5. EIA, CDIF - Integrated Meta-model - Data Modeling Subject Area<sup>1</sup>, EIA/PN-3072, CDIF-DRAFT-DMOD-V11, Editor: Rob Hill, July 1994.
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7. Bruce, T. A., Designing Quality Databases with IDEF1X Information Models. Dorset House Publishing, New York, 1992.

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<sup>1</sup>The referenced version of the EIA document is the latest one available for public review. However, the mapping in this NIST document is based on updated information from the July 1994 CDIF meeting.



