

Mapping of the NIOBE database towards CIDOC CRM-Archeo (*project documentation*)

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october 2016

Version 1.2

Introduction

In this document we illustrate the result of the activity regarding the mapping between the database NIOBE of the Soprintendenza Speciale per il Colosseo, il Museo Nazionale Romano e l'Area Archeologica di Roma (SSCol) and the semantic model (CIDOC CRM- Archaeo) under development in the Ariande project. CRM Archaeo is a semantic model and represents an extension of the well-known CIDOC-CRM model [Definition of the CIDOC Conceptual Reference Model, *produced by* the ICOM/CIDOC Documentation Standards Group, *continued by* the CIDOC CRM Special Interest Group, Version 6.2.1 October 2015].

The objective of the work has been the definition of the mapping between the NIOBE database schema and the concepts of the semantic model CIDOC CRM-Archeo. In the following sections we illustrate the mapping definition phase, in particular we describe: (i) the source schema of the NIOBE database, (ii) the criteria used to map concepts from SITAR to CIDOC CRM-Archeo or other related semantic models and (iii) the rationale of some core choices in the mapping.

The work has been carried out by the Department of Computer Science (University of Verona) Italy under the supervision of Alberto Belussi and in strict cooperation with the domain experts of the (SSCol) for the SITAR model, and representatives of ICCU and PIN for the CIDOC-CRM and compliant models.

Mapping definition

The kernel of the NIOBE database can be described at conceptual level by means of the UML class diagram shown in Fig. 1. In this diagram three core concepts are reported as UML classes: (i) the “CODICI” class, representing the achieve reference to the administrative document (in Italian “scheda”) that describes the object of interest; (ii) the “OGGETTO” class, that is the object of interest described in a “scheda”. Other classes can be identified in the NIOBE database; they are used to describe specific aspects of the object of interest: for instance, the current object location (“LOCALIZZAZIONE” class), the previous object locations (“PROVENIENZA” class), the place where the object was found (“REPERIMENTO” class), the chronology of the object (“CRONOLOGIA” class) and other classes describing technical information about the object and the vocabularies used in the cataloguing process.

In the NIOBE database the objects of interest consist of the artifacts preserved in the collections of the “Museo Nazionale Romano” museum, which include: statues, architectural elements, mosaics, coins and ceramics.

In the following subsections we illustrate in details the mapping towards CIDOC CRM-Archaeo (or other related models: CIDOC CRM, CRM Sci, SKOS) of each of these classes.

Mapping of the vocabularies

In the NIOBE database we found several vocabularies that have been used for the taxonomy of the core concepts or for the classification of the instances of other classes. They are listed in Table 1.

Vocabulary	Used as domain of	Mapped to
NIOBE_CLS_DEF	OGGETTO.Categoria di materiale	E55_Type
NIOBE_STCC_DEF	OGGETTO.Stato di conservazione	E55_Type





Table 1: vocabularies of NIOBE database

For all of them we have adopted the same mapping towards CIDOC-CRM as described in the matching table of the 3M mapping tool reported hereby.

Notice that:

- The lemma in Italian has been mapped to a `rdf-schema#label` with `language='it'`.
- The corresponding translation in English has been mapped to a `rdf-schema#label` with `language='en'`.
- When available the mapping of the lemma towards the Getty vocabulary (Art & Architecture Thesaurus® Online, <http://www.getty.edu/research/tools/vocabularies/aat/index.html>) has been represented as a property `core#exactMatch/core#relatedMath/core#broadMatch/core#narrowMatch` from the `E55_Type` to the corresponding concept of the Getty vocabulary linked by means of its URL.

In Appendix A we list the vocabularies and their corresponding translations in English and the mapping towards the Getty vocabulary (Art & Architecture Thesaurus® Online, <http://www.getty.edu/research/tools/vocabularies/aat/index.html>).

SOURCE	TARGET CONSTANT EXPRESSION	IF RULE	COMMENTS
D	 //FeatureCollection/O GTD3	 E55_Type	
P	↓ VOCE	↓ <code>rdf-schema#label</code>	
R	 VOCE	 <code>rdf-schema#Literal</code> it	
P	↓ VOCE_EN	↓ <code>rdf-schema#label</code>	




















R	<input type="checkbox"/> VOCE_EN	<input type="checkbox"/> rdf-schema#Literal en	
P	↓ ID == TERM_ID <input type="checkbox"/> OGTD3_GETTY ↓ GETTY_URL	↓ <i>core#exactMatch</i>	//FeatureCollection/OGTD3_GETTY[OGTD3_ID=../ID]/SKOS_REL= exact Match
R	<input type="checkbox"/> GETTY_URL	<input type="checkbox"/> core#Concept	
P	↓ ID == TERM_ID <input type="checkbox"/> OGTD3_GETTY ↓ GETTY_URL	↓ <i>core#narrowMatch</i>	//FeatureCollection/OGTD3_GETTY[OGTD3_ID=../ID]/SKOS_REL= narrowMatch
R	<input type="checkbox"/> GETTY_URL	<input type="checkbox"/> core#Concept	
P	↓ ID == TERM_ID <input type="checkbox"/> OGTD3_GETTY ↓ GETTY_URL	↓ <i>core#broadMatch</i>	//FeatureCollection/OGTD3_GETTY[OGTD3_ID=../ID]/SKOS_REL= broad Match
R	<input type="checkbox"/> GETTY_URL	<input type="checkbox"/> core#Concept	
P	↓ ID == TERM_ID <input type="checkbox"/> OGTD3_GETTY ↓ GETTY_URL	↓ <i>core#relatedMatch</i>	//FeatureCollection/OGTD3_GETTY[OGTD3_ID=../ID]/SKOS_REL= relatedMatch
R	<input type="checkbox"/> GETTY_URL	<input type="checkbox"/> core#Concept	











Mapping of the location attributes

The attribute describing the current location of an instance of the “OGGETTO” class, have been mapped to CIDOC-CRM as described in the matching table of the 3M mapping tool reported hereby.

Notice that:











- **E53_Place** class has been used for representing a location either when it is specified as a specific building or as an address.
- When available also the municipality, the province and the country has been specified, as instances of **E53_Place** with no properties, linked to the **E53_Place** through an instance of the **P89_falls_within** property.

	SOURCE	TARGET CONSTANT EXPRESSION	IF RULE
D	 //FeatureCollection/LC	 E53_Place	
P	↓ IDLDCN == ID  //FeatureCollection/LDCN ↓ VOCE	↓ P1_is_identified_by  E44_Place_Appellation ↓ rdf-schema#label	
R	 VOCE	 rdf-schema#Literal	
P	↓ IDLDCN == ID  //FeatureCollection/LDCN ↓ ID == IDLDCN  //FeatureCollection/LDCU ↓ VOCE	↓ P1_is_identified_by  E45_Address ↓ rdf-schema#label	
R	 VOCE	 rdf-schema#Literal	
P	↓ IDPVCC == ID  //FeatureCollection/PVCC ↓ VOCE	↓ P89_falls_within	
R	 VOCE	 →  E53_Place [P2_has_type] [E55_Type = "municipality"]	
P	↓ IDLDCQ == ID  //FeatureCollection/LDCQ ↓ VOCE	↓ P2_has_type  E55_Type ↓ rdf-schema#label	
R	 VOCE	 rdf-schema#Literal	
P	↓	↓ P89_falls_within	

	SOURCE	TARGET CONSTANT EXPRESSION	IF RULE
	IDPVCP == ID  //FeatureCollection/PVCP ↓ VOCE		
R	 VOCE	 →  E53_Place [P2_has_type] [E55_Type = "province"]	
P	↓ IDPVCS == ID  //FeatureCollection/PVCS ↓ VOCE	↓ <i>P89_falls_within</i>	
R	 VOCE	 →  E53_Place [P2_has_type] [E55_Type = "country"]	
P	↓ LDCS	↓ <i>P3_has_note</i>	
R	 LDCS	 rdfs-schema#Literal	

Mapping of the temporal attributes

In several classes it is necessary to map time interval. The following mappings are proposed for this type of properties.

	SOURCE	TARGET CONSTANT EXPRESSION	IF RULE
D	 //DTSF	 E52_Time-Span	
P	↓ DTSF	↓ <i>P82a_begin_of_the_begin</i>	
R	 DTSF	 XMLSchema#dateTime	
P	↓ DTSF	↓ <i>P81a_end_of_the_begin</i>	
R	 DTSF	 XMLSchema#dateTime	
P	↓ DTSI	↓ <i>P81b_begin_of_the_end</i>	
R	 DTSI	 XMLSchema#dateTime	
P	↓ DTSI	↓ <i>P82b_end_of_the_end</i>	
R	 DTSI	 XMLSchema#dateTime	

Mapping of excavation processes
















Each excavation process is mapped into an object of the class *A1_Excavation_Process_Unit*. The attributes of an excavation process have been mapped to CIDOC-CRM as described in the matching table of the 3M mapping tool reported hereby.

SOURCE	TARGET CONSTANT EXPRESSION	IF RULE
D [FeatureCollection/SPR] //FeatureCollection/SPR	[FeatureCollection/SPR] A1_Excavation_Process_Unit	
P ↓ SPR	↓ P2_has_type	
R [FeatureCollection/SPR] SPR	[FeatureCollection/SPR] E55_Type	
P ↓ DSCD	↓ P4_has_time-span	
R [FeatureCollection/DSCD] DSCD	[FeatureCollection/DSCD] E52_Time-Span	
P ↓ IDCD == ID [FeatureCollection/CD] ↓ ID == IDCD [FeatureCollection/DSCA] ↓ DSCA	↓ P14_carried_out_by [FeatureCollection/CD] → [FeatureCollection/DSCA] E21_Person [P2_has_type] [E55_Type = "scientific equipe member"] ↓ P131_is_identified_by [FeatureCollection/DSCA] E82_Actor_Appellation ↓ rdf-schema#label	
R [FeatureCollection/DSCA] DSCA	[FeatureCollection/DSCA] rdf-schema#Literal	
P ↓ IDDSFC == ID [FeatureCollection/DSCF] ↓ VOCE	↓ P14_carried_out_by [FeatureCollection/DSCF] E40_Legal_Body ↓ P131_is_identified_by [FeatureCollection/DSCF] E82_Actor_Appellation ↓ rdf-schema#label	
R [FeatureCollection/VOCE] VOCE	[FeatureCollection/VOCE] rdf-schema#Literal	
P ↓ LGRI	↓ P7_took_place_at	
R [FeatureCollection/LGRI] LGRI	[FeatureCollection/LGRI] E53_Place	
P ↓ LGRU	↓ AP5_cut [FeatureCollection/LGRU] A8_Stratigraphic_Unit ↓ P1_is_identified_by [FeatureCollection/LGRU] E42_Identifier ↓ rdf-schema#label	
R [FeatureCollection/LGRU] LGRU	[FeatureCollection/LGRU] rdf-schema#Literal	

Mapping of the object building techniques




















The class *E12_Production* has been used to represent the event describing the creation of the object and the building techniques have been represented starting from *E12* as follows:

E12_Production → *P33_used_specific_technique* → *E29_Design_or_Procedure* → ...

	SOURCE	TARGET CONSTANT EXPRESSION	IF RULE
D	 //FeatureCollection/DT	 E12_Production	
P	↓ DTSF	↓ <i>P4_has_time-span</i>	
R	 DTSF	 E52_Time-Span	
P	↓ IDCD == ID  //FeatureCollection/CD ↓ ID == IDCD  //FeatureCollection/MTCT ↓ MTCT	↓ <i>P33_used_specific_technique</i>  E29_Design_or_Procedure ↓ <i>P2_has_type</i>	
R	 MTCT	 E55_Type	
P	↓ DTZE	↓ <i>P10_falls_within</i>  E4_Period ↓ <i>P1_is_identified_by</i>  E49_Time_Appellation ↓ <i>rdf-schema#label</i>	
R	 DTZE	 <i>rdf-schema#Literal</i> it	
P	↓ DTZG	↓ <i>P4_has_time-span</i>	
R	 DTZG	 E52_Time-Span	

Mapping of the object measurements

Each measurement regarding the object of interest is mapped into an object of the class **E16_Measurement**. The attributes of an excavation process have been mapped to CIDOC-CRM as described in the matching table of the 3M mapping tool reported hereby.

SOURCE	TARGET CONSTANT EXPRESSION	IF RULE
D  //FeatureCollection/MT	 E16_Measurement	
P ↓ MISA	↓ P40_observed_dimension →  E54_Dimension[E54-height] [P1_is_identified_by] [E42_Identifier = "height"] ↓ P90_has_value	
R  MISA	 rdf-schema#Literal	
P ↓ MISU	↓ P40_observed_dimension →  E54_Dimension[E54-height] ↓ P91_has_unit →  E58_Measurement_Unit ↓ rdf-schema#label	
R  MISU	 rdf-schema#Literal	
P ↓ MISD	↓ P40_observed_dimension →  E54_Dimension[E54-diameter] [P1_is_identified_by] [E42_Identifier = "diameter"] ↓ P90_has_value	
R  MISD	 rdf-schema#Literal	
P ↓ MISU	↓ P40_observed_dimension →  E54_Dimension[E54-diameter] ↓ P91_has_unit →  E58_Measurement_Unit ↓ rdf-schema#label	
R  MISU	 rdf-schema#Literal	
P ↓ MISL	↓ P40_observed_dimension →  E54_Dimension[E54-width] [P1_is_identified_by] [E42_Identifier = "width"] ↓ P90_has_value	
R  MISL	 rdf-schema#Literal	

P	↓ MISU	↓ P40_observed_dimension E54_Dimension[E54-width] ↓ P91_has_unit E58_Measurement_Unit ↓ rdf-schema#label		
R	□ MISU	□ rdf-schema#Literal		
P	↓ MISN	↓ P40_observed_dimension E54_Dimension[E54-length] [P1_is_identified_by] [E42_Identifier = "length"] ↓ P90_has_value		
R	□ MISN	□ rdf-schema#Literal		
P	↓ MISU	↓ P40_observed_dimension E54_Dimension[E54-length] ↓ P91_has_unit E58_Measurement_Unit ↓ rdf-schema#label		
R	□ MISU	□ rdf-schema#Literal		
P	↓ MISP	↓ P40_observed_dimension E54_Dimension[E54-depth] [P1_is_identified_by] [E42_Identifier = "depth"] ↓ P90_has_value		
R	□ MISP	□ rdf-schema#Literal		
P	↓ MISU	↓ P40_observed_dimension E54_Dimension[E54-depth] ↓ P91_has_unit E58_Measurement_Unit ↓ rdf-schema#label		
R	□ MISU	□ rdf-schema#Literal		
P	↓ MISS	↓ P40_observed_dimension E54_Dimension[E54-thickness] [P1_is_identified_by] [E42_Identifier = "thickness"] ↓ P90_has_value		
R	□ MISS	□ rdf-schema#Literal		

<p>P</p> <p>↓</p> <p>MISU</p>	<p>↓</p> <p><i>P40_observed_dimension</i></p> <p>█</p> <p>E54_Dimension[E54-thickness]</p> <p>↓</p> <p><i>P91_has_unit</i></p> <p>█</p> <p>E58_Measurement_Unit</p> <p>↓</p> <p><i>rdf-schema#label</i></p>		
<p>R</p> <p>█</p> <p>MISU</p>	<p>█</p> <p><i>rdf-schema#Literal</i></p>		
<p>P</p> <p>↓</p> <p>MISG</p>	<p>↓</p> <p><i>P40_observed_dimension</i></p> <p>█ →</p> <p>E54_Dimension</p> <p>[<i>P91_has_unit</i>]</p> <p>[E58_Measurement_Unit = "gram"]</p> <p>↓</p> <p><i>P90_has_value</i></p>		
<p>R</p> <p>█</p> <p>MISG</p>	<p>█</p> <p><i>rdf-schema#Literal</i></p>		
<p>P</p> <p>↓</p> <p>IDCD == ID</p> <p>█</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>█</p> <p>//FeatureCollection/MISV</p> <p>↓</p> <p>MISV</p>	<p>↓</p> <p><i>P3_has_note</i></p>		
<p>R</p> <p>█</p> <p>MISV</p>	<p>█</p> <p><i>rdf-schema#Literal</i> it</p>		

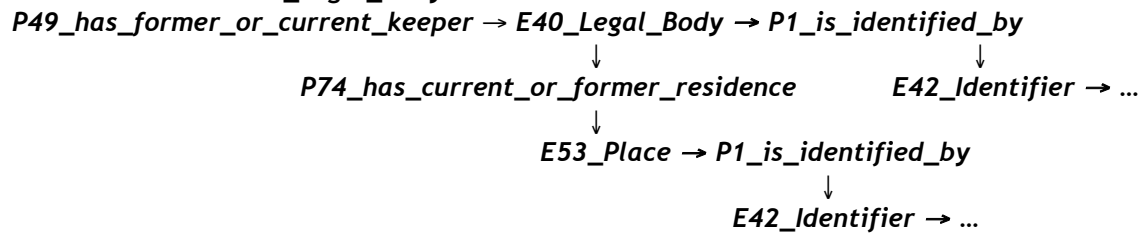
Mapping of the class “OGGETTO”

Each instance of this class represents the object of interest which is described in an archive document and is mapped into an object of the class *E22_Man-Made_Object*.

The attributes of the class are mapped as described in the matching table of the 3M mapping tool reported hereby.

Notice that:

- The current keeper of the object and its current residence have been represented by means of an instance of the *E40_Legal_Body* class as follows:

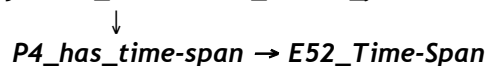


- The assignment of the unique inventory number to the object has been represented by means of the *E15_Identifier_Assignment* class.
- The current location of the object has been represented by means of the property *P55_has_current_location* with an instance of the *E53_Place* class with the set of properties illustrated in the previous subsection “Mapping of the location attributes” (see page 4).
- The belonging of the object to a collection has been represented by means of an instance of the *E78_Collection* class as follows:

P46i_forms_part_of → *E78_Collection* → *P102_has_title* → *E35_Title* → ...

- The description of the object transfer from one place to another has been represented by means of a *E9_Move* class as follows:

P25i_moved_by → *E9_Move* → *P7_moved_from* → *E53_Place*



The *E52_Time-Span* has a set of properties illustrated in the previous subsection “Mapping of the temporal attributes” (see page 6)

- The description of the object finding event has been represented by means of a *S19_Encounter_event* class as follows:

O19i_was_object_found_by → *S19_Encounter_event* → *P9i_forms_part_of* →



The *A1_Excavaton_Process_Unit* has a set of properties illustrated in the previous subsection “Mapping of the excavation processes” (see page 8).

- The description of the subject (icon) that is depicted on the object has been represented by means of a *E25_Man-Made_Feature* class as follows:

P56_bears_feature → *E25_Man-Made_Feature* → *P1_is_identified_by*



- The description of the measurements regarding the object has been represented by means of the *E16_Measurement* class with the set of properties illustrated in the previous subsection “Mapping of the object measurements” (see page 9).
- The object condition has been represented by means of a *E3_Condition_State* class.
- In the case in which the finding is fragmentary, the description of the remaining parts has been represented by means of the *E81_Transformation* class as follows:

P124i_was_transformed_by → *E81_Transformation* → *P123_resulted_in*



- The object building techniques has been represented by means of a *E12_Production* class with the set of properties illustrated in the previous subsection “Mapping of the object building techniques” (see page 9).

- The bibliography specifically referred to the object has been represented by means of the ***E31_Document*** class with the set of properties illustrated in the previous subsection “Mapping of the object building techniques” (see page 7).
- The bibliography that can be used for comparing the object with other similar instances has been represented by means of the ***E73_Information_Object*** class as follows:

P67i_is_referred_to_by → ***E73_Information_Object*** → ...



P2_has_type → ***E55_Type*** → “*related bibliography*”




















- The object renovation processes have been represented by means of the ***E11_Modification*** class as follows:



























P31i_was_modified_by → ***E11_Modification*** → ...

























P2_has_type → ***E55_Type*** → “*renovation*”

- Additional notes about the object have been represented by using the property ***P3_has_note***

	SOURCE	TARGET CONSTANT EXPRESSION	IF RULE
D	 //FeatureCollection/OG	 E22_Man-Made_Object	
P	↓ IDCD	↓ P1_is_identified_by  E42_Identifier ↓ rdf-schema#label	
R	 IDCD	 rdf-schema#Literal	
P	↓ IDOGDT == ID  //FeatureCollection/OGDT ↓ VOCE	↓ P2_has_type	
R	 VOCE	 E55_Type	
P	↓ IDOGDT1 == ID  //FeatureCollection/OGDT1 ↓ VOCE	↓ P2_has_type	
R	 VOCE	 E55_Type	
P	↓ IDOGDT2 == ID  //FeatureCollection/OGDT2 ↓ VOCE	↓ P2_has_type	
R	 VOCE	 E55_Type	
P	↓ IDOGDT3 == ID  //FeatureCollection/OGDT3 ↓ VOCE	↓ P2_has_type	
R	 VOCE	 E55_Type	
P	↓ IDCD == ID  //FeatureCollection/CD ↓ ID == IDCD  //FeatureCollection/DA ↓	↓ P3_has_note	

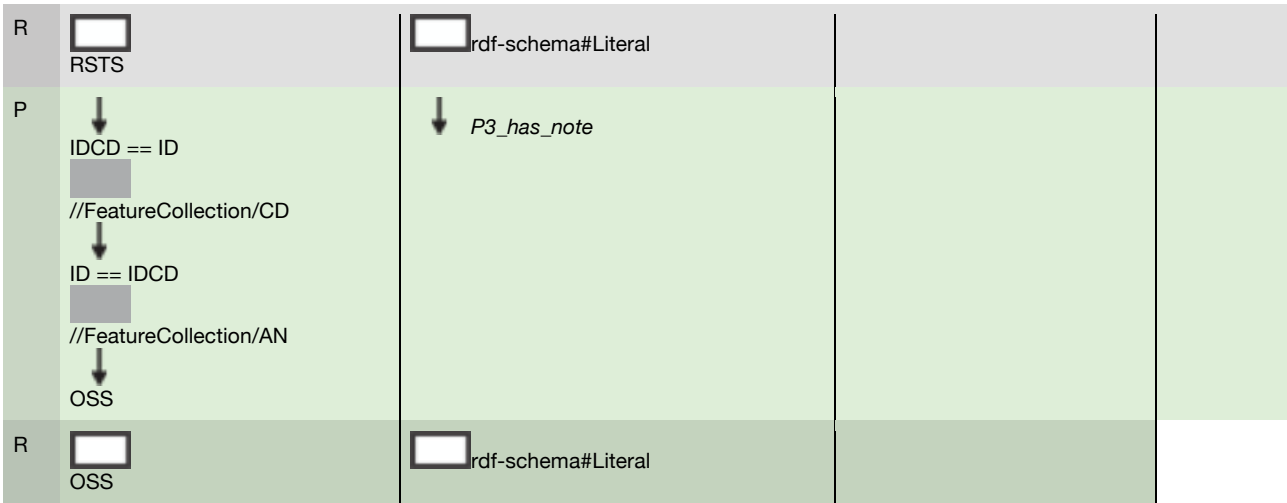
	DESO		
R	 DESO	 rdf-schema#Literal (Description...)	
P	<p>↓</p> <p>IDCD == ID</p> <p></p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>IDECP == ID</p> <p></p> <p>//FeatureCollection/ECP</p> <p>↓</p> <p>VOCE</p>	<p>↓</p> <p><i>P49_has_former_or_current_keeper</i></p> <p> E40_Legal_Body[E40-1]</p> <p>↓</p> <p><i>P1_is_identified_by</i></p> <p> E42_Identifier</p> <p>↓</p> <p><i>rdf-schema#label</i></p>	
R	 VOCE	 rdf-schema#Literal	
P	<p>↓</p> <p>IDCD == ID</p> <p></p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>IDNCTR == ID</p> <p></p> <p>//FeatureCollection/NCTR</p> <p>↓</p> <p>VOCE</p>	<p>↓</p> <p><i>P49_has_former_or_current_keeper</i></p> <p> E40_Legal_Body[E40-1]</p> <p>↓</p> <p><i>P74_has_current_or_former_residence</i></p> <p> E53_Place</p> <p>↓</p> <p><i>P1_is_identified_by</i></p> <p> E42_Identifier</p> <p>↓</p> <p><i>rdf-schema#label</i></p>	
R	 VOCE	 rdf-schema#Literal	
P	<p>↓</p> <p>IDCD == ID</p> <p></p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p></p> <p>//FeatureCollection/UB</p> <p>↓</p> <p>INVN</p>	<p>↓</p> <p><i>P140i_was_attributed_by</i></p> <p> E15_Identifier_Assignment[E15-1]</p> <p>↓</p> <p><i>P37_assigned</i></p> <p> E42_Identifier</p> <p>↓</p> <p><i>rdf-schema#label</i></p>	
R	 INVN	 rdf-schema#Literal	
P	<p>↓</p> <p>IDCD == ID</p> <p></p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p></p> <p>//FeatureCollection/UB</p> <p>↓</p> <p>INVD</p>	<p>↓</p> <p><i>P140i_was_attributed_by</i></p> <p> E15_Identifier_Assignment[E15-1]</p> <p>↓</p> <p><i>P4_has_time-span</i></p>	
R	 INVD	 E52_Time-Span	

P	<p>↓</p> <p>IDCD == ID</p> <p>█</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>█</p> <p>//FeatureCollection/UB</p> <p>↓</p> <p>INVS</p>	<p>↓</p> <p><i>P140i_was_attributed_by</i></p> <p>█</p> <p>E15_Identifier_Assignment[E15-1]</p> <p>↓</p> <p><i>P141_assigned</i></p> <p>█ → █</p> <p>E54_Dimension</p> <p>[P91_has_unit]</p> <p>[E58_Measurement_Unit = "euro"]</p> <p>↓</p> <p><i>P90_has_value</i></p>		
R	<p>█</p> <p>INVS</p>	<p>█</p> <p>rdf-schema#Literal</p>		
P	<p>↓</p> <p>IDCD == ID</p> <p>█</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>█</p> <p>//FeatureCollection/LC</p> <p>↓</p> <p>ID</p>	<p>↓</p> <p><i>P55_has_current_location</i></p>		(ATTENZIONE MANCA LA COLLOCAZIONE..)
R	<p>█</p> <p>ID</p>	<p>█</p> <p>E53_Place</p>		
P	<p>↓</p> <p>IDCD == ID</p> <p>█</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>█</p> <p>//FeatureCollection/LC</p> <p>↓</p> <p>LDCM</p>	<p>↓</p> <p><i>P46i_forms_part_of</i></p> <p>█</p> <p>E78_Collection</p> <p>↓</p> <p><i>P102_has_title</i></p> <p>█</p> <p>E35_Title</p> <p>↓</p> <p><i>rdf-schema#label</i></p>		
R	<p>█</p> <p>LDCM</p>	<p>█</p> <p>rdf-schema#Literal it</p>		
P	<p>↓</p> <p>IDCD == ID</p> <p>█</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>█</p> <p>//FeatureCollection/LA</p> <p>↓</p> <p>ID</p>	<p>↓</p> <p><i>P25i_moved_by</i></p> <p>█</p> <p>E9_Move[E9-1]</p> <p>↓</p> <p><i>P27_moved_from</i></p>		
R	<p>█</p> <p>ID</p>	<p>█</p> <p>E53_Place</p>		
P	<p>↓</p> <p>IDCD == ID</p> <p>█</p> <p>//FeatureCollection/CD</p> <p>↓</p>	<p>↓</p> <p><i>P25i_moved_by</i></p> <p>█</p> <p>E9_Move[E9-1]</p> <p>↓</p> <p><i>P4_has_time-span</i></p>		

	<p>ID == IDCD  //FeatureCollection/LA ↓ PRDI</p>		
R	<p> PRDI</p>	<p> E52_Time-Span</p>	
P	<p>↓ IDCD == ID  //FeatureCollection/CD ↓ ID == IDCD  //FeatureCollection/RP ↓ ID</p>	<p>↓ <i>O19i_was_object_found_by</i>  S19_Encounter_Event ↓ <i>P9i_forms_part_of</i></p>	
R	<p> ID</p>	<p> A1_Excavation_Process_Unit</p>	
P	<p>↓ OGTN</p>	<p>↓ <i>P102_has_title</i>  E35_Title ↓ <i>rdf-schema#label</i></p>	
R	<p> OGTN</p>	<p> <i>rdf-schema#Literal</i> it</p>	
P	<p>↓ SGTI</p>	<p>↓ <i>P56_bears_feature</i>  E25_Man-Made_Feature[E25-1] ↓ <i>P1_is_identified_by</i>  E41_Appellation ↓ <i>rdf-schema#label</i></p>	
R	<p> SGTI</p>	<p> <i>rdf-schema#Literal</i> it</p>	
P	<p>↓ SGTT</p>	<p>↓ <i>P56_bears_feature</i>  E25_Man-Made_Feature[E25-1] ↓ <i>P1_is_identified_by</i>  E35_Title ↓ <i>rdf-schema#label</i></p>	
R	<p> SGTT</p>	<p> <i>rdf-schema#Literal</i> it</p>	
P	<p>↓ IDCD == ID  //FeatureCollection/CD ↓ ID == IDCD  //FeatureCollection/MTC ↓</p>	<p>↓ <i>P45_consists_of</i>  E57_Material ↓ <i>rdf-schema#label</i></p>	

	<p>IDMTC2 == ID</p> <p>↓</p> <p>//FeatureCollection/MTC2</p> <p>↓</p> <p>VOCE</p>		
R	<p>VOCE</p>	<p>↓</p> <p>rdf-schema#Literal it</p>	
P	<p>↓</p> <p>IDCD == ID</p> <p>↓</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>↓</p> <p>//FeatureCollection/MT</p> <p>↓</p> <p>ID</p>	<p>↓</p> <p>P39i_was_measured_by</p>	
R	<p>ID</p>	<p>↓</p> <p>E16_Measurement</p>	
P	<p>↓</p> <p>IDCD == ID</p> <p>↓</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>↓</p> <p>//FeatureCollection/CO</p> <p>↓</p> <p>IDSTCC == ID</p> <p>↓</p> <p>//FeatureCollection/STCC</p> <p>↓</p> <p>ID</p>	<p>↓</p> <p>P44_has_condition</p> <p>↓</p> <p>E3_Condition_State[E3-1]</p> <p>↓</p> <p>P2_has_type</p>	
R	<p>ID</p>	<p>↓</p> <p>E55_Type</p>	
P	<p>↓</p> <p>IDCD == ID</p> <p>↓</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>↓</p> <p>//FeatureCollection/CO</p> <p>↓</p> <p>STCS</p>	<p>↓</p> <p>P44_has_condition</p> <p>↓</p> <p>E3_Condition_State[E3-1]</p> <p>↓</p> <p>P3_has_note</p>	
R	<p>STCS</p>	<p>↓</p> <p>rdf-schema#Literal it</p>	
P	<p>↓</p> <p>IDCD == ID</p> <p>↓</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p>	<p>↓</p> <p>P124i_was_transformed_by</p> <p>↓</p> <p>E81_Transformation</p> <p>↓</p> <p>P123_resulted_in</p> <p>↓</p> <p>E25_Man-Made_Feature</p>	

	<p>↓</p> <p>//FeatureCollection/CO</p> <p>↓</p> <p>STCP2</p>	<p>↓</p> <p><i>rdf-schema#label</i></p>		
R	<p>STCP2</p>	<p>↓</p> <p><i>rdf-schema#Literal</i> it</p>		
P	<p>↓</p> <p>IDCD == ID</p> <p>↓</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>↓</p> <p>//FeatureCollection/DT</p> <p>↓</p> <p>ID</p>	<p>↓</p> <p><i>P108i_was_produced_by</i></p>		
R	<p>ID</p>	<p>↓</p> <p><i>E12_Production</i></p>		
P	<p>↓</p> <p>IDCD == ID</p> <p>↓</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>↓</p> <p>//FeatureCollection/BIB</p> <p>↓</p> <p>ID</p>	<p>↓</p> <p><i>P70i_is_documented_in</i></p>		
R	<p>ID</p>	<p>↓</p> <p><i>E31_Document</i></p>		
P	<p>↓</p> <p>IDCD == ID</p> <p>↓</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>↓</p> <p>//FeatureCollection/BIB2</p> <p>↓</p> <p>BIB</p>	<p>↓</p> <p><i>P67i_is_referred_to_by</i></p> <p>↓</p> <p><i>E73_Information_Object</i></p> <p>[P2_has_type]</p> <p>[E55_Type = "related bibliography"]</p> <p>↓</p> <p><i>rdf-schema#label</i></p>		
R	<p>BIB</p>	<p>↓</p> <p><i>rdf-schema#Literal</i></p>		
P	<p>↓</p> <p>IDCD == ID</p> <p>↓</p> <p>//FeatureCollection/CD</p> <p>↓</p> <p>ID == IDCD</p> <p>↓</p> <p>//FeatureCollection/RST</p> <p>↓</p> <p>RSTS</p>	<p>↓</p> <p><i>P31i_was_modified_by</i></p> <p>↓</p> <p><i>E11_Modification</i></p> <p>[P2_has_type]</p> <p>[E55_Type = "renovation"]</p> <p>↓</p> <p><i>rdf-schema#label</i></p>		



Appendix A

We show in this appendix the translations of the lemma of the NIOBE vocabularies, together with the matching terms of the Getty repository.

The considered vocabularies are listed in the following table.

Vocabulary	Used as domain of	Mapped to
NIOBE_MTCM	OGGETTO.Categoria di materiale	E55_Type
NIOBE_MTCT	OGGETTO.Tecnica di realizzazione	E55_Type
NIOBE_OGTD (NIOBE_OGTD1/2/3)	OGGETTO.Classificazione	E55_Type
NIOBE_TDZE	OGGETTO.Periodi storici	E55_Type
NIOBE_STCC	OGGETTO.Stato di conservazione	E55_Type

NIOBE_MTCM

name_it	name_en	skos_relation	getty_name	getty_url
Marmo	marble (rock)	exactMatch	marble (rock)	http://vocab.getty.edu/aat/300011443
Bronzo	bronze	exactMatch	bronze (metal)	http://vocab.getty.edu/aat/300010957
Basalto	basalt (basic igneous rock)	exactMatch	basalt (basic igneous rock)	http://vocab.getty.edu/aat/300011222
breccia	breccia	closeMatch	breccia	http://vocab.getty.edu/aat/300011425
breccia	breccia marble	closeMatch	breccia marble	http://vocab.getty.edu/aat/300011451
Calcare	calcareous sandstone	exactMatch	calcareous sandstone	http://vocab.getty.edu/aat/300011392
Lavagna	slate (rock)	broadMatch	slate (rock)	http://vocab.getty.edu/aat/300011646
Marmo africano	marmo africano (marmor luculleum)	exactMatch	Affricano	http://vocab.getty.edu/aat/300011461
marmo bardiglio	bardiglio	exactMatch	bardiglio	http://vocab.getty.edu/aat/300011498
Marmo bianco	white marble	exactMatch	white marble	http://vocab.getty.edu/aat/300011571
Marmo bianco a grana fine	white fine-grained marble	exactMatch	statuary marble	http://vocab.getty.edu/aat/300011571
Marmo bianco a grana media	white medium-grained marble	narrowMatch	dolomitic marble	http://vocab.getty.edu/aat/300380134
Marmo bianco a grana media	white medium-grained marble	broadMatch	white marble	http://vocab.getty.edu/aat/300011571
Marmo bianco a grana grossa	white coarse grained marble	broadMatch	white marble	http://vocab.getty.edu/aat/300011571
Marmo bianco greco	Greek white marble	narrowMatch	porino	http://vocab.getty.edu/aat/300011604
Marmo bianco greco	Greek white marble	narrowMatch	dolomitic marble	http://vocab.getty.edu/aat/300380134
Marmo bianco greco	Greek white marble	broadMatch	white marble	http://vocab.getty.edu/aat/300011571
Marmo bianco greco a grana grossa	Coarse grained Greek white marble	broadMatch	white marble	http://vocab.getty.edu/aat/300011571
Marmo bigio	gray marble	exactMatch	gray marble	http://vocab.getty.edu/aat/300011501
Marmo bigio antico	bigio antico	exactMatch	bigio antico	http://vocab.getty.edu/aat/300011501

NIOBE_MTCT

name_it	name_en	skos_relation	getty_name	getty_url
Affresco	fresco painting (technique)	exactMatch	fresco painting (technique)	http://vocab.getty.edu/aat/300053357
Altorilievo	high relief (technique)	exactMatch	high relief (technique)	http://vocab.getty.edu/aat/300053626
Fusione	casting (process)	broadMatch	casting (process)	http://vocab.getty.edu/aat/300053104
Fusione a cera persa	lost-wax process	exactMatch	lost-wax process	http://vocab.getty.edu/aat/300053113
Scalpellatura	chiseling (technique)	broadMatch	chipping	http://vocab.getty.edu/aat/300053752

NIOBE_STCC

name_it	name_en	skos_relation	getty_name	getty_url
Integro/a	unbroken	broadMatch	conditions	http://vocab.getty.edu/aat/300389724
Integro/a	unbroken	relatedMatch	unbroken	http://vocab.getty.edu/aat/300010355
Mutilo/a	maimed	broadMatch	conditions	http://vocab.getty.edu/aat/300389724
Mutilo/a	maimed	relatedMatch	breaking	http://vocab.getty.edu/aat/300053083
Frammentario/a	fragmented	broadMatch	conditions	http://vocab.getty.edu/aat/300389724
Frammentario/a	fragmented	relatedMatch	breaking	http://vocab.getty.edu/aat/300053083
Ricomposto/a	reassembled	broadMatch	conditions	http://vocab.getty.edu/aat/300389724

NIOBE_TDZE

name_it	name_en	skos_relation	getty_name	getty_url
Età giulio-claudia	Julio-Claudian	exactMatch	Julio-Claudian	http://vocab.getty.edu/aat/300020545
Età augustea	Augustan	exactMatch	Augustan	http://vocab.getty.edu/aat/300020543
Età neroniana	Neronian	broadMatch	Julio-Claudian	http://vocab.getty.edu/aat/300020545
Età adrianea	Hadrianic	exactMatch	Hadrianic	http://vocab.getty.edu/aat/300107350
Età flavia	Flavian	exactMatch	Flavian	http://vocab.getty.edu/aat/300020551
Età domiziana	Domitian's Age	broadMatch	Flavian	http://vocab.getty.edu/aat/300020551
Età traiana	Trajanic	exactMatch	Trajanic	http://vocab.getty.edu/aat/300107348
Età antonina	Antonine	exactMatch	Antonine	http://vocab.getty.edu/aat/300020560
Età severiana	Severian	exactMatch	Severan	http://vocab.getty.edu/aat/300020566
Età tardo-repubblicana	Late Republican	exactMatch	Late Republican	http://vocab.getty.edu/aat/300020540
Prima età imperiale	Early Imperial	exactMatch	Early Imperial	http://vocab.getty.edu/aat/300107346

NIOBE_OGTD

name_it	name_en	skos_relation	getty_name	getty_url
ara	ara	exactMatch	arae	http://vocab.getty.edu/aat/300007633
architrave	architrave	exactMatch	architraves (entablature)	http://vocab.getty.edu/aat/300001780
baglio	baglio	closeMatch	beams (structural elements)	http://vocab.getty.edu/aat/300001497
base	basis	exactMatch	bases (object components)	http://vocab.getty.edu/aat/300001656
busto	bust	exactMatch	busts (figures)	http://vocab.getty.edu/aat/300047457
cratere	krater	exactMatch	kraters	http://vocab.getty.edu/aat/300198855
emblema	emblem	closeMatch	emblems (allegorical pictures)	http://vocab.getty.edu/aat/300123040
erma	herm	exactMatch	herms	http://vocab.getty.edu/aat/300047170
fregio	frieze	exactMatch	friezes (ornamental areas)	http://vocab.getty.edu/aat/300123582
gruppo scultoreo	sculpture group	exactMatch	sculpture groups	http://vocab.getty.edu/aat/300400898
rilievo	relief	exactMatch	reliefs (sculptures)	http://vocab.getty.edu/aat/300047230
rivestimento ad intonaco	plaster (coating)	broadMatch	plaster	http://vocab.getty.edu/aat/300014922
rivestimento ad intonaco	plaster (coating)	broadMatch	coating (material)	http://vocab.getty.edu/aat/300014907
rivestimento a mosaico	mosaic (coating)	exactMatch	mosaics (visual works)	http://vocab.getty.edu/aat/300015342
rivestimento a mosaico	mosaic (coating)	broadMatch	coating (material)	http://vocab.getty.edu/aat/300014907
rivestimento in opus sectile	opus sectile (coating)	exactMatch	opus sectile (visual works)	http://vocab.getty.edu/aat/300254462
rivestimento in opus sectile	opus sectile (coating)	broadMatch	coating (material)	http://vocab.getty.edu/aat/300014907
sarcofago	sarcophagus	exactMatch	sarcophagi (coffins)	http://vocab.getty.edu/aat/300005947
soffitto	ceiling	exactMatch	ceilings	http://vocab.getty.edu/aat/300002031
statua	statue	exactMatch	statues	http://vocab.getty.edu/aat/300047600
testa	head	broadMatch	heads (representations)	http://vocab.getty.edu/aat/300262520
testa	head	broadMatch	sculpture components	http://vocab.getty.edu/aat/300184602
timone	rudder	broadMatch	rudders	http://vocab.getty.edu/aat/300212841
vasca	pool	broadMatch	bathtubs	http://vocab.getty.edu/aat/300052625
vasca	pool	broadMatch	water tanks	http://vocab.getty.edu/aat/300006203
vaso	vase	closeMatch	vases	http://vocab.getty.edu/aat/300132254

NIOBE_OGTD1

name_it	name_en	skos_relation	getty_name	getty_url
a fasce	banded	closeMatch	frets (patterns)	http://vocab.getty.edu/aat/300010155
a fasce	banded	closeMatch	running ornament	http://vocab.getty.edu/aat/300165347
a mosaico	mosaic	relatedMatch	mosaic (process)	http://vocab.getty.edu/aat/300138684
con decorazione figurata	figured	broadMatch	motifs	http://vocab.getty.edu/aat/300009700
con decorazione figurata	figured	relatedMatch	figures (representations)	http://vocab.getty.edu/aat/300189808
con decorazione geometrica	geometric pattern/motif	closeMatch	geometric patterns	http://vocab.getty.edu/aat/300165213
con decorazione geometrica	geometric pattern/motif	closeMatch	geometric motifs	http://vocab.getty.edu/aat/300009764
decorata	ornated	broadMatch	design elements (attributes)	http://vocab.getty.edu/aat/300009699
decorata	ornated	relatedMatch	decoration (process)	http://vocab.getty.edu/aat/300056257
decorativo*	ornamental/decorative	relatedMatch	ornaments (object genre)	http://vocab.getty.edu/aat/300266794
decorativo*	ornamental/decorative	broadMatch	design elements (attributes)	http://vocab.getty.edu/aat/300009699
femminile	female figure	relatedMatch	women (female humans)	http://vocab.getty.edu/aat/300025943
ghiera	gear	broadMatch	gears	http://vocab.getty.edu/aat/300125467
ghiera	gear	broadMatch	steering wheels	http://vocab.getty.edu/aat/300212892
maschile	male figure	relatedMatch	men (male humans)	http://vocab.getty.edu/aat/300025928
pavimentale	pavement	relatedMatch	pavements (surface elements)	http://vocab.getty.edu/aat/300002088
pavimentale*	pavement*	relatedMatch	pavements (surface elements)	http://vocab.getty.edu/aat/300002088
rettangolare o non determinabile*	rectangular or undetermined	narrowMatch	rectangular	http://vocab.getty.edu/aat/300263831
rettangolare o non determinabile*	rectangular or undetermined	narrowMatch	undetermined (information indicator)	http://vocab.getty.edu/aat/300379012
testata	head/front	broadMatch	fronts (object portions)	http://vocab.getty.edu/aat/300190703
voltato	vaulted	exactMatch	vaulted	http://vocab.getty.edu/aat/300187630

NIOBE_OGTD2

name_it	name_en	skos_relation	getty_name	getty_url
a cassettoni	coffered (ceiling)	relatedMatch	coffers (ceiling components)	http://vocab.getty.edu/aat/300002041
a cassettoni	coffered (ceiling)	relatedMatch	coffered ceilings	http://vocab.getty.edu/aat/300002039
con decorazione figurata	figured	broadMatch	motifs	http://vocab.getty.edu/aat/300009700
con decorazione figurata	figured	relatedMatch	figures (representations)	http://vocab.getty.edu/aat/300189808
con decorazione geometrica	geometric pattern/motif	closeMatch	geometric patterns	http://vocab.getty.edu/aat/300165213
con decorazione geometrica	geometric pattern/motif	closeMatch	geometric motifs	http://vocab.getty.edu/aat/300009764
con decorazione vegetale	plant derived pattern/motif	closeMatch	plant-derived motifs	http://vocab.getty.edu/aat/300164599
con decorazione vegetale	plant derived pattern/motif	closeMatch	floral patterns	http://vocab.getty.edu/aat/300010135
con decorazione vegetale	plant derived pattern/motif	closeMatch	foliation (pattern)	http://vocab.getty.edu/aat/300165104
decorato*	ornated	broadMatch	design elements (attributes)	http://vocab.getty.edu/aat/300009699
decorato*	ornated	relatedMatch	decoration (process)	http://vocab.getty.edu/aat/300056257
figurato	figured	broadMatch	motifs	http://vocab.getty.edu/aat/300009700
figurato	figured	relatedMatch	figures (representations)	http://vocab.getty.edu/aat/300189808
ideale	ideal	closeMatch	Ideal, the	http://vocab.getty.edu/aat/300069306
nuda	nude	relatedMatch	nudes (representations)	http://vocab.getty.edu/aat/300189568
panneggiato	drapery	relatedMatch	drapery (representations)	http://vocab.getty.edu/aat/300262585
panneggiata	drapery	relatedMatch	drapery (representations)	http://vocab.getty.edu/aat/300262585
ritratto	portrait	relatedMatch	portraits	http://vocab.getty.edu/aat/300015637

NIOBE_OGTD3

name_it	name_en	skos_relation	getty_name	getty_url
decorativa*	ornamental/decorative	broadMatch	design elements (attributes)	http://vocab.getty.edu/aat/300009699
decorativa*	ornamental/decorative	relatedMatch	ornaments (object genre)	http://vocab.getty.edu/aat/300266794
blocco	block	broadMatch	construction block	http://vocab.getty.edu/aat/300374975
blocco	block	broadMatch	blocks (shaped masses)	http://vocab.getty.edu/aat/300014614