Towards CRM OWL

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Current state: CRM RDFs - ECRM OWL

CRM RDFs: maintained by Forth-ICS based on just the model specification document

ECRM OWL: maintained by Erlangen, Gnm, Koenig based on the model specification document with additional owl specific statements (restrictions, property classifications etc.)

These encodings are compatible but they follow different documentation decisions

- The differences and the Proposal initiative were presented by Mark Fichtner in 55th CIDOC CRM and 48th FRBR CRM, December 2022. Presentation link: https://www.cidoc-crm.org/sites/default/files/cidoc2022.pdf

Proposal:

A) Create and maintain an additional **CRM OWL** implementation based on just the model specification - no additional owl specific statements
B) Follow the same documentation decisions for both **ECRM OWL** and **CRM OWL** rather than just adapting **CRM RDFs** to OWL syntax (owl:Class, owl:Ontology, owl:ObjectProperty, owl:DatatypeProperty)

A) CRM OWL creation

Main CRM OWL module can be created starting from CRM RDFs with some simple replacements

- Replace rdfs:Class with owl:Class
- Replace rdf:Property with range different from rdfs:Literal with owl:ObjectProperty
- Replace rdf:Property with range equal to rdfs:Literal with owl:DatatypeProperty

Main CRM OWL module will not include owl specific statements that are not explicitly specified in the model specification e.g. owl:Restrictions, owl:TransitiveProperty, owl:AsymmetricProperty etc.

- Further owl:ObjectProperty classifications proposals can automatically be created based on phrases detected in the scope note text of each property but we suggest that they will become part of a separate OWL module e.g. https://cidoc-crm.org/owl/7.1.3/CIDOC_CRM_v7.1.3_PropertyClassificationProposals.owl

Proposal A:

- Create main CRM OWL module without any additional statements compared to CRM RDFs. Next slides include suggestions to follow good practices from ECRM OWL
- Keep automatic detection of further property classifications in a separate module
- carefully go through the (automatically extracted) property classifications (transitive/symmetric/etc.) and make a final decision

B1: Scope note

- **CRM RDFs** includes just the model specification scope note
- **ECRM OWL** has a more elaborated scope note including Examples and FOL-Paragraphs etc.

Proposal B1:

- For **CRM OWL** we suggest that we should follow the **ECRM OWL** scope note specification format
- Do the same in the RDFS implementation???

B1: Scope note

crmrdfs:P1_is_identified_by scope note

```
    <rdfs:comment>This property describes the naming or
    identification of any real-world item by a name or any other
    identifier.
This property is intended for identifiers in general use, which form
part of the world the model intends to describe, and not merely for
internal database identifiers which are specific to a technical
system, unless these latter also have a more general use outside the
technical context. This property includes in particular
identification by mathematical expressions such as coordinate systems
used for the identification of instances of E53 Place. The property
does not reveal anything about when, where and by whom this
identifier was used. A more detailed representation can be made using
the fully developed (i.e., indirect) path through E15 Identifier
Assignment.
This property is a shortcut for the path from E1 CRM Entity through
P140i was attributed by, E15 Identifier Assignment, P37 assigned to
E42 Identifier.
It is also a shortcut for the path from E1 CRM Entity through P1 is
identified by, E41 Appellation, P139 has alternative form to E41
Appellation.</rdfs:comment>
```

ecrmowl:P1_is_identified_by scope note

```
    <rdfs:comment xml:lang="en">Quantification: many to many (0,n:0,n)

Scope note:
This property describes the naming or identification of any real-world item by a name or any
other identifier.
This property is intended for identifiers in general use, which form part of the world the
model intends to describe, and not merely for internal database identifiers which are specific
to a technical system, unless these latter also have a more general use outside the technical
context. This property includes in particular identification by mathematical expressions such
as coordinate systems used for the identification of instances of E53 Place. The property does
not reveal anything about when, where and by whom this identifier was used. A more detailed
representation can be made using the fully developed (i.e., indirect) path through E15
Identifier Assignment.
This property is a shortcut for the path from E1 CRM Entity through P140i was attributed by,
E15 Identifier Assignment, P37 assigned to E42 Identifier.
It is also a shortcut for the path from E1 CRM Entity through P1 is identified by, E41
Appellation, P139 has alternative form to E41 Appellation.

Examples:
- The capital of Italy (E53) is identified by "Rome" (E41). (Leach, 2017)
- Text 25014-32 (E33) is identified by "The Decline and Fall of the Roman Empire" (E35).
(Gibbon, 2013)

In First Order Logic:
- P1(x,y) ⇒ E1(x)
- P1(x,y) ⇒ E41(y)
- P1(x,y) ⇐ (∃z) [E15(z)∧ P140i(x,z) ∧ P37(z,y)]
- P1(x,y) ⇐ (∃z) [E41(z)∧ P1(x,z) ∧ P139(z,y)]
</rdfs:comment>
```

B2: Scope note of inverse properties

In the official model specification the declarations of properties are typically defined based on the forward direction each property.

a) Inverse properties where forward direction **IS** expressed in RDFs/OWL (e.g. P1i identifies)
   - **CRM RDFs**: does **NOT** define a scope note for these properties
   - **ECRM OWL**: defines scope note using the fields of the forward direction and specific notation that the text refers to the forward direction of the property

b) Inverse properties where the forward direction is **NOT** expressed in RDFs/OWL (e.g. P170i time is defined by)
   - **CRM RDFs**: defines scope note using the scope note of the forward direction and specific notation that the text refers to the forward direction of the property
   - **ECRM OWL**: defines scope note using the fields of the forward direction and specific notation that the text refers to the forward direction of the property

<u>Proposal B2:</u>

- For **CRM OWL** follow the **ECRM OWL** scope note of inverse properties format for both a) and b) cases
- Do the same in the RDFS implementation???

B2: Scope note of inverse properties

Scope note of crmrdfs: P170i_time_is_defined_by

```
    <rdfs:comment>Scope note for 'P170': This property
    associates an instance of E61 Time Primitive with the
    instance of E52 Time-Span that constitutes the
    interpretation of the terms of the time primitive as
    an extent in absolute, real time.
The quantification allows several instances of E61 Time
Primitive that are each expressed in different syntactic
forms, to define the same instance of E52 Time-Span.
</rdfs:comment>
```

Scope note of ecrmowl:P170i_time_is_defined_by

```
    <skos:notation>P170i</skos:notation>
    <rdfs:domain rdf:resource="E52_Time-Span"/>
    <rdfs:comment xml:lang="en">Quantification of the inverse property:
    many to one (0,1:0,n)

Scope note of the inverse property:
This property associates an instance of E61 Time Primitive with the
instance of E52 Time-Span that constitutes the interpretation of the
terms of the time primitive as an extent in absolute, real time.
The quantification allows several instances of E61 Time Primitive that
are each expressed in different syntactic forms, to define the same
instance of E52 Time-Span.

Examples of the inverse property:
- "1800/1/1 0:00:00 - 1899/31/12 23:59:59" (E61) defines time the 19th
century (E52).
- "1968/1/1 - 2018/1/1" (E61) defines time 1968/1/1 - 2018/1/1 (E52).
[an arbitrary time-span during which the Saint Titus reliquary was
present in the Saint Titus Church in Heraklion, Crete]

In First Order Logic of the inverse property:
- P170(x,y) ⇒ E61(x)
- P170(x,y) ⇒ E52(y)
- P170(x, y) ⇒ P81i(x, y) ∧ P82i(x, y)
</rdfs:comment>
```

B3: Class/Property identifier

- **CRM RDFs** does not include any field that explicitly specifies the Class/Property identifier (E1, P1, P1i)
- **ECRM OWL** uses skos:notation in order to explicitly specify the Class/Property identifier (E1, P1, P1i)

```
<skos:notation>P1i</skos:notation>
```

Proposal B3:

- For **CRM OWL** follow the **ECRM OWL** Class/Property identifier documentation decision
- Do the same in the RDFS implementation???

B4: rdfs:label

- **CRM RDFs** does not include the Class/Property identifier in rdfs:label
- **ECRM OWL** always includes the Class/Property identifier in rdfs:label
  - Both directions of properties include the identifier of the forward direction
    - e.g. P140 was attributed by instead of P140i was attributed by
  - ECRM OWL has been updated in order to:
    - Include rdfs:label with all translations specified in CRM RDFs prefixed by the identifier
    - Include skos:prefLabel for all translations specified in CRM RDFs in order to provide a property without the identifier

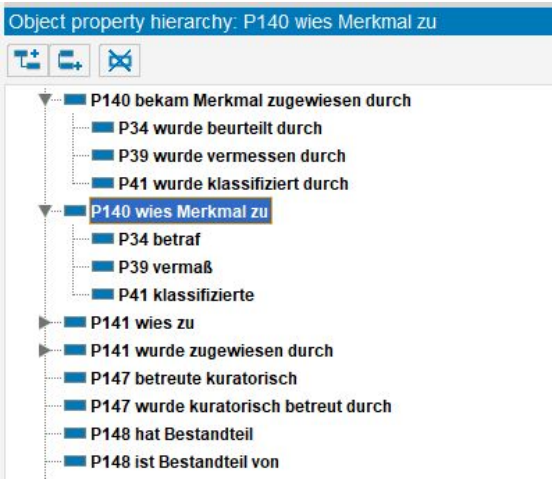
<u>Proposal B4:</u>

- For **CRM OWL** we suggest that we should follow the **ECRM OWL** rdfs:label updated format and use the inverse property identifier for inverse property labels
- Do the same in the RDFS implementation???

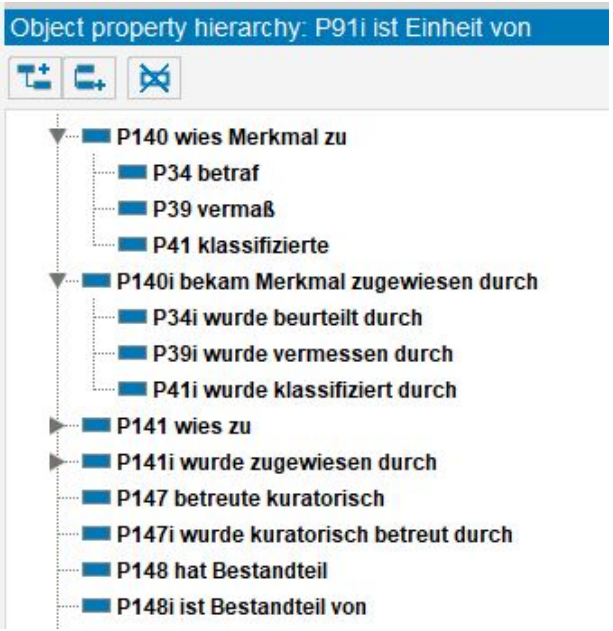
B4: rdfs:label

CRM RDFs view in Protégé

ECRM OWL view in Protégé



CRM OWL view in Protégé



Links: CRM RDFs / CRM OWL / ECRM OWL

CRM RDFs:

- https://cidoc-crm.org/rdfs/7.1.3/CIDOC_CRM_v7.1.3.rdf
- https://cidoc-crm.org/rdfs/7.1.3/CIDOC_CRM_v7.1.3_PC.rdf
- https://cidoc-crm.org/rdfs/7.1.3/CIDOC_CRM_v7.1.3_Supplement.rdf

CRM OWL:

- https://cidoc-crm.org/owl/7.1.3/CIDOC_CRM_v7.1.3.owl
- https://cidoc-crm.org/owl/7.1.3/CIDOC_CRM_v7.1.3_PropertyClassificationProposals.owl

ECRM OWL:

- https://erlangen-crm.org/ontology/ecrm/ecrm_current.owl
- https://erlangen-crm.org/ontology/ecrm/ecrm_231027.owl (remove once the next link becomes active)
- https://erlangen-crm.org/ontology/ecrm/ecrm_240307.owl (temporarily inactive)