

REPRÉSENTATION DES CONNAISSANCES

NICOLA CARBONI

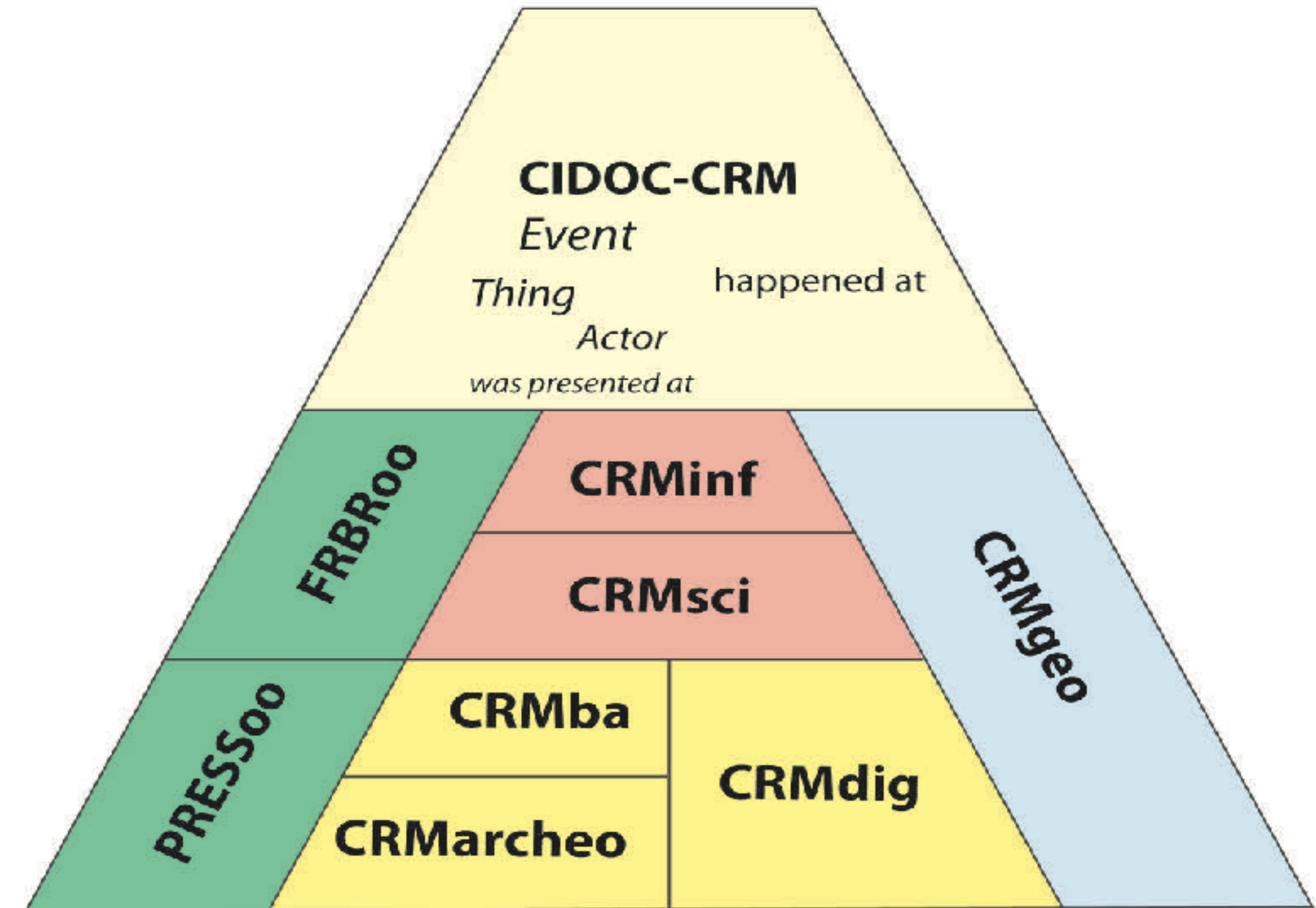
ICOM international
council
of museums

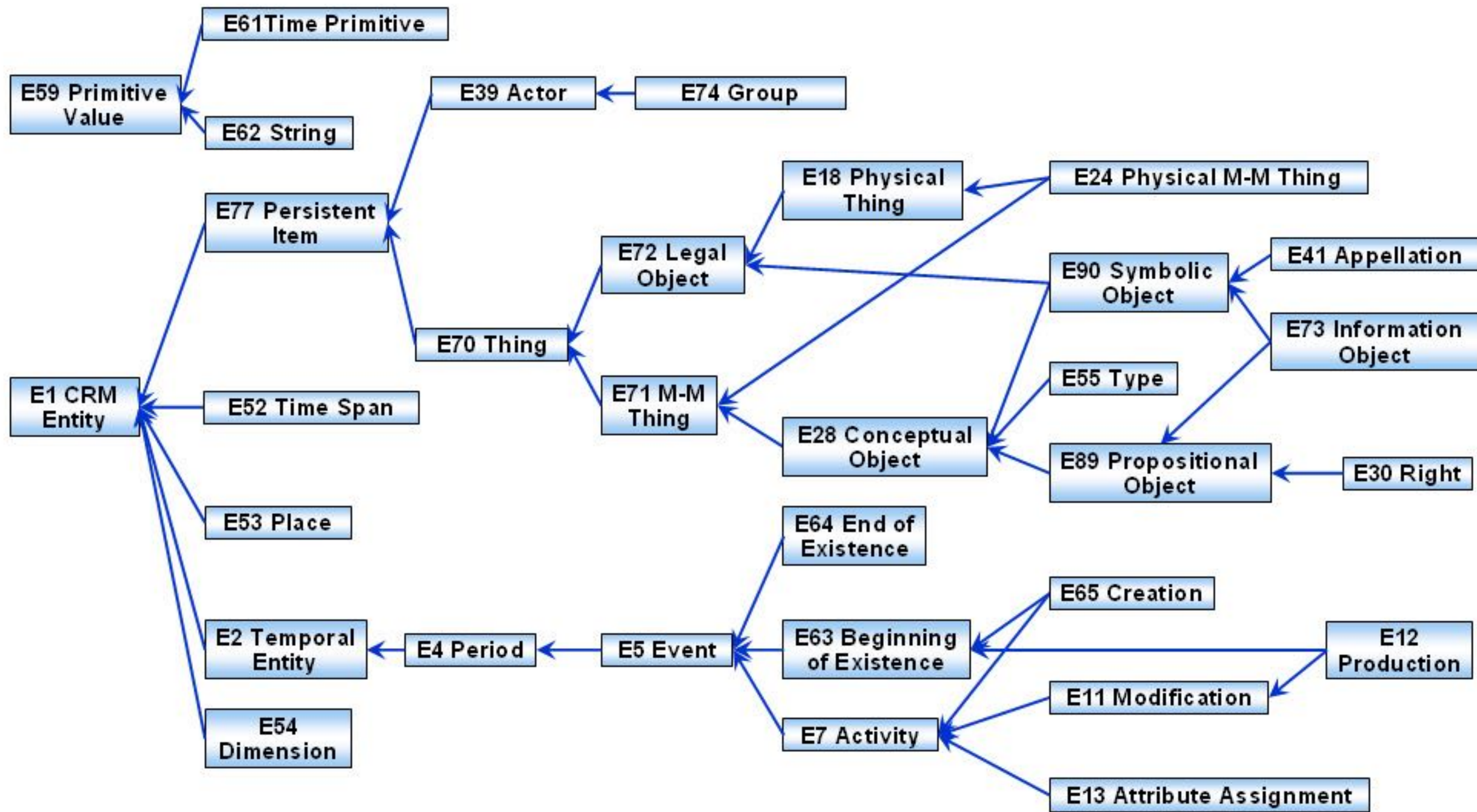
CIDOC
CRM

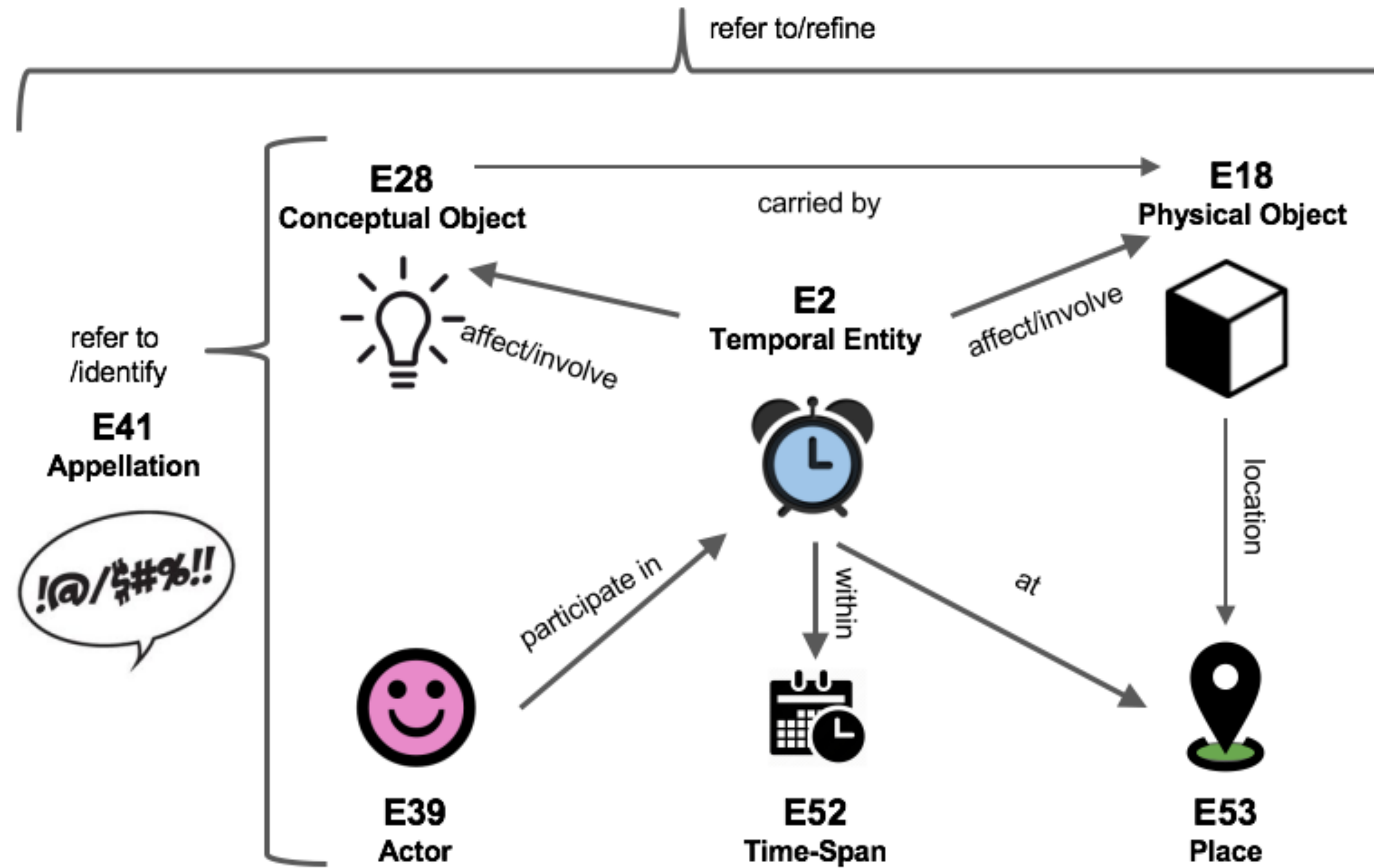
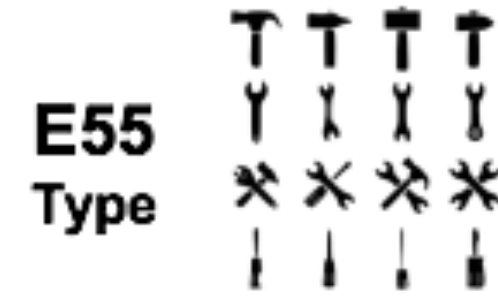


- Developed by the **CRM Special Interest Group of the International Committee for Documentation (CIDOC)** of the International Council of Museums (ICOM), following an initiative of ICS-FORTH, Heraklion, Crete.
- a **core ontology** describing the underlying semantics of over a hundred database schemata and structures from all museum disciplines, archives and libraries.
- Recognized **ISO Standard** since 2006 (ISO21127:2006)
- the **result of 20 years** of interdisciplinary work and agreement
- a **generic model of recording of “what has happened”** in human scale
- **generates huge, meaningful networks of knowledge by a simple abstraction:** history as meetings of people, things and information.

Type	Top Level Ontology
Scope	Cultural Heritage and E-Sciences
Classes	90+-
Relations	150+-
Version	6
Maintained by	CIDOC CRM SIG
Official Extensions	8
Access	http://www.cidoc-crm.org/









E24 Human Made Thing

E12 Production

E52 Time-Span



E21 Person



E24 Human Made Thing

PI08 has produced

PI4 carried out by

E12 Production

P4 has time-span

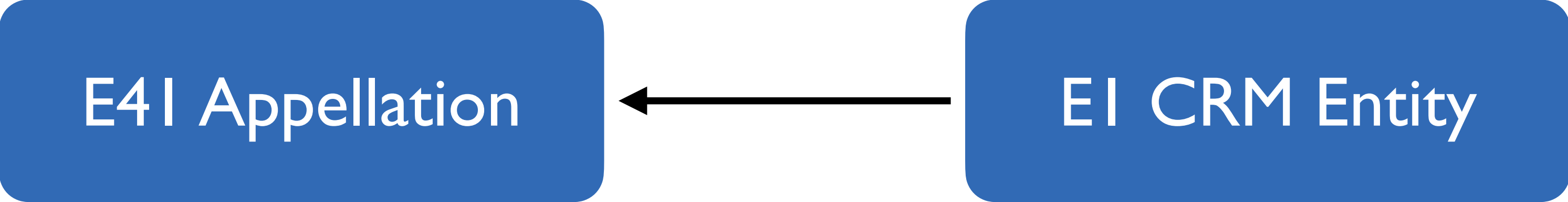
E52 Time-Span

1937

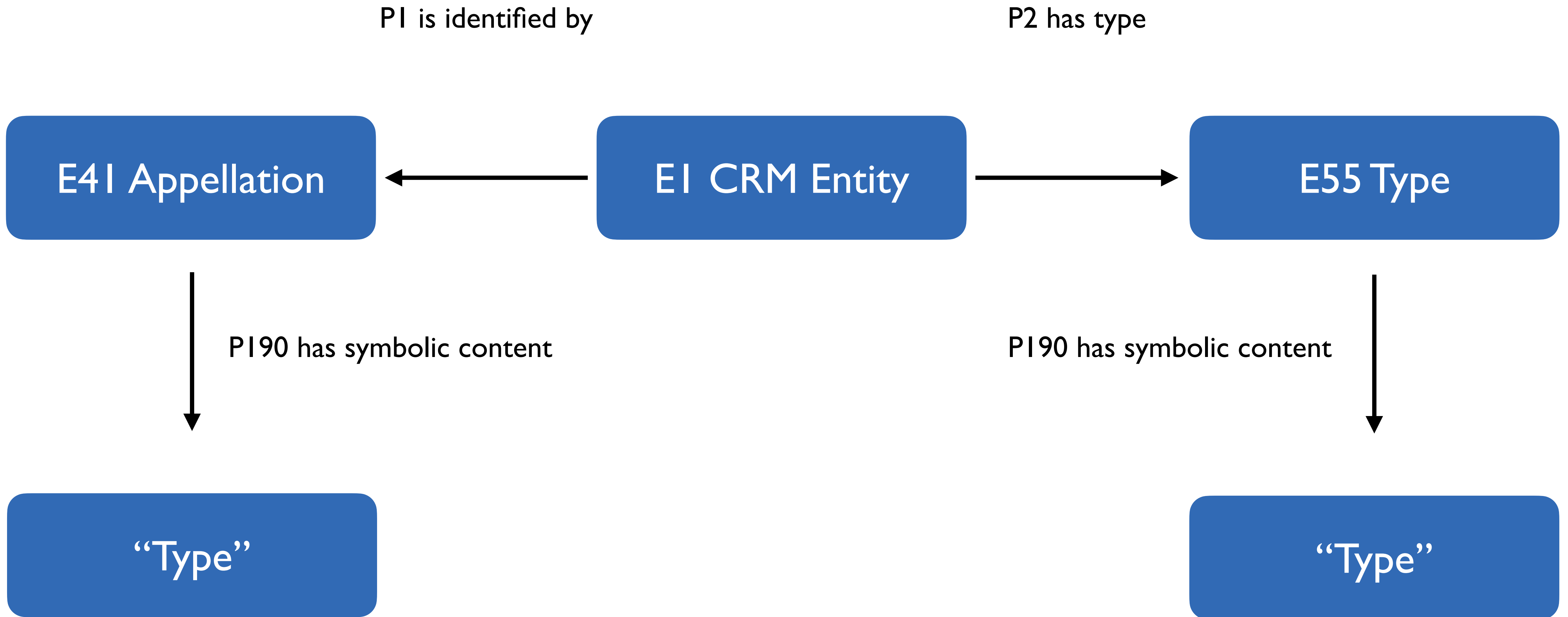


E21 Person

PI is identified by









E4I Appellation

PI is identified by



E21 Person

P2 has type



E55 Type

PI90 has symbolic content

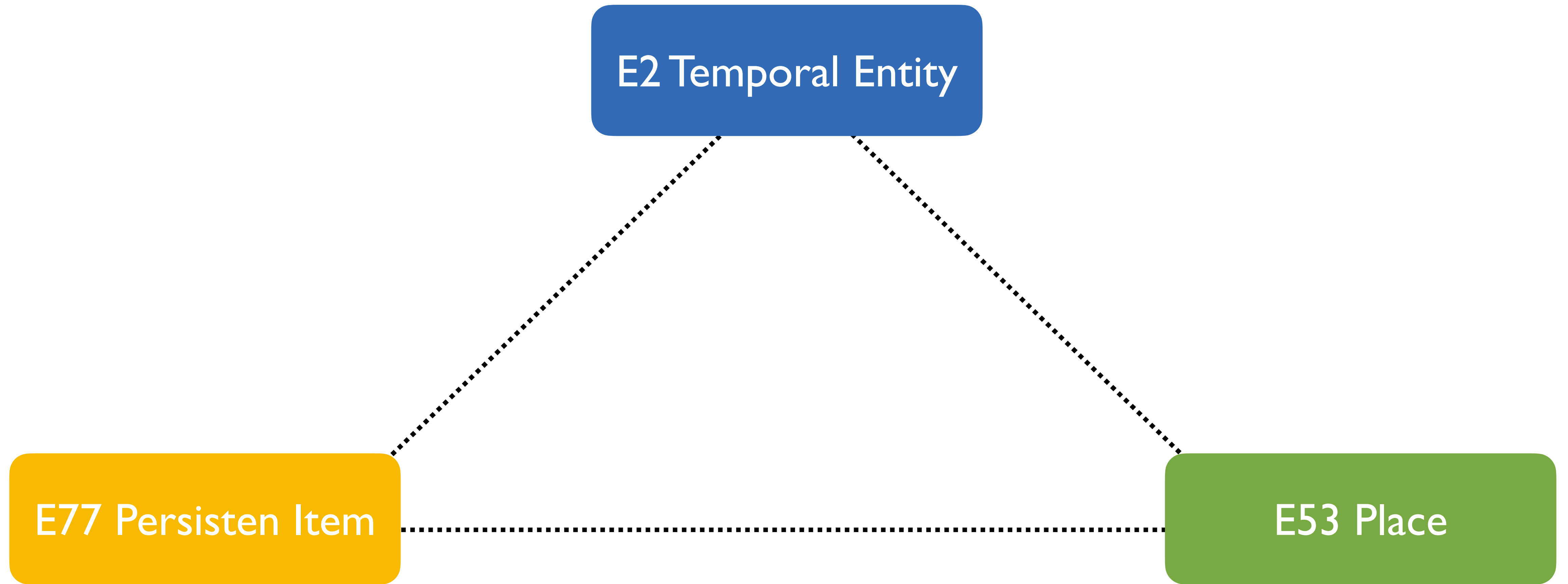


“Pablo Picasso”

PI90 has symbolic content



“Artist”



E2 Temporal Entity

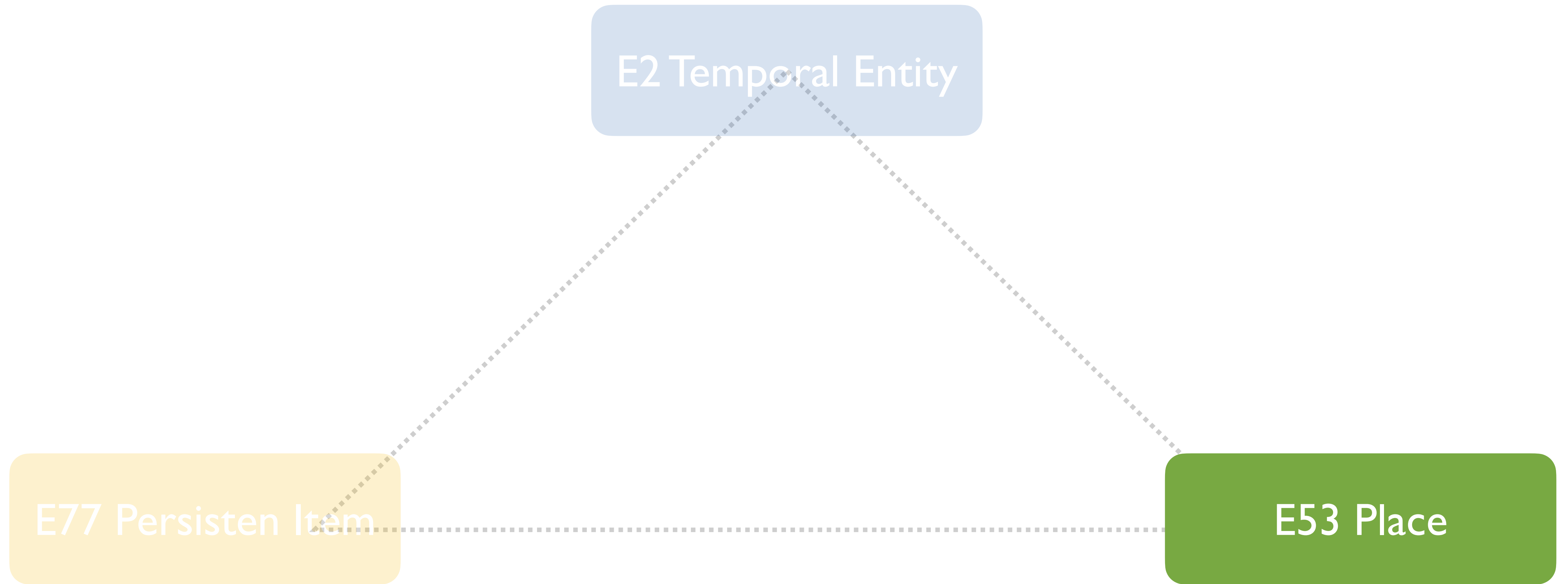
E77 Persistent Item

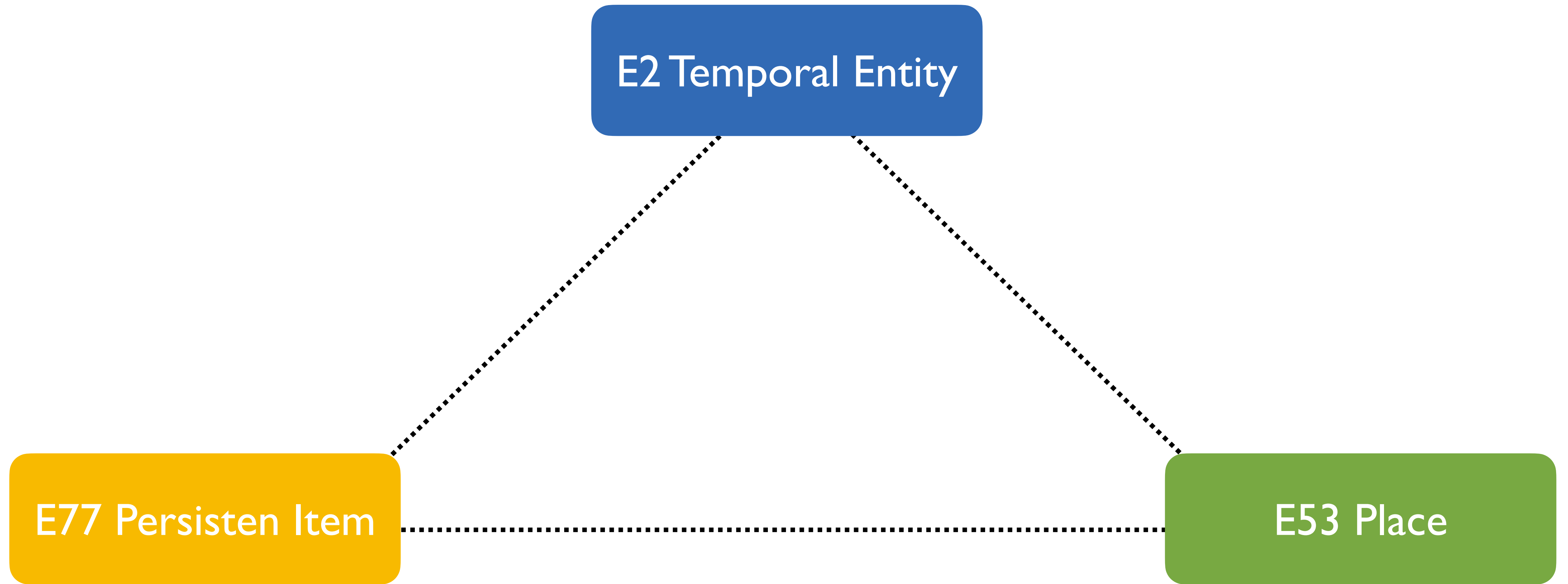
E53 Place

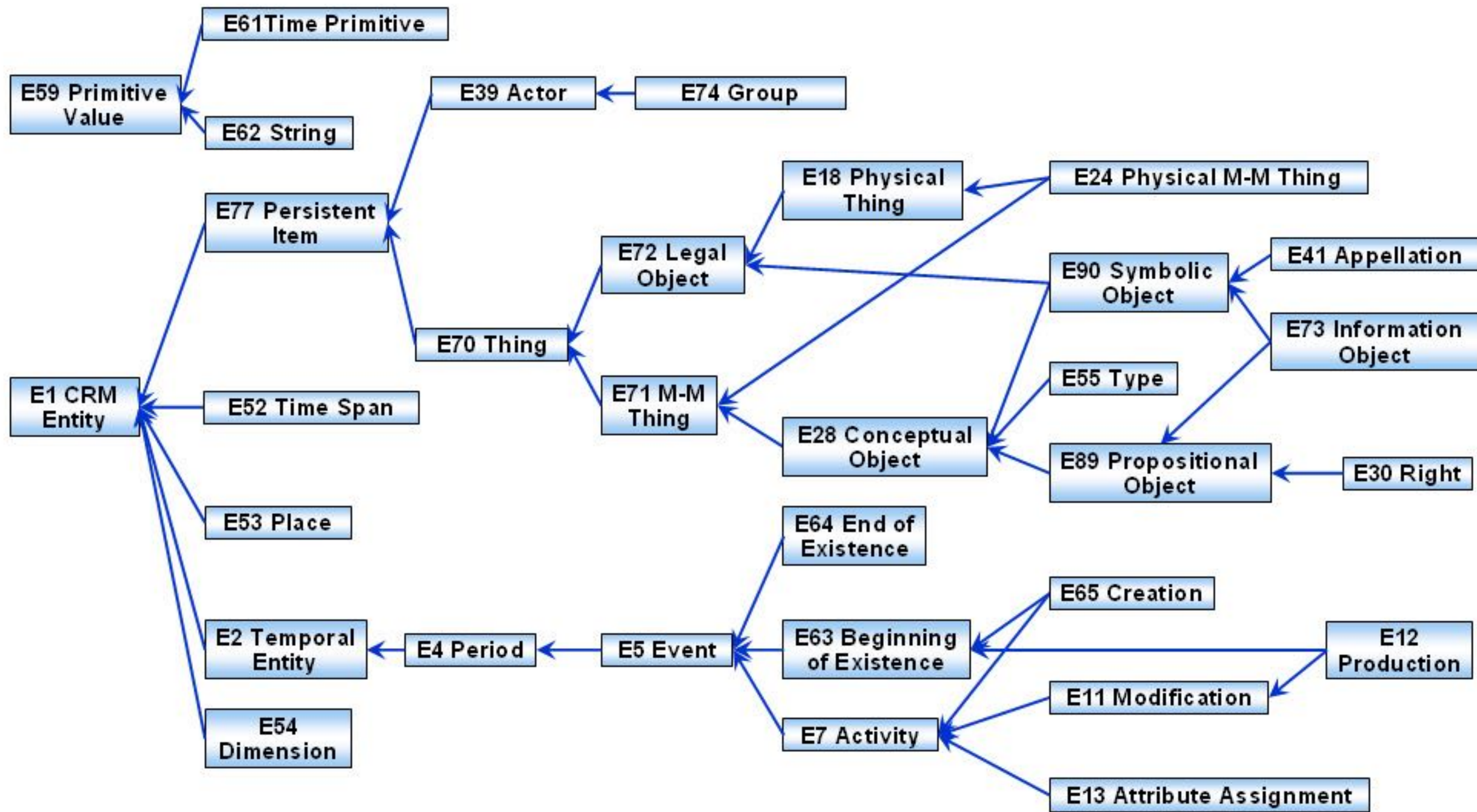
E2 Temporal Entity

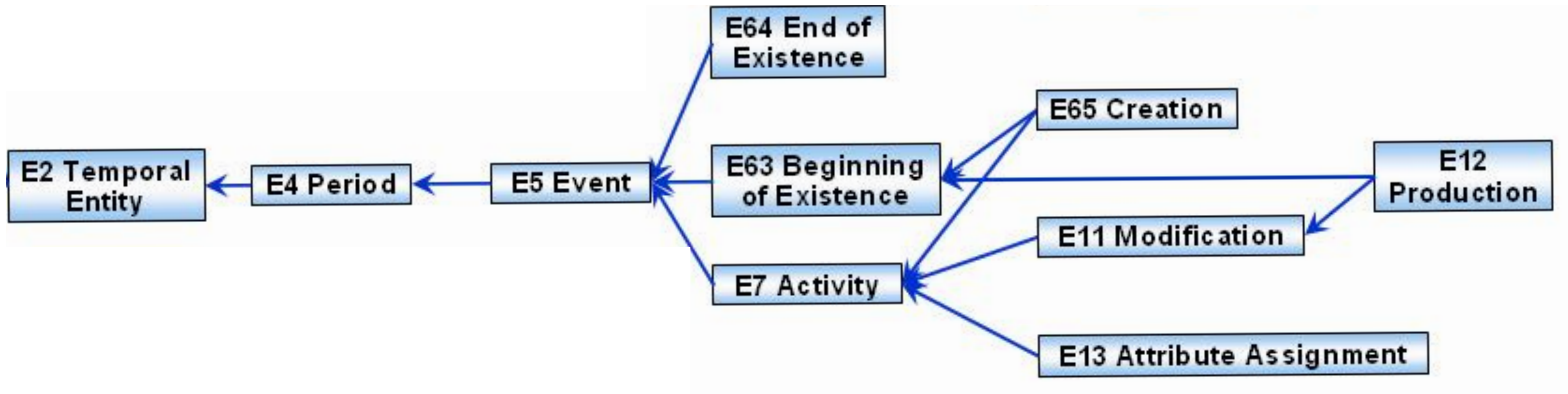
E77 Persisten Item

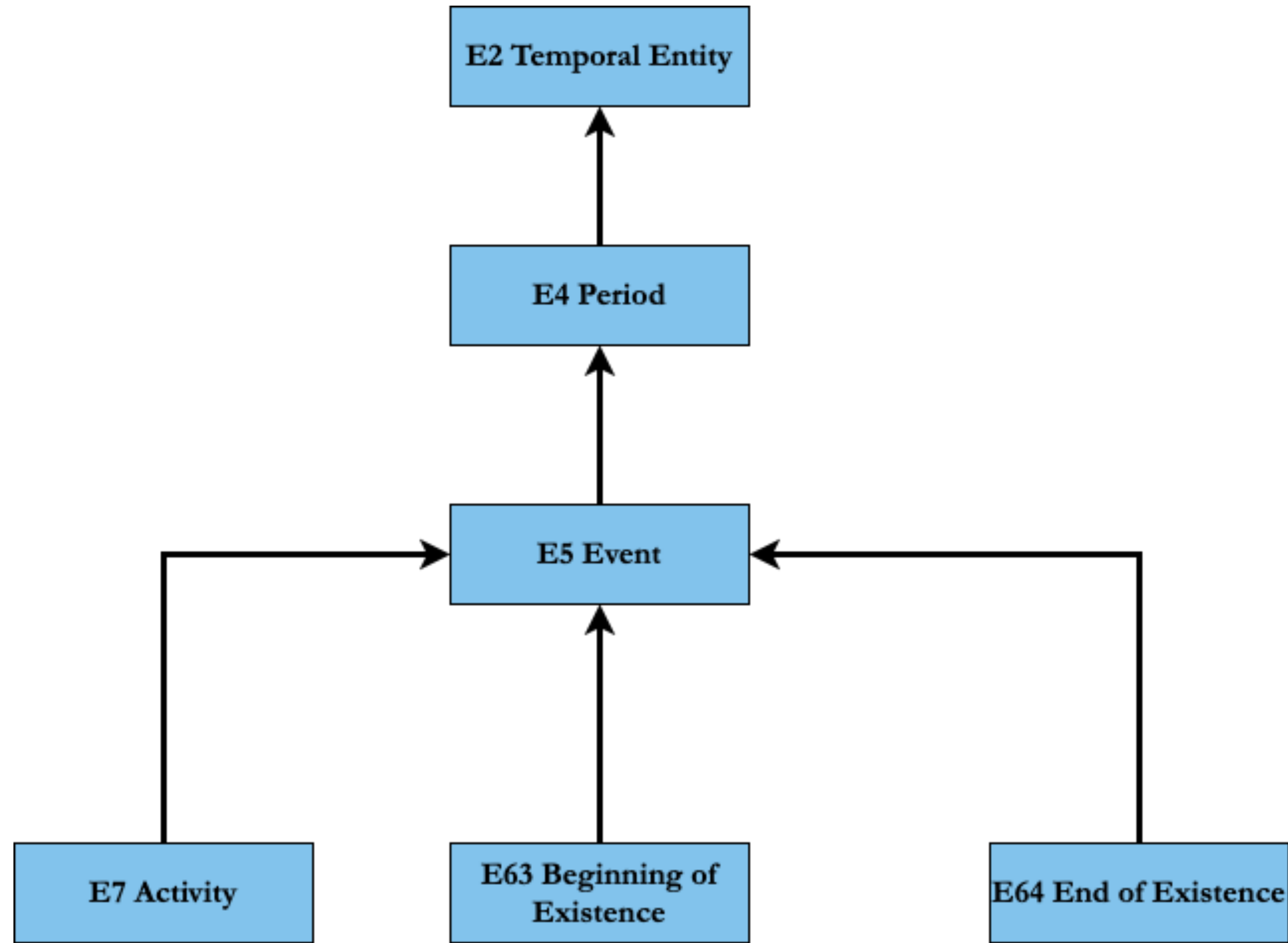
E53 Place



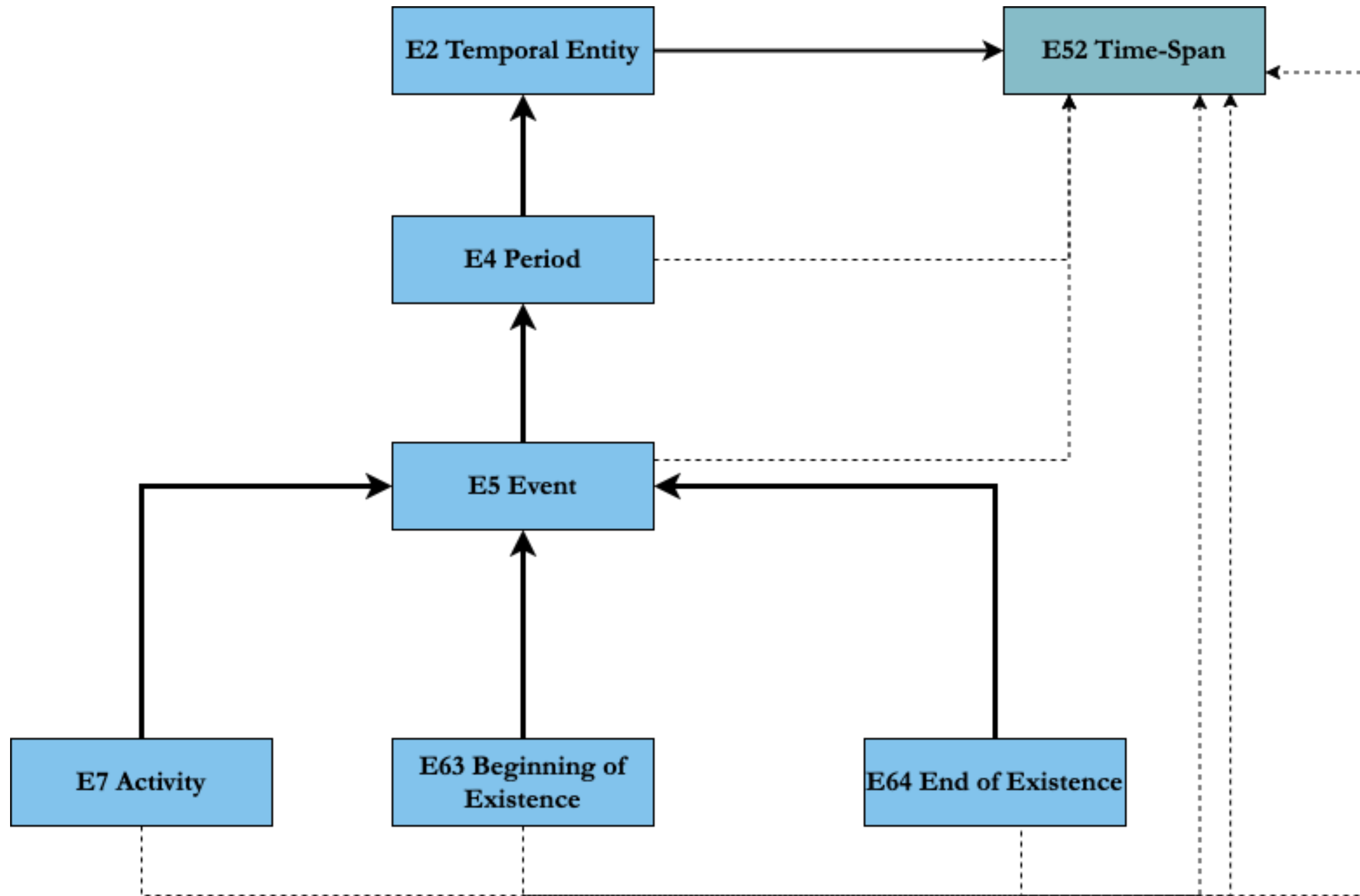


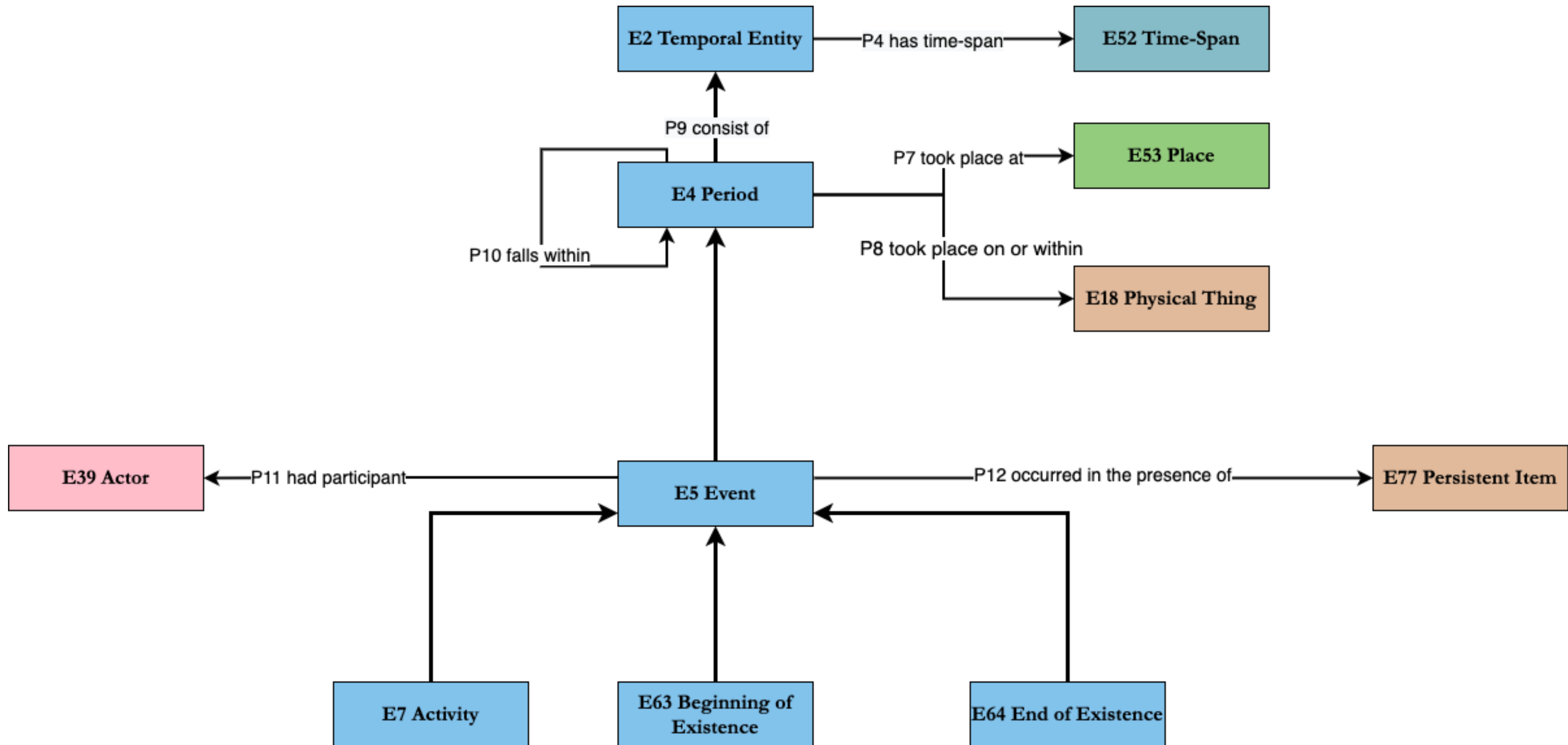


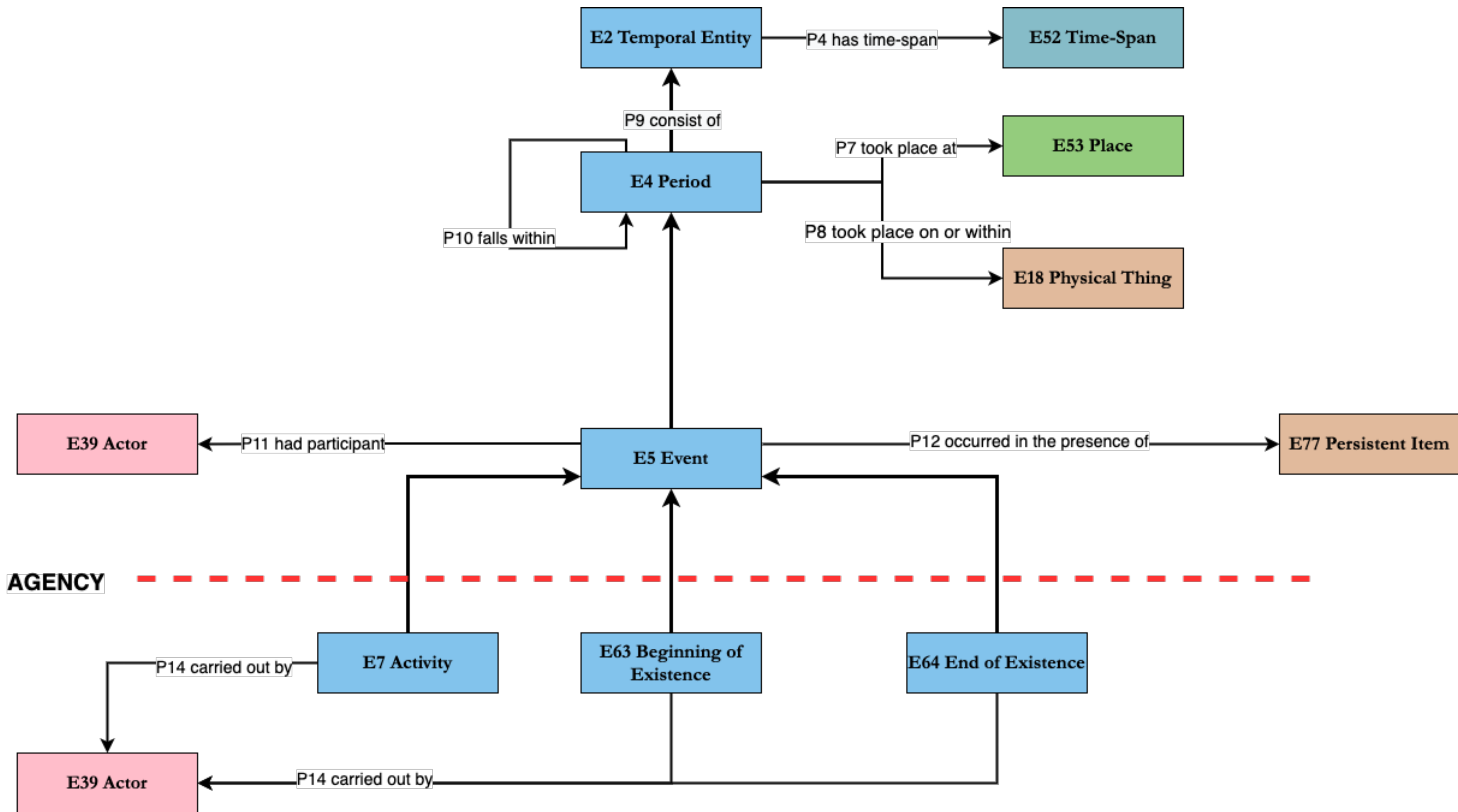


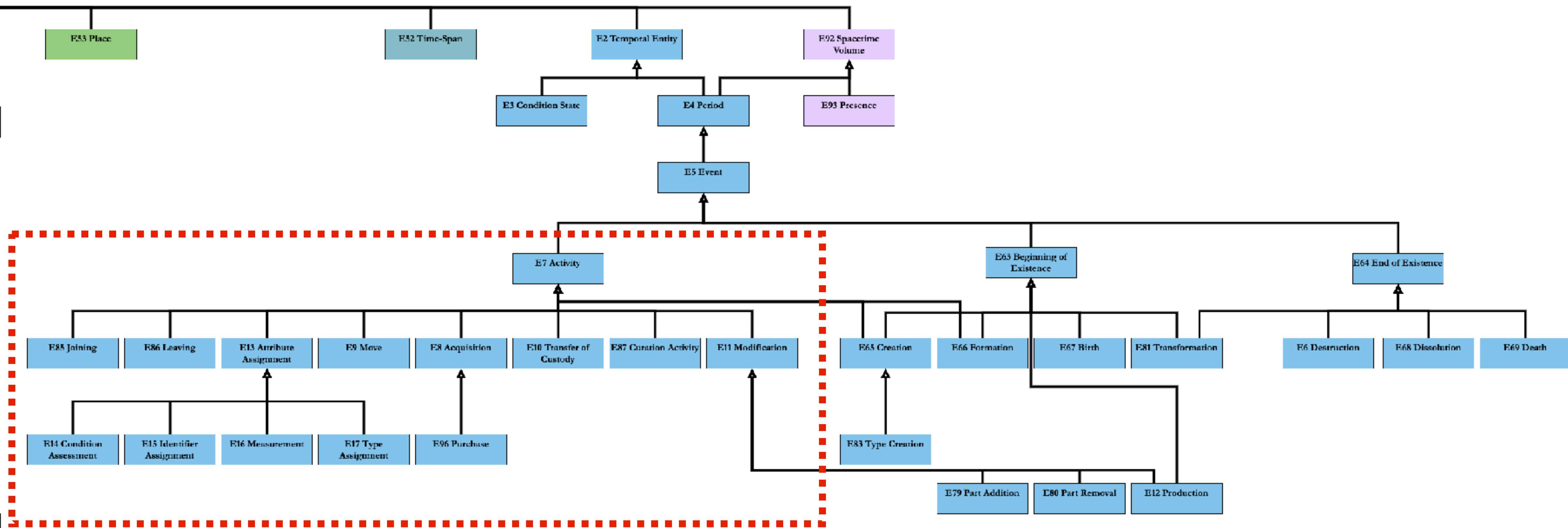


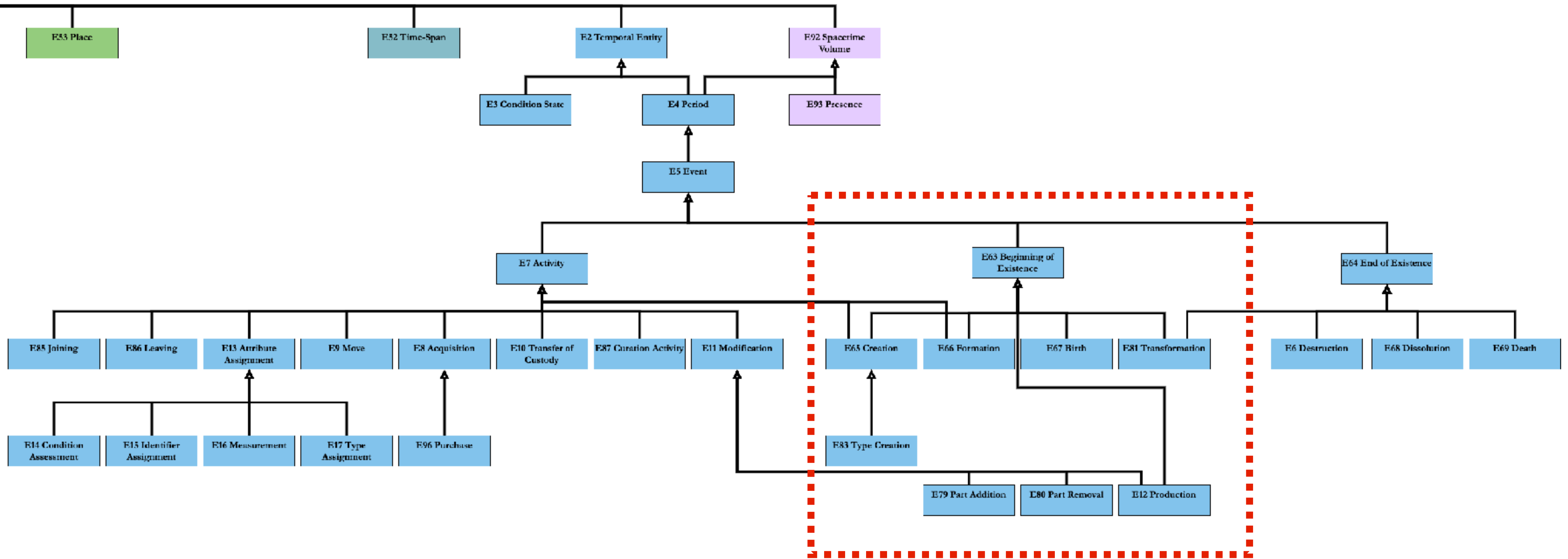
P4 has time-span

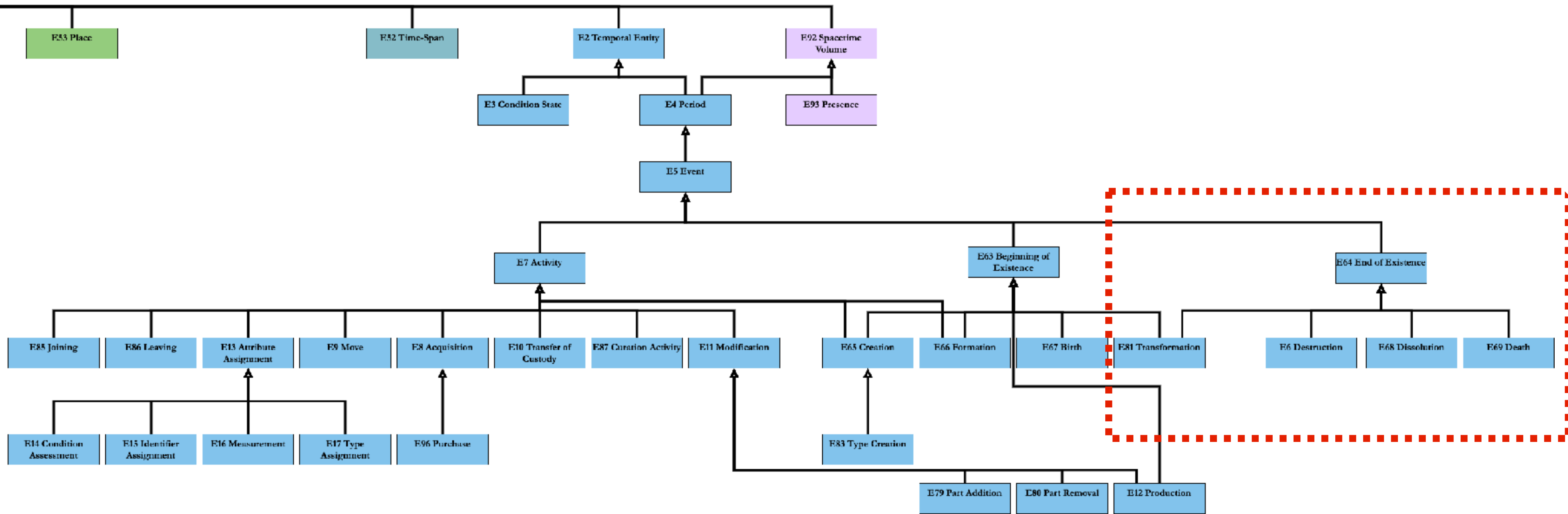


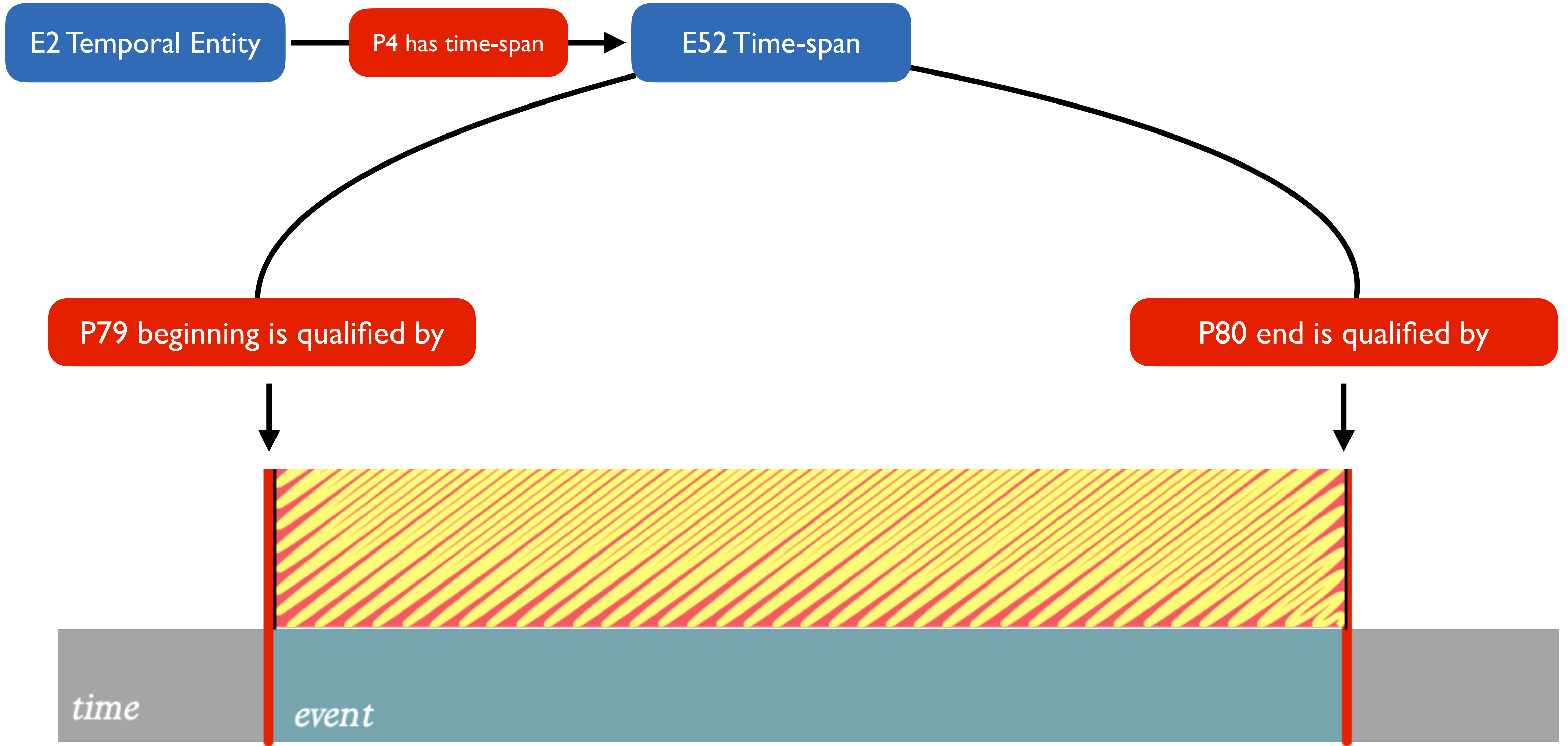


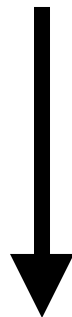










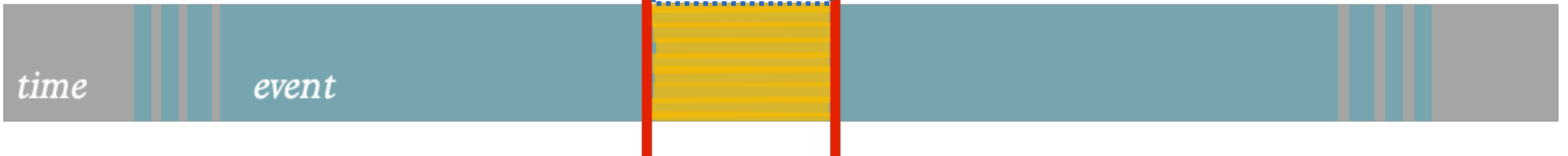


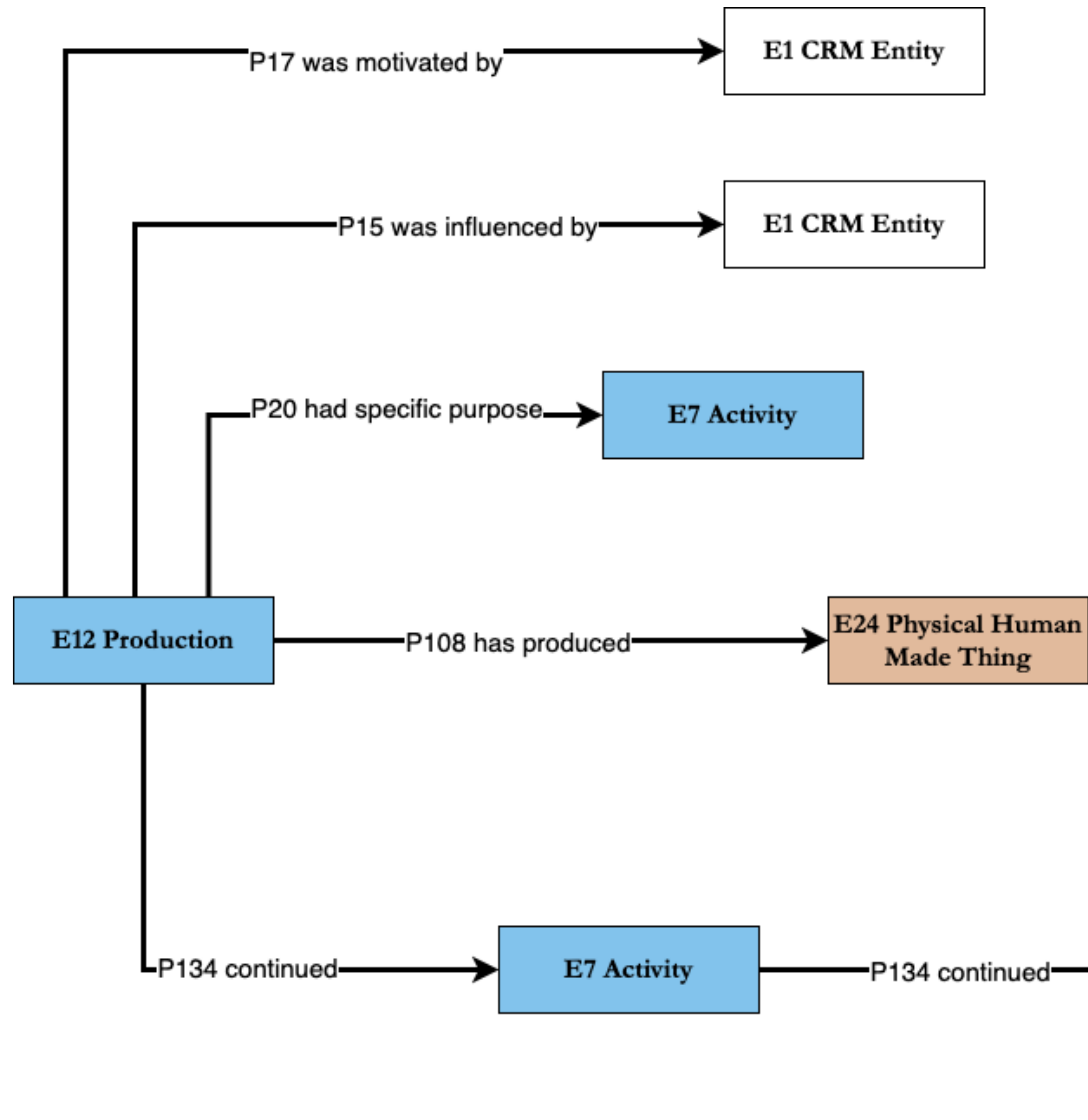
P82 at some time within

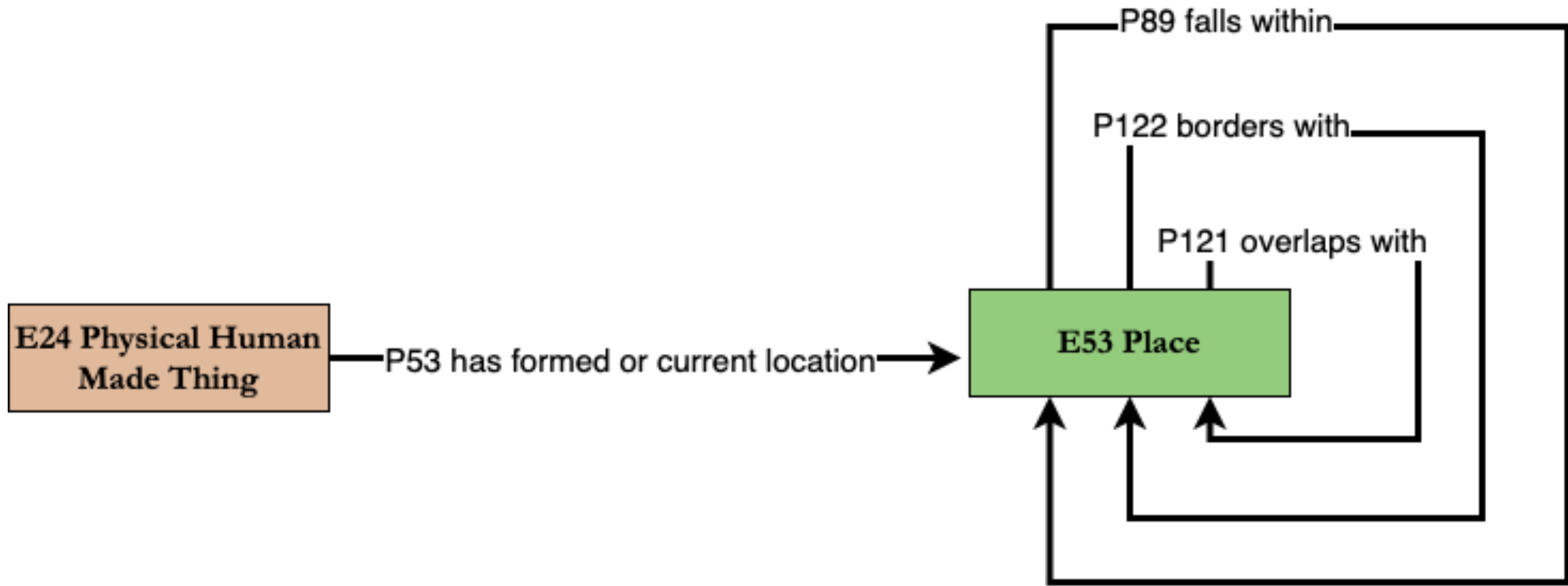


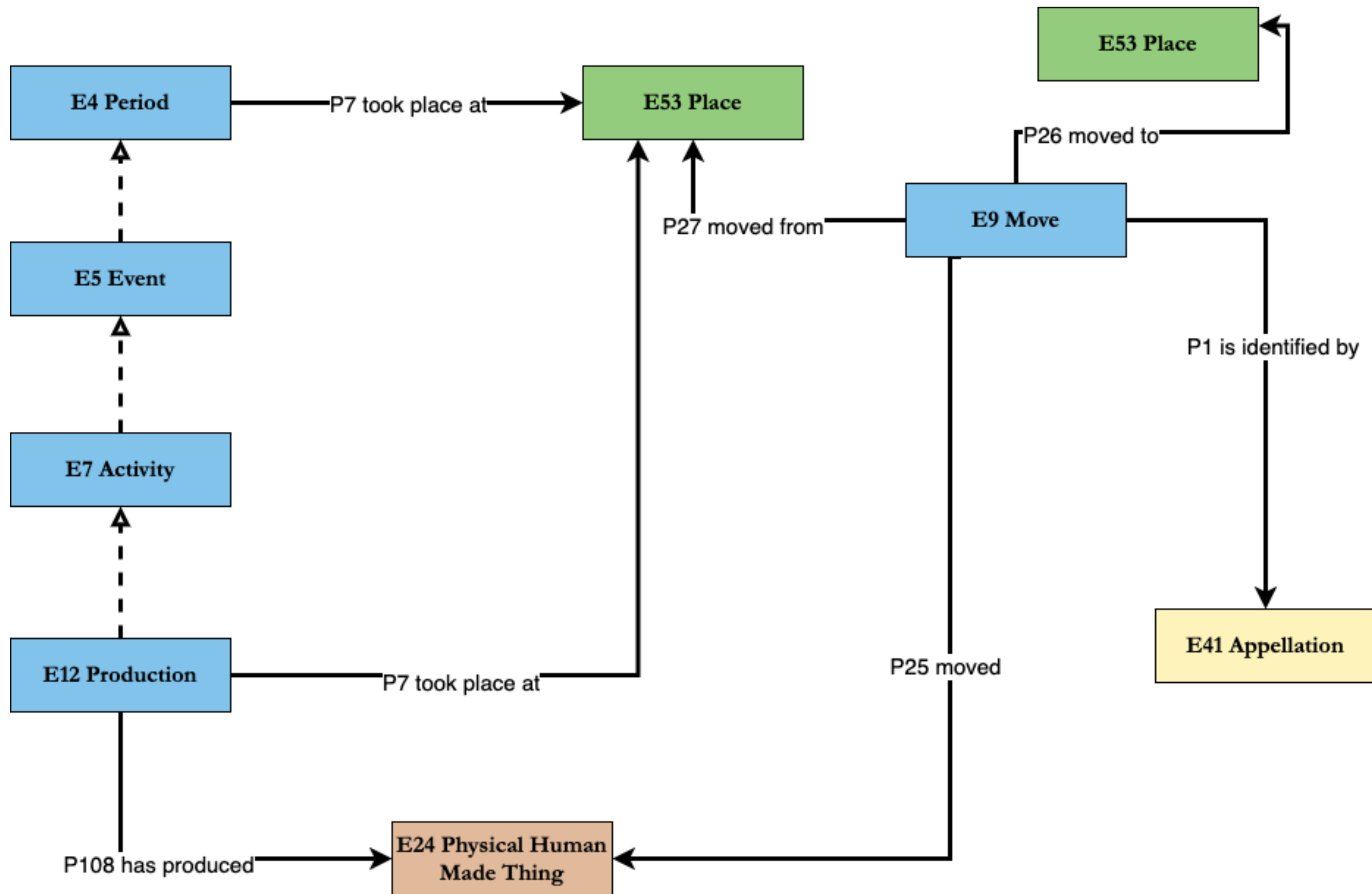


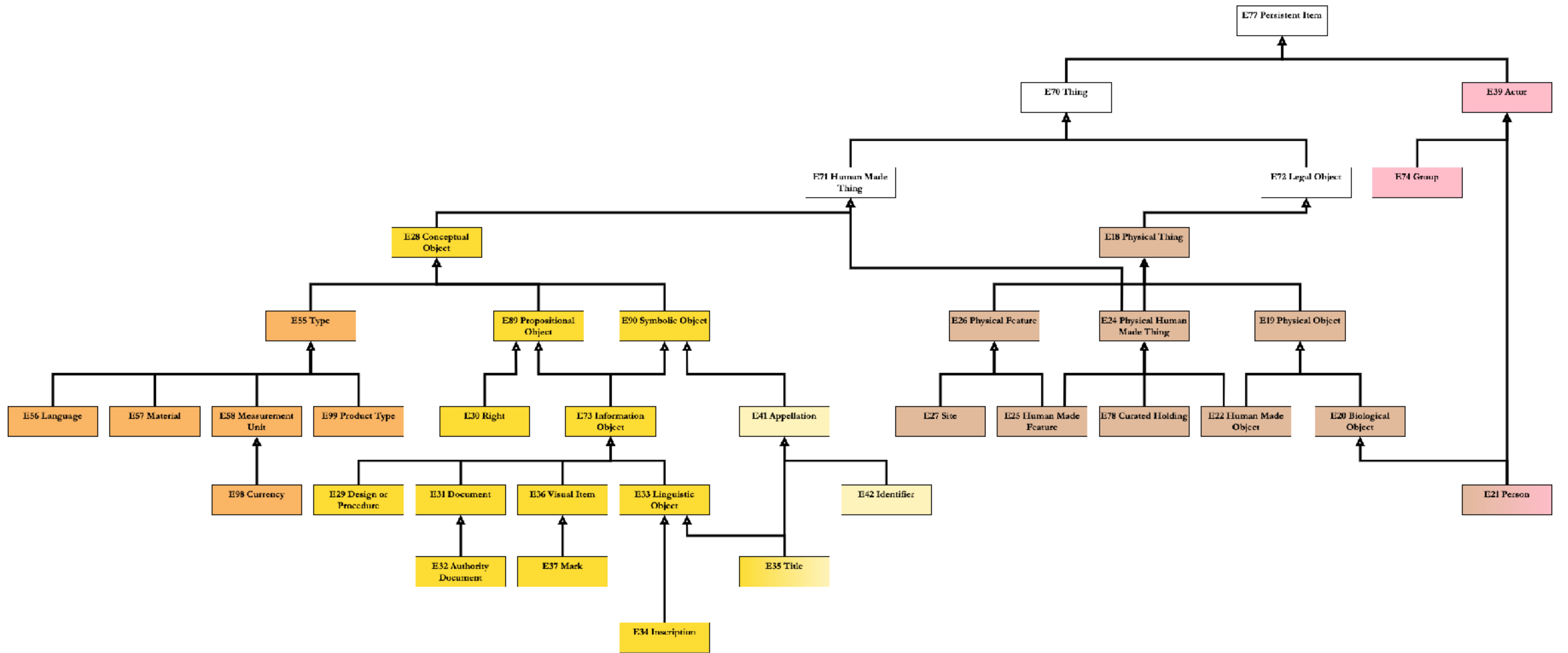
P81 ongoing through

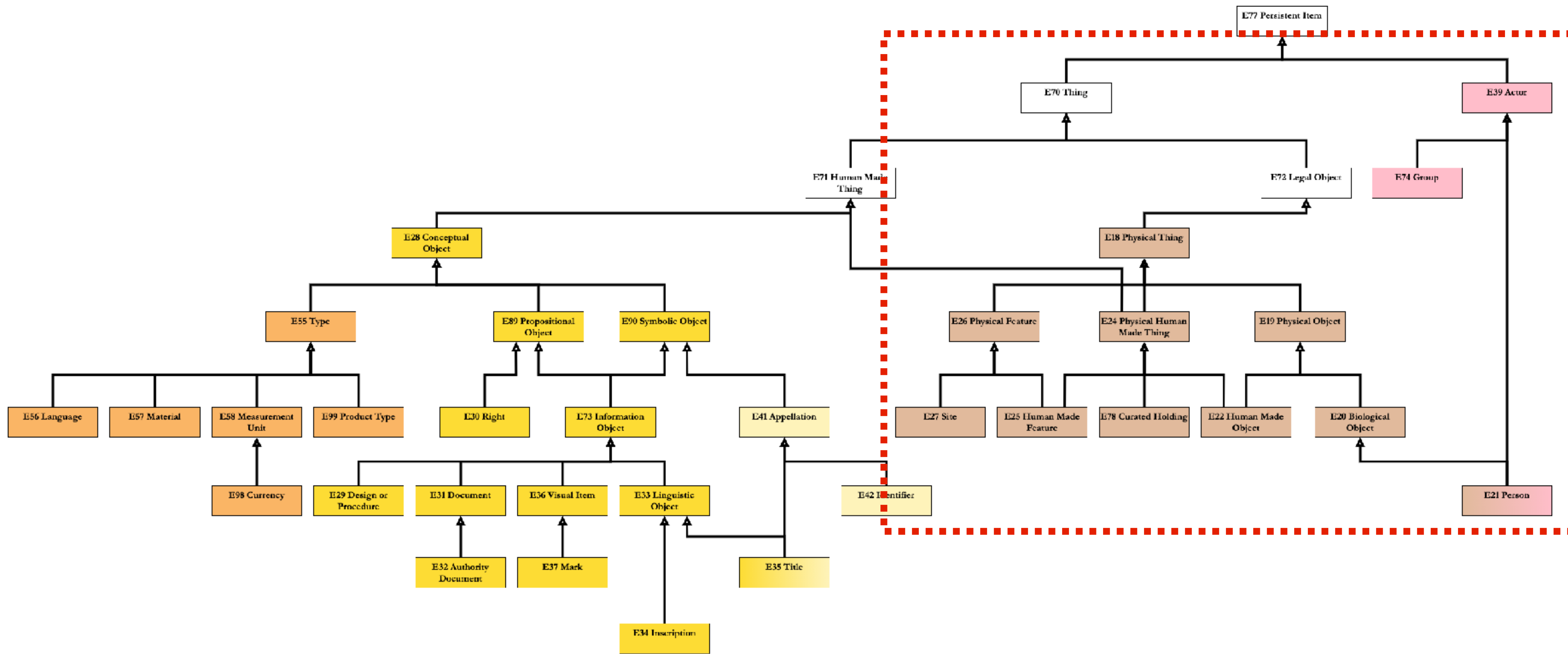


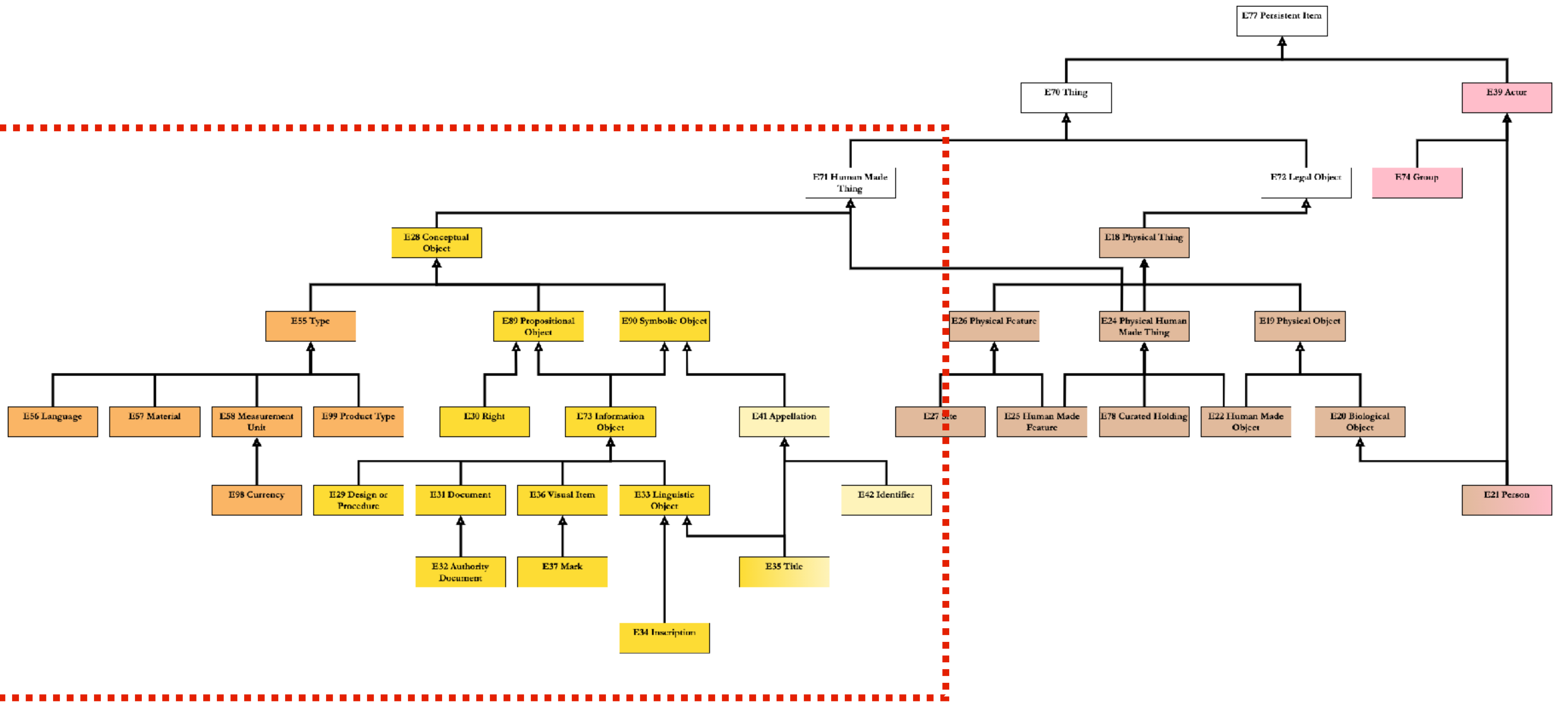




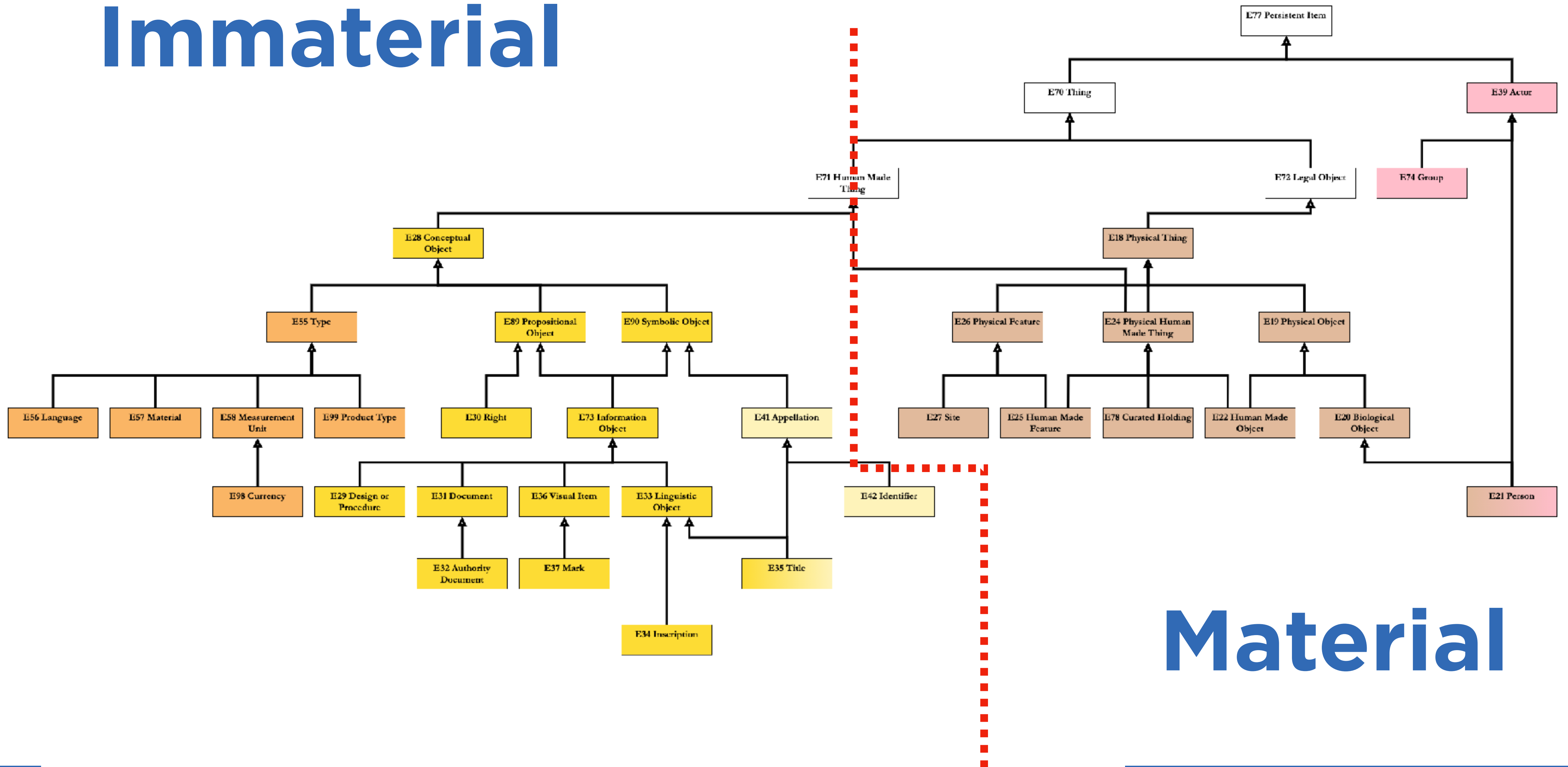




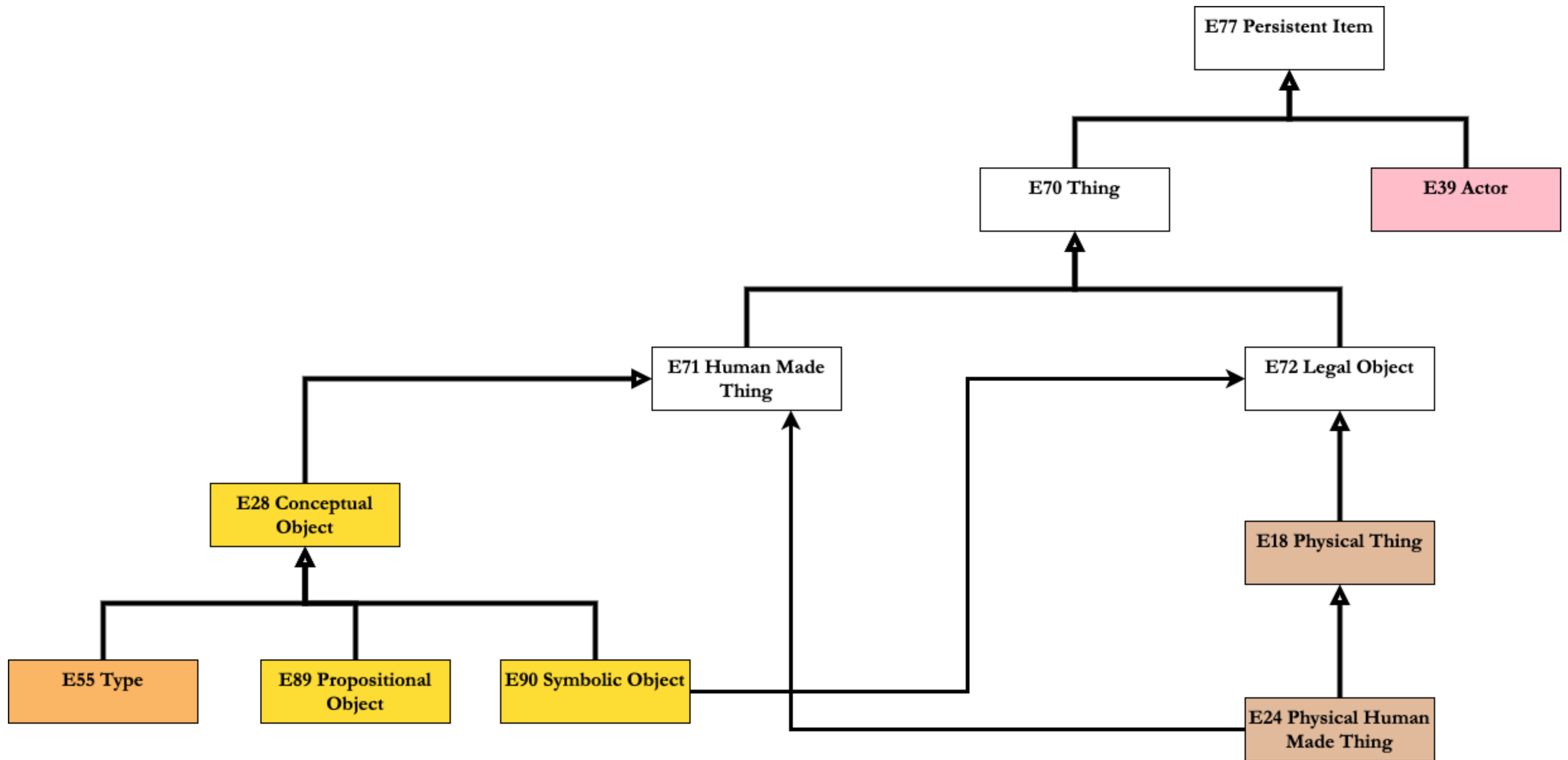


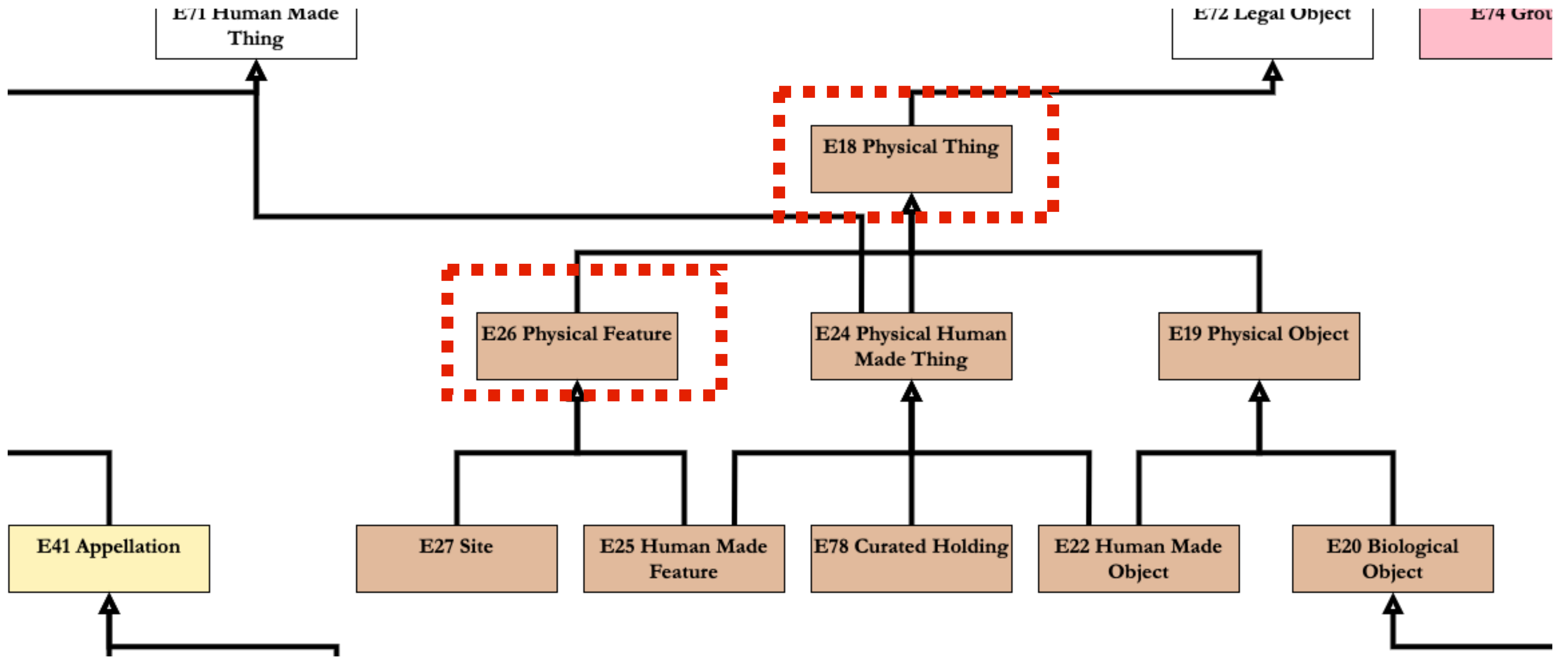


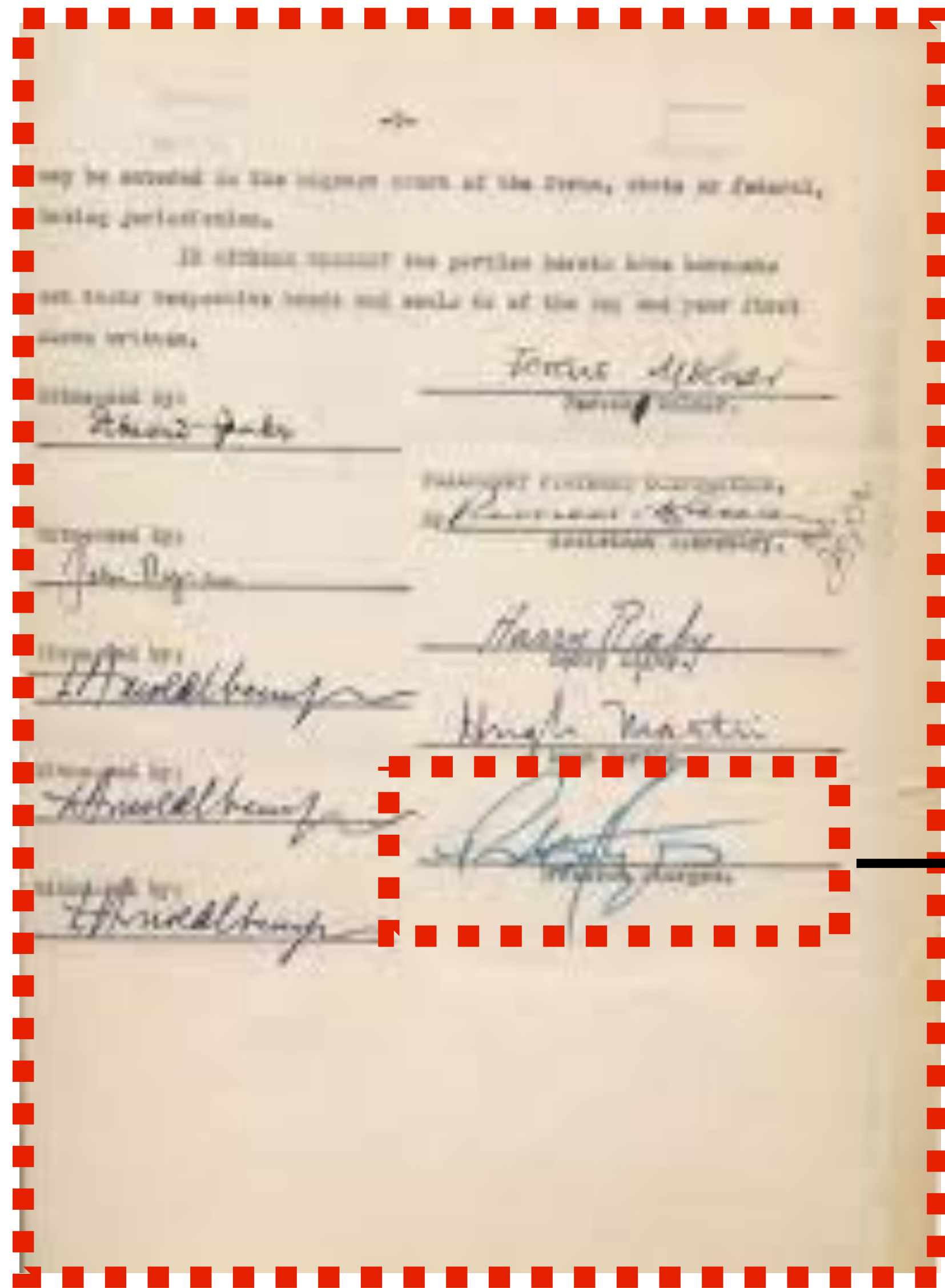
Immaterial



Material





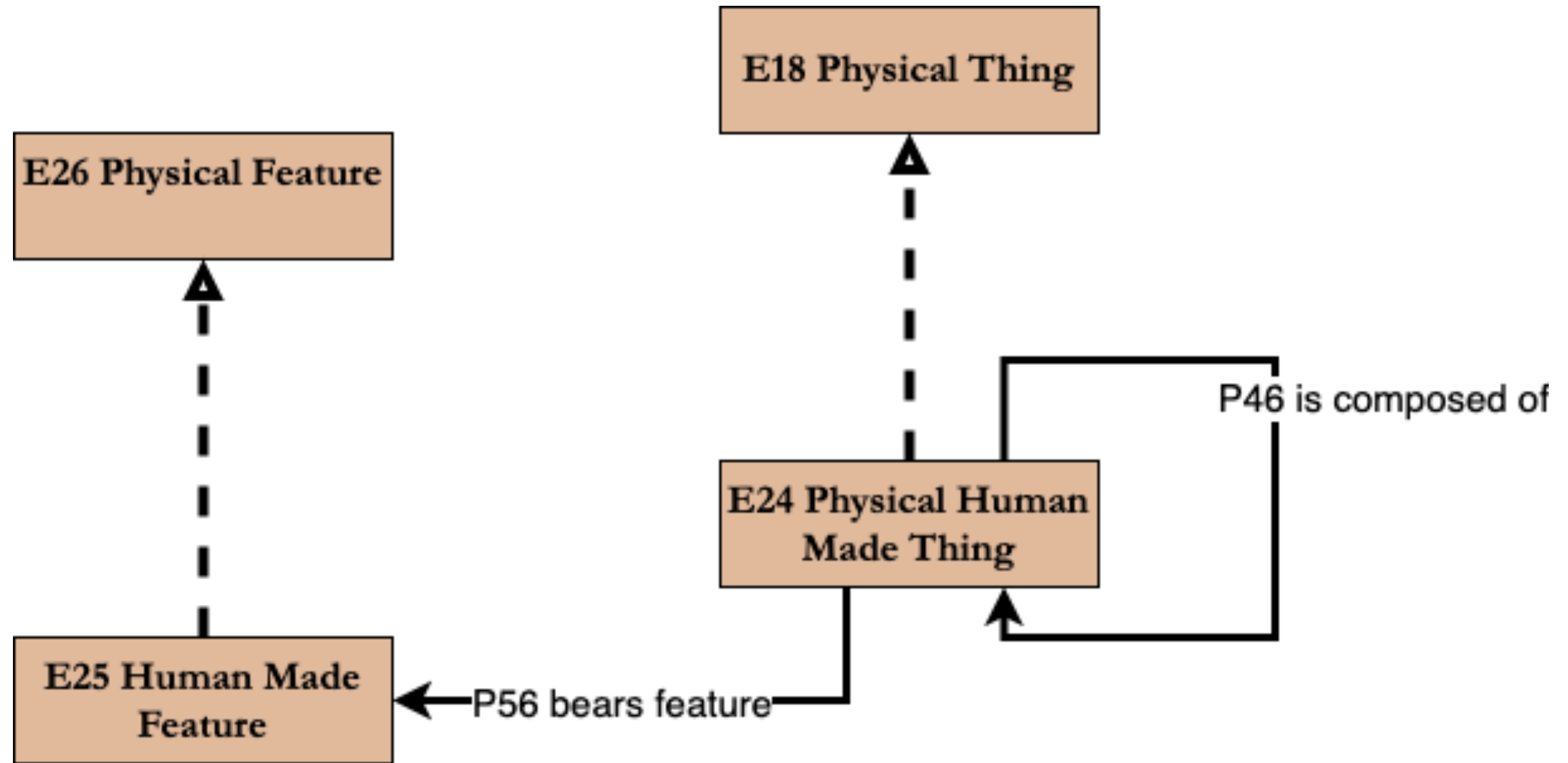


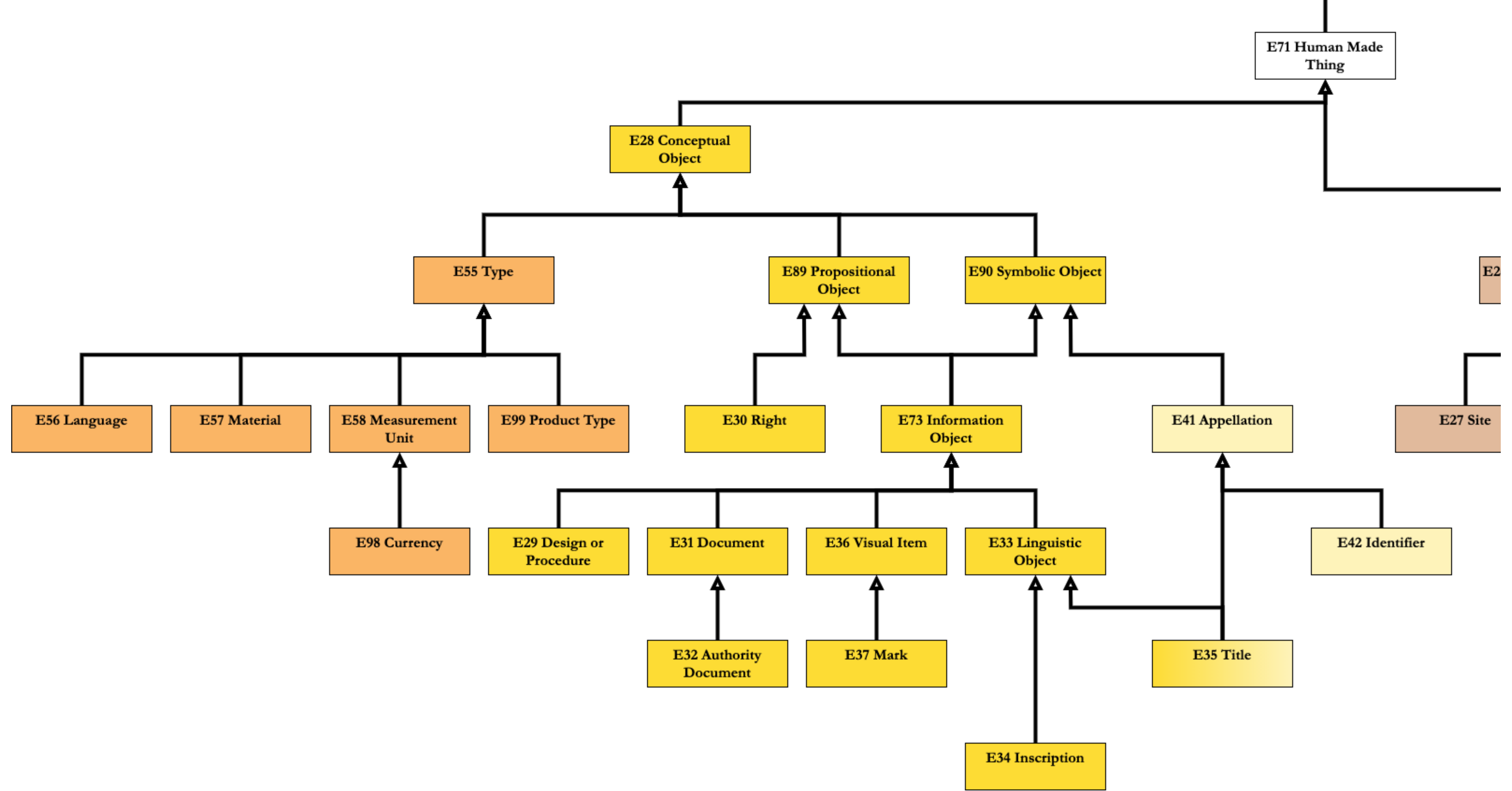
E26 Physical Feature

E25 Human Made Feature

E18 Physical Thing

E24 Physical Human Made Thing





Conceptual object

This class comprises non-material products of our minds and other human produced data that have become objects of a discourse about their identity, circumstances of creation or historical implication. The production of such information may have been supported by the use of technical devices such as cameras or computers.

Symbolic object

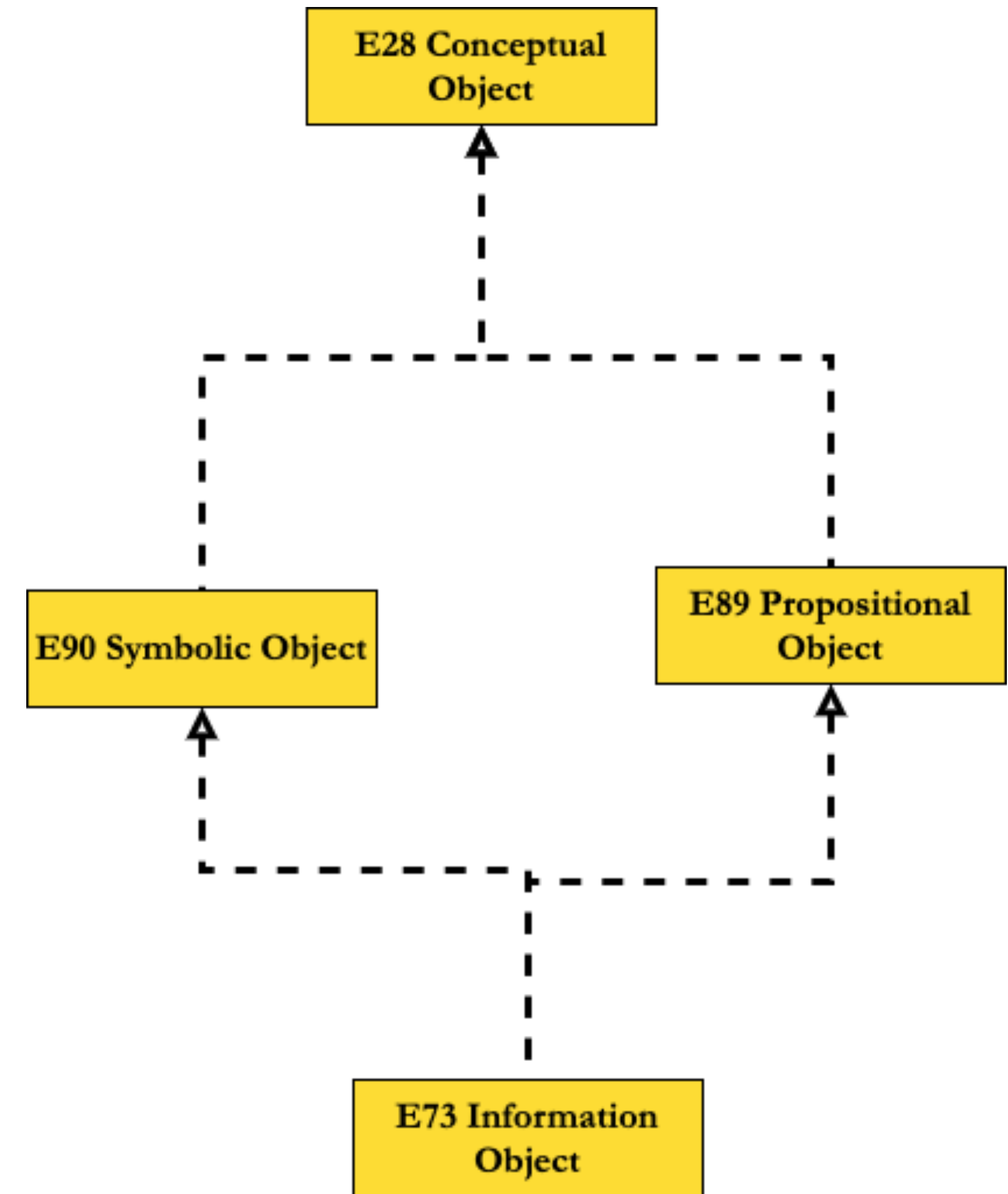
This class comprises identifiable symbols and any aggregation of symbols, such as characters, identifiers, traffic signs, emblems, texts, data sets, images, musical scores, multimedia objects, computer program code or mathematical formulae that have an objectively recognizable structure and that are documented as single units.

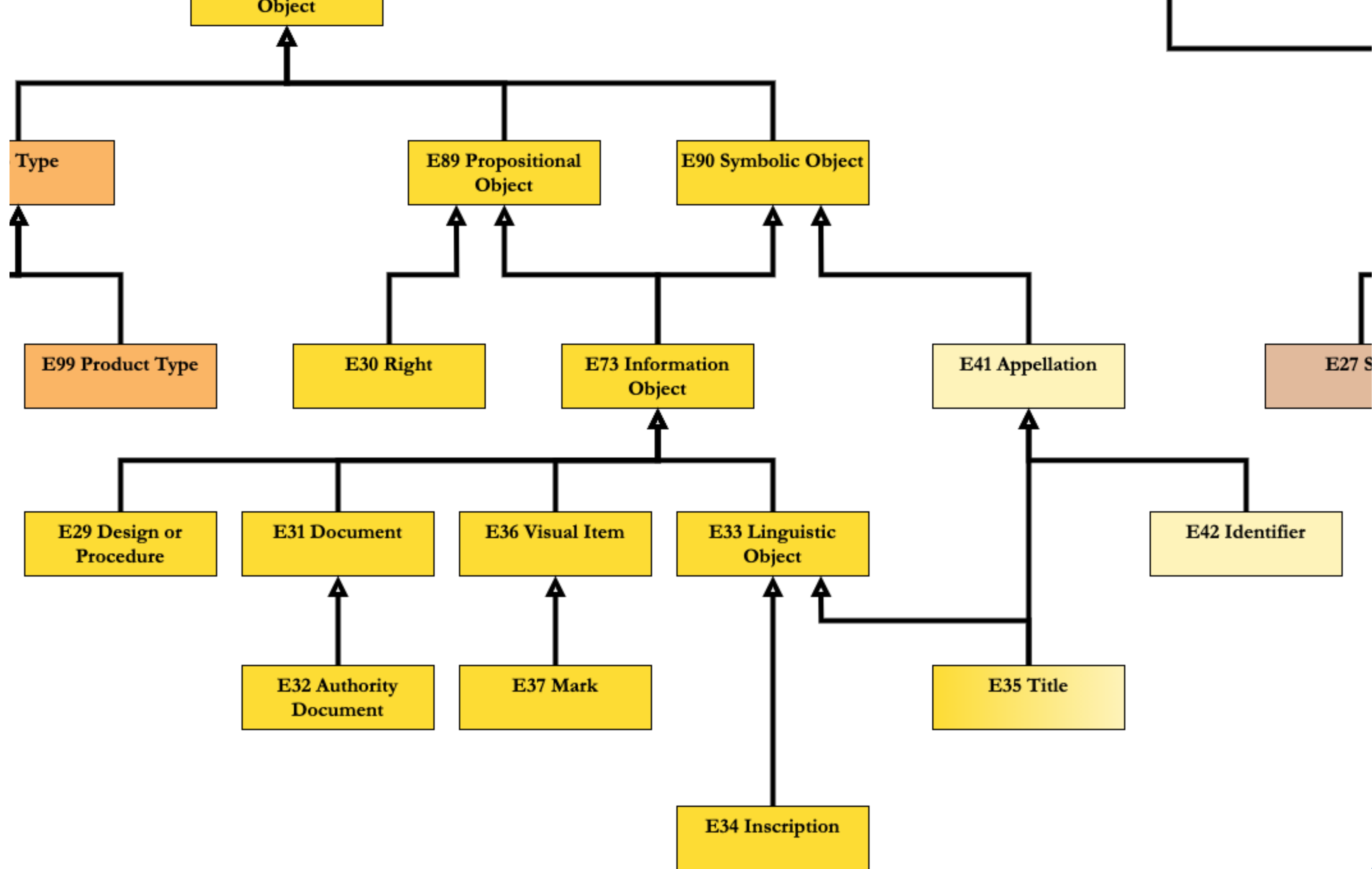
Propositional object

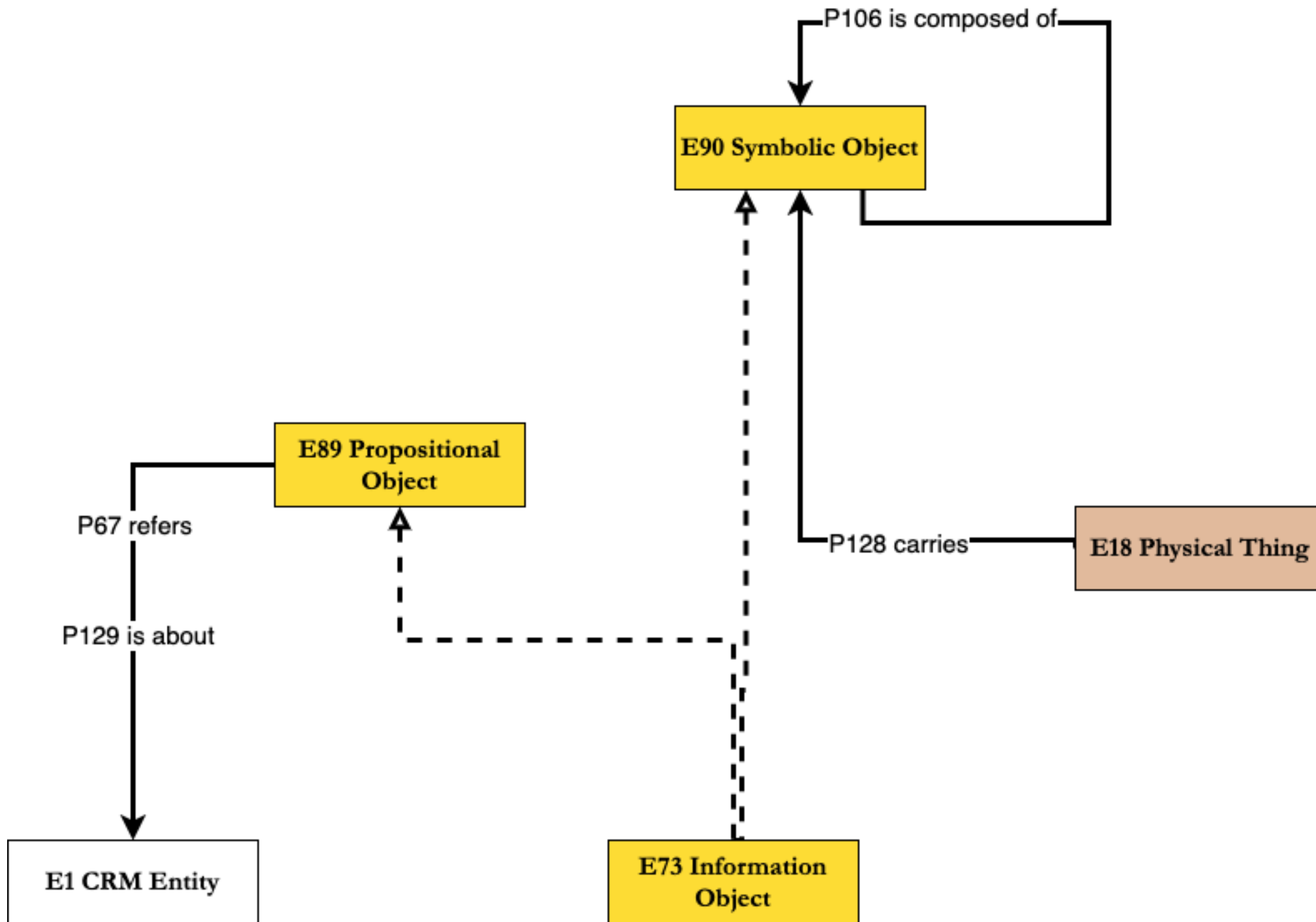
This class comprises immaterial items, including but not limited to stories, plots, procedural prescriptions, algorithms, laws of physics or images that are, or represent in some sense, sets of propositions about real or mental things and that are documented as single units or serve as topic of discourse.

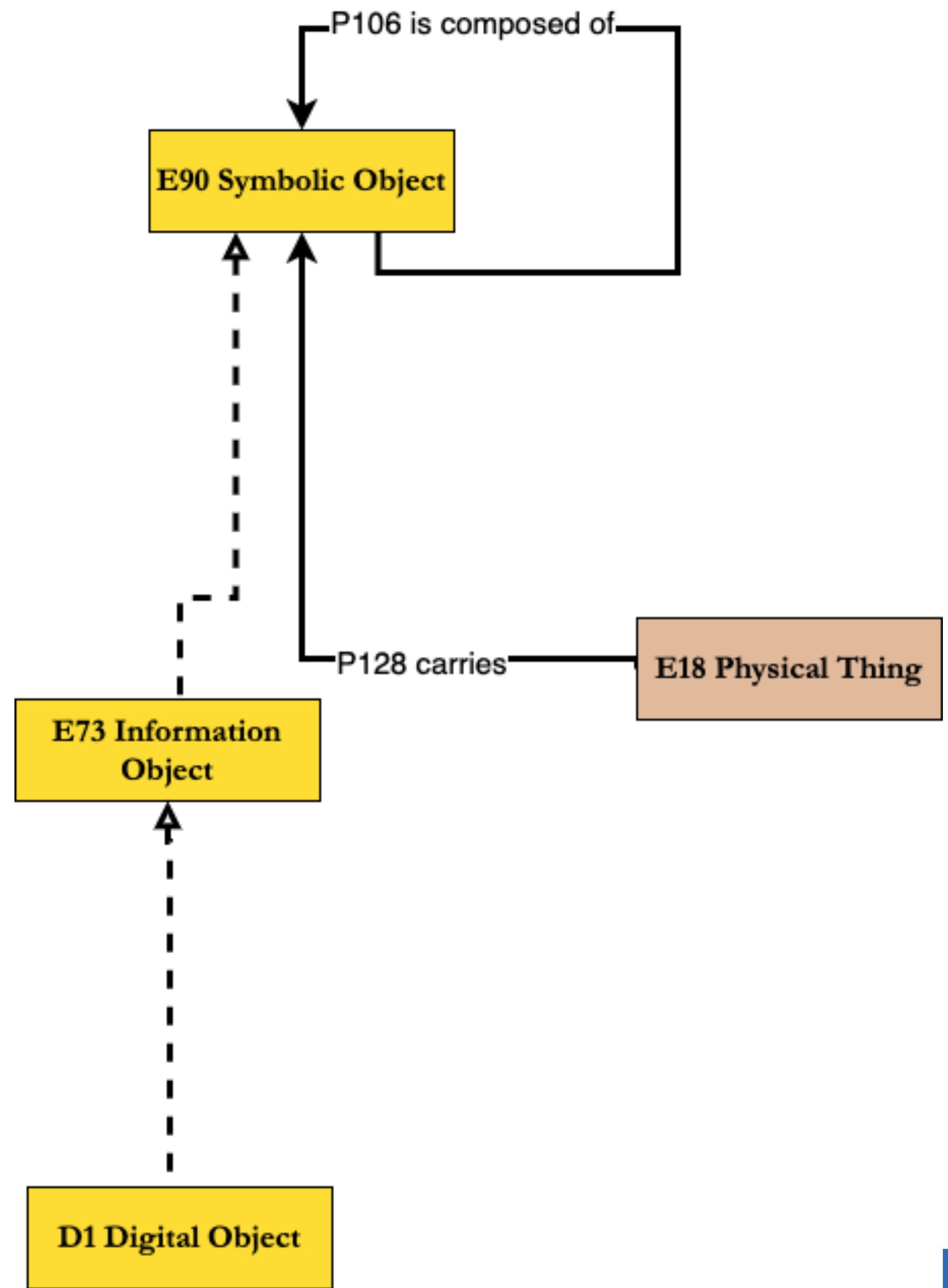
Information object

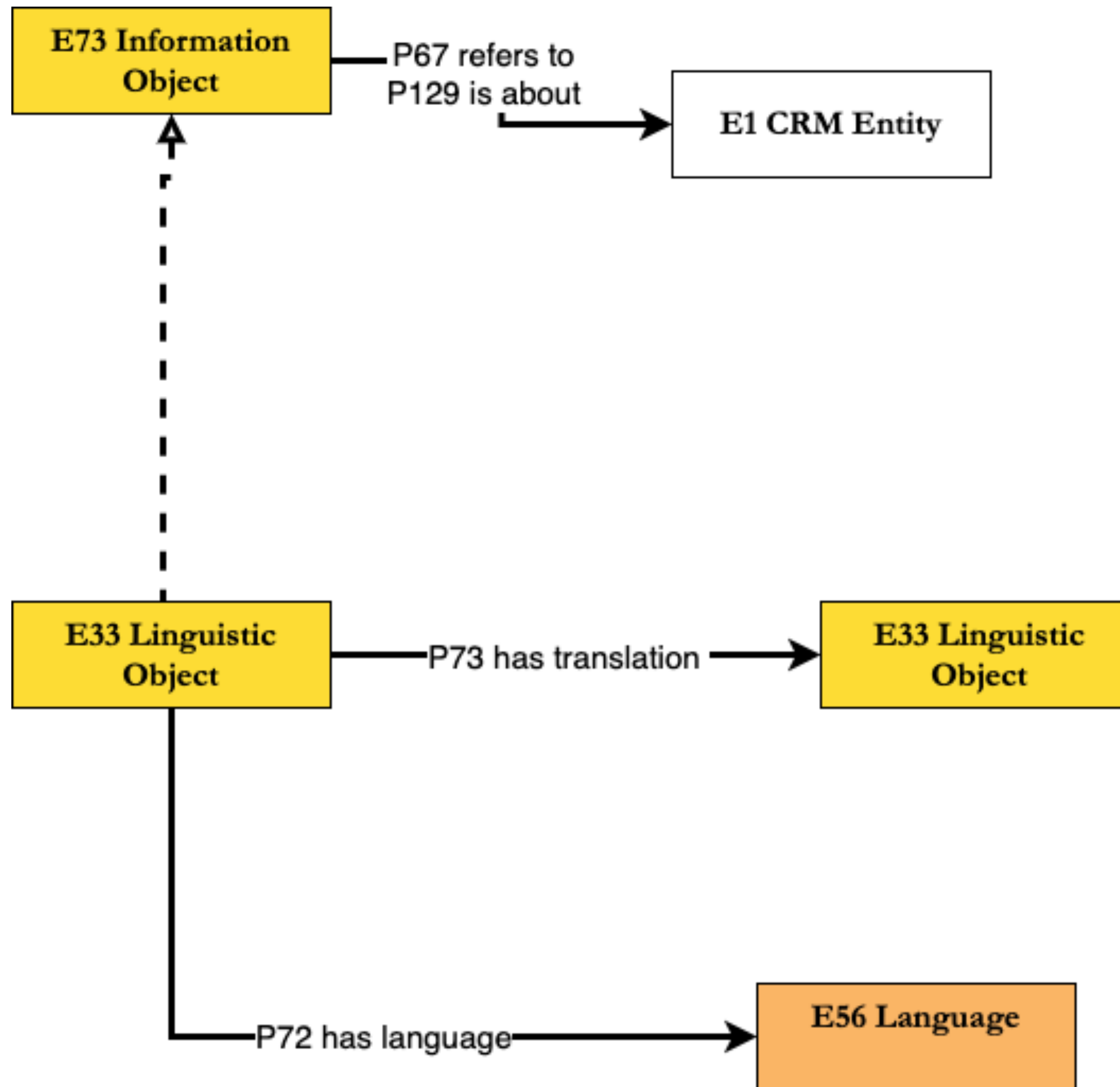
This class comprises identifiable immaterial items, such as a poems, jokes, data sets, images, texts, multimedia objects, procedural prescriptions, computer program code, algorithm or mathematical formulae, that have an objectively recognizable structure and are documented as single units

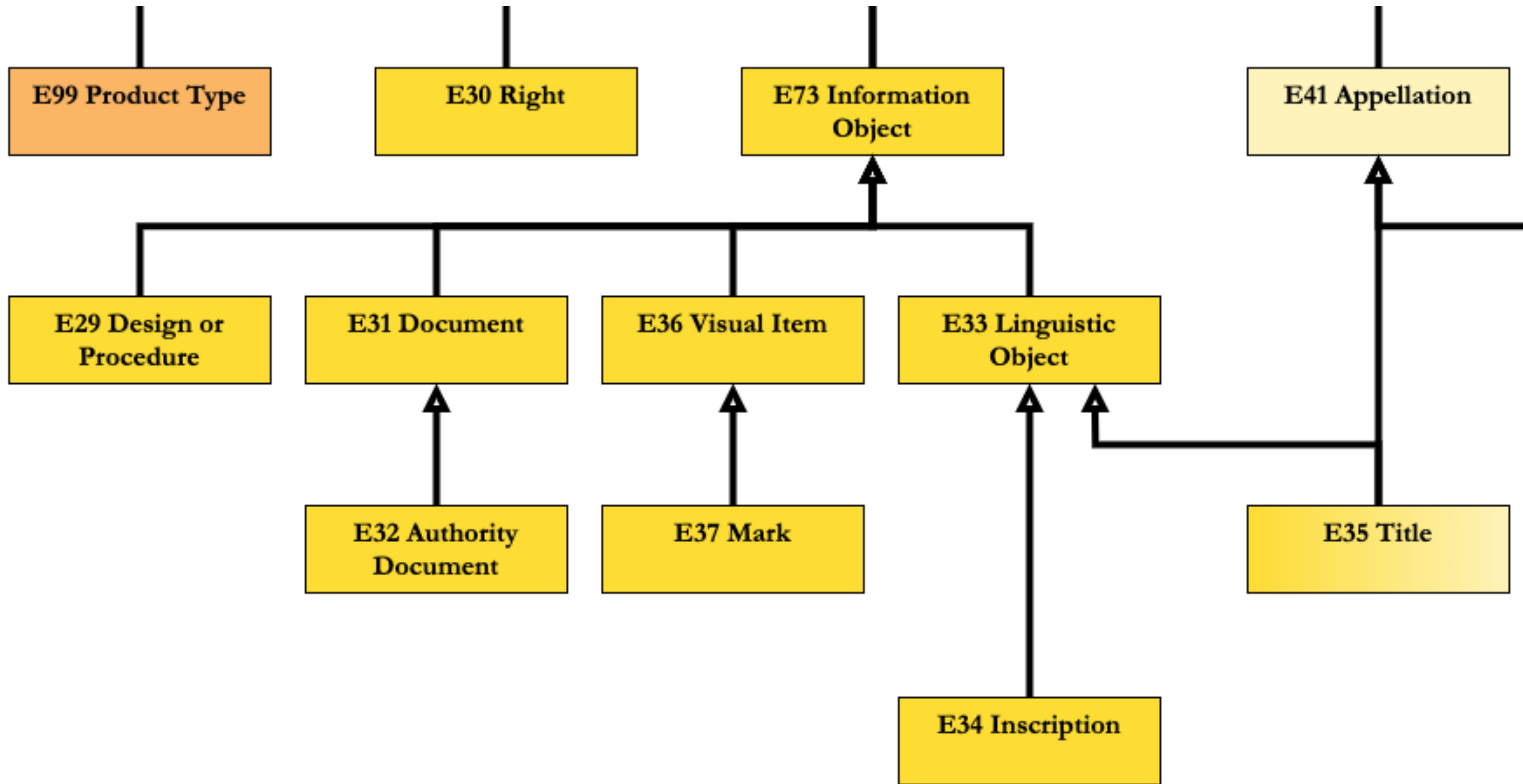


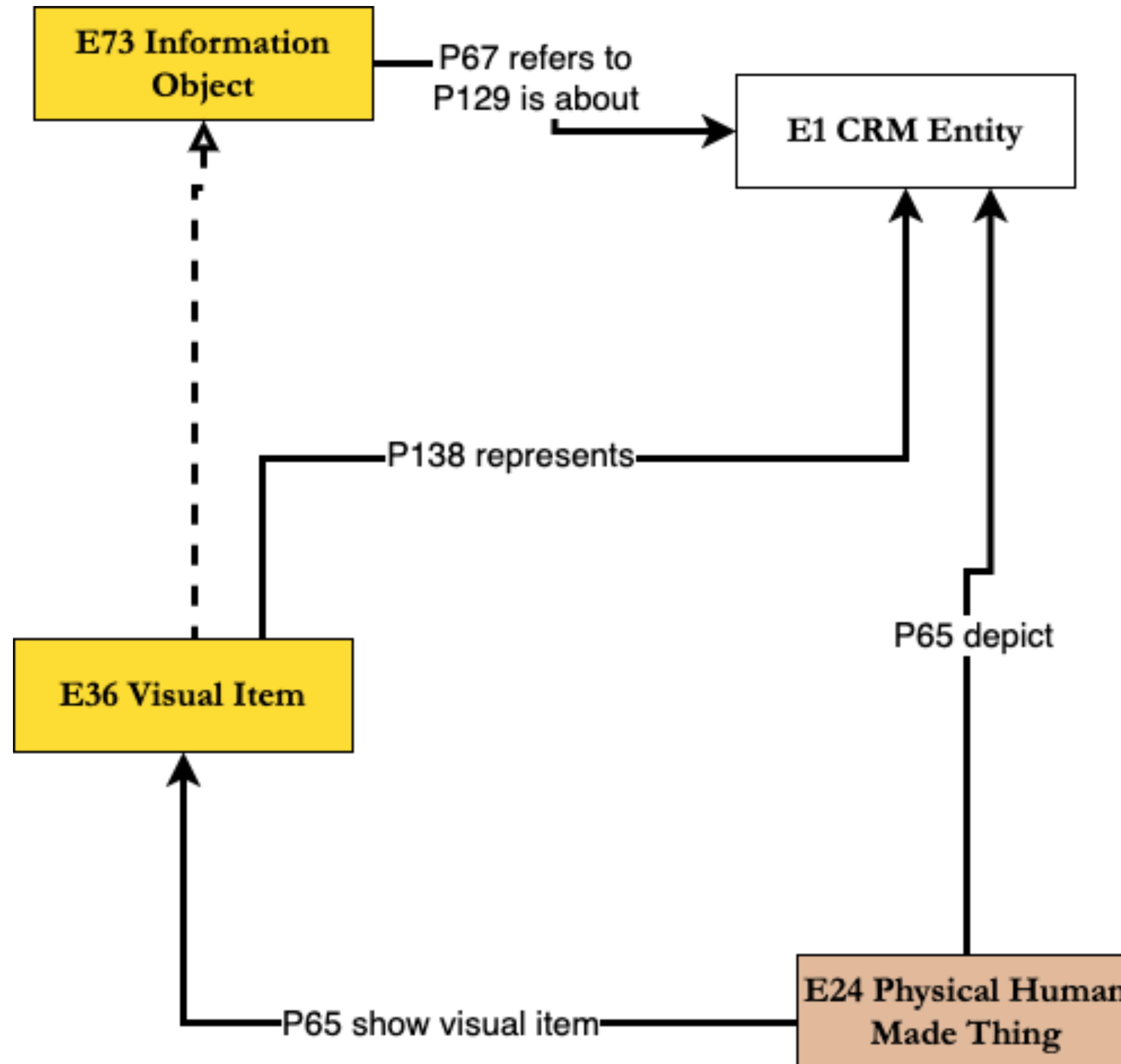




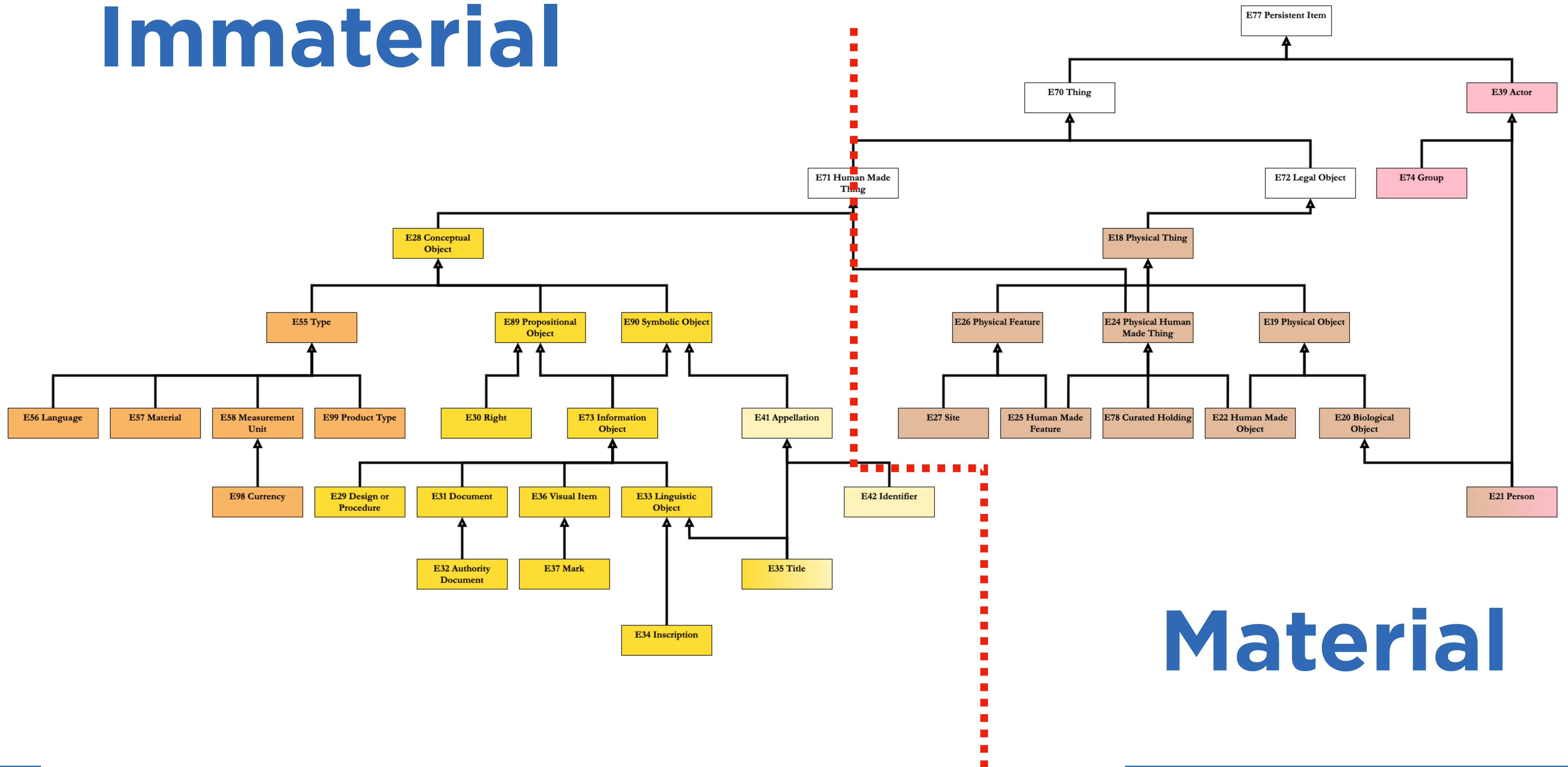




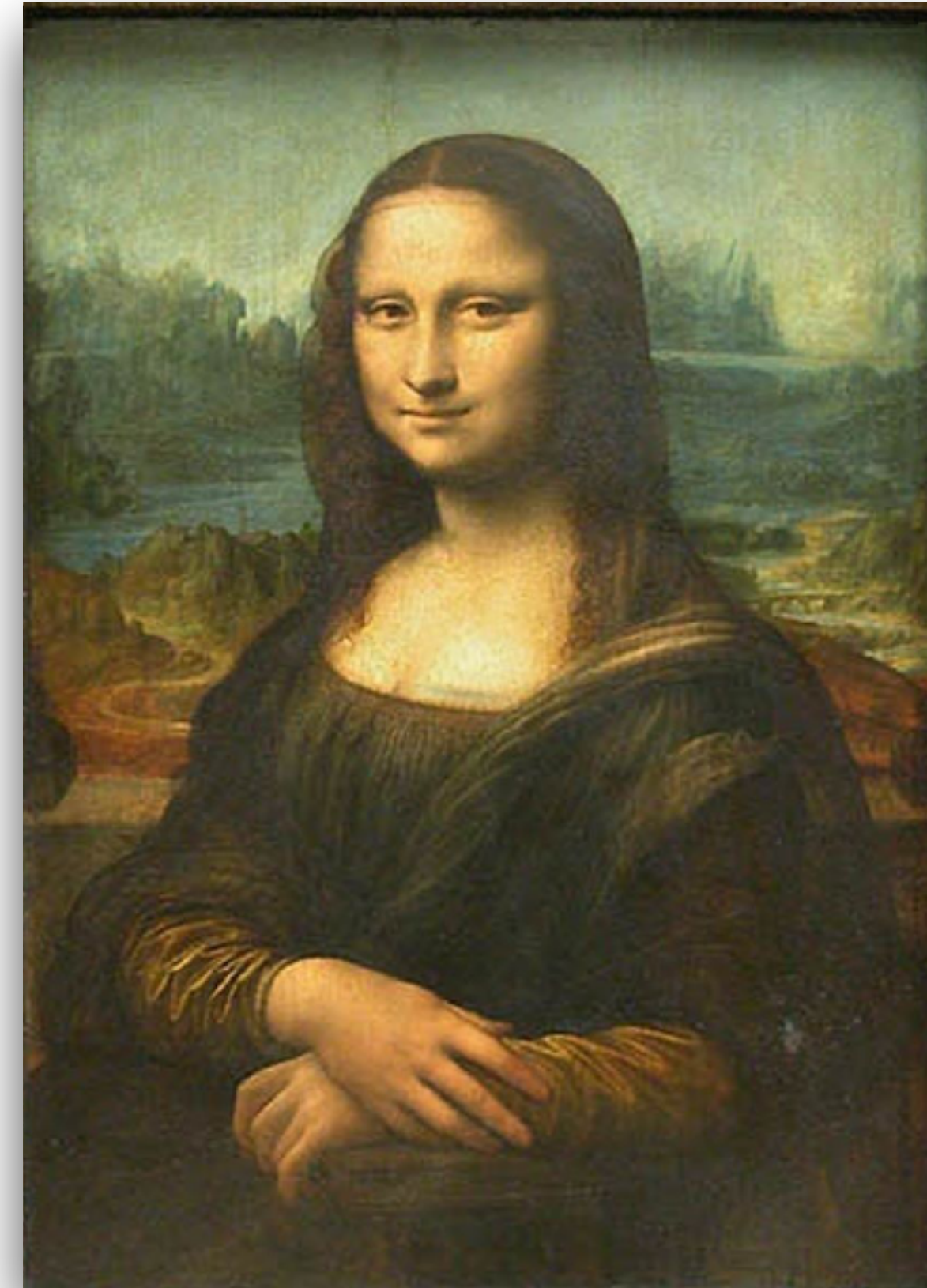


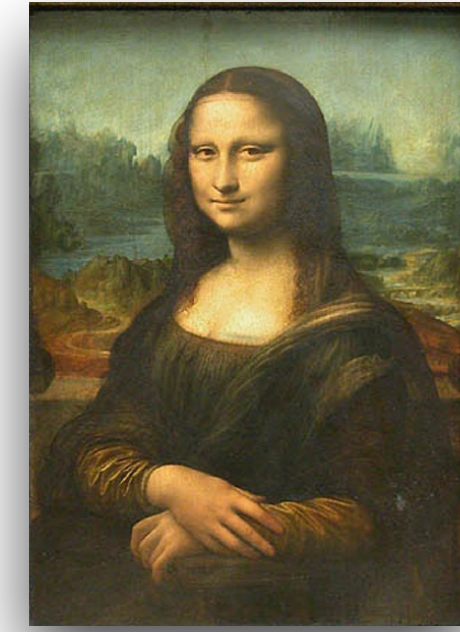


Immaterial



Material





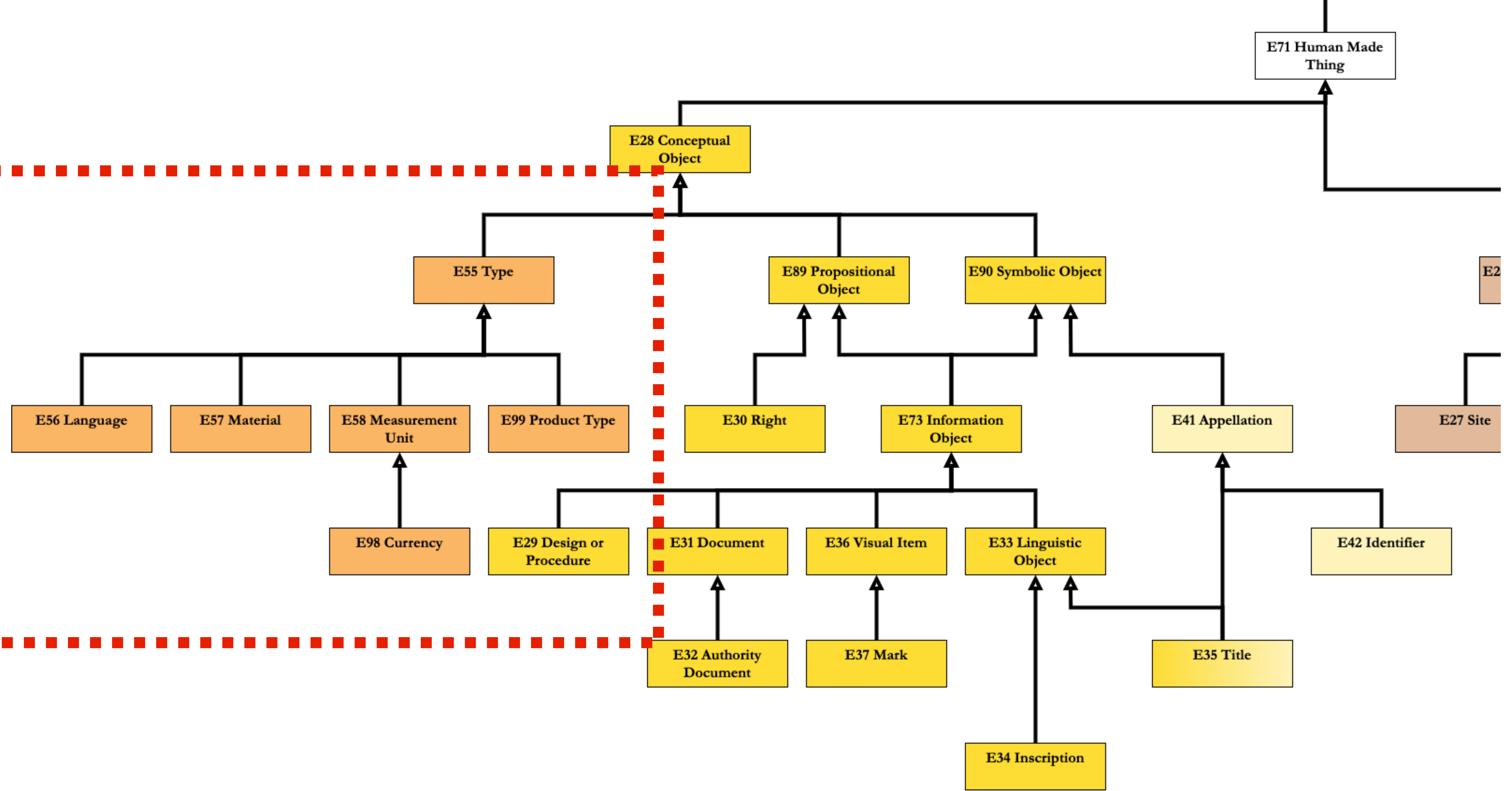
**E24 Physical Human
Made Thing**

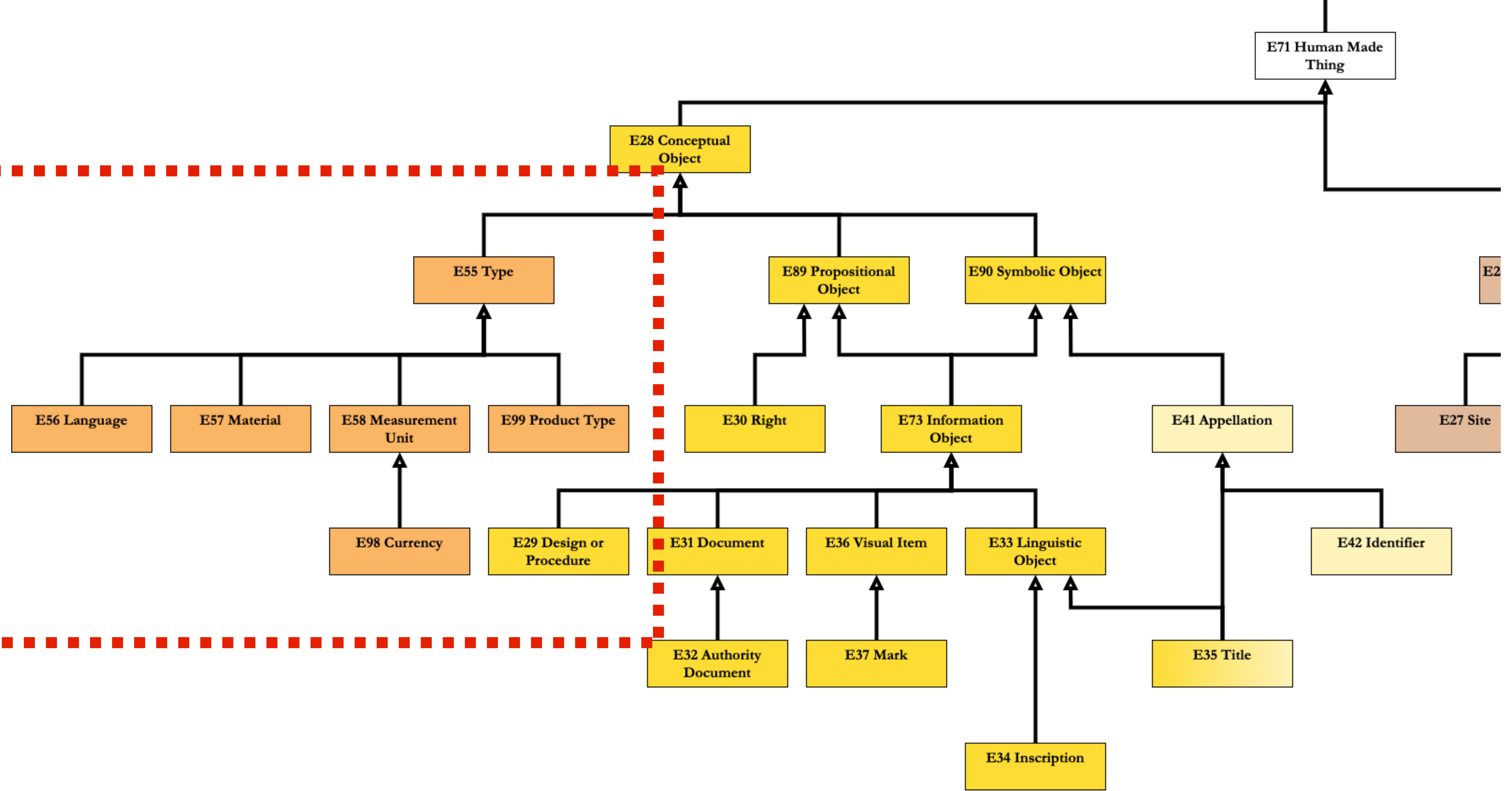
**E24 Physical Human
Made Thing**

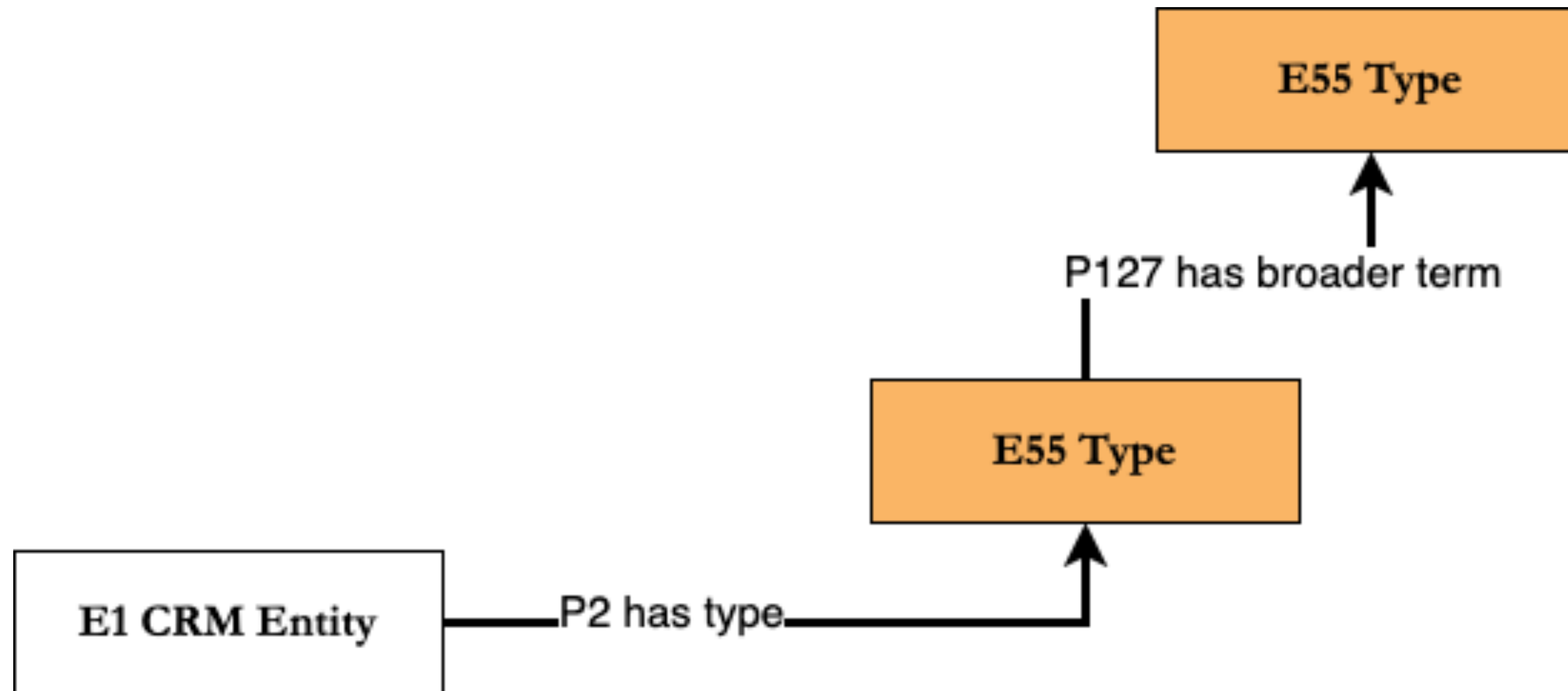
P128 carries

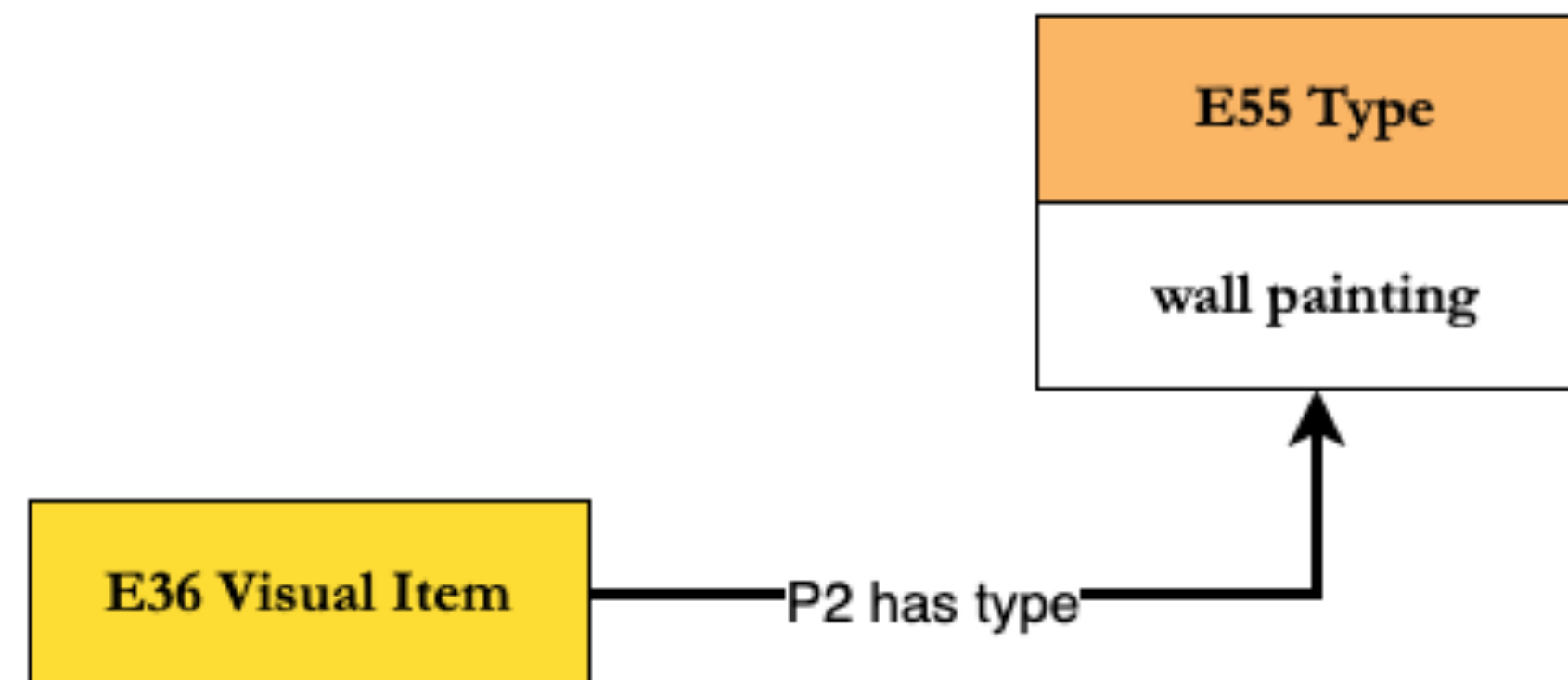
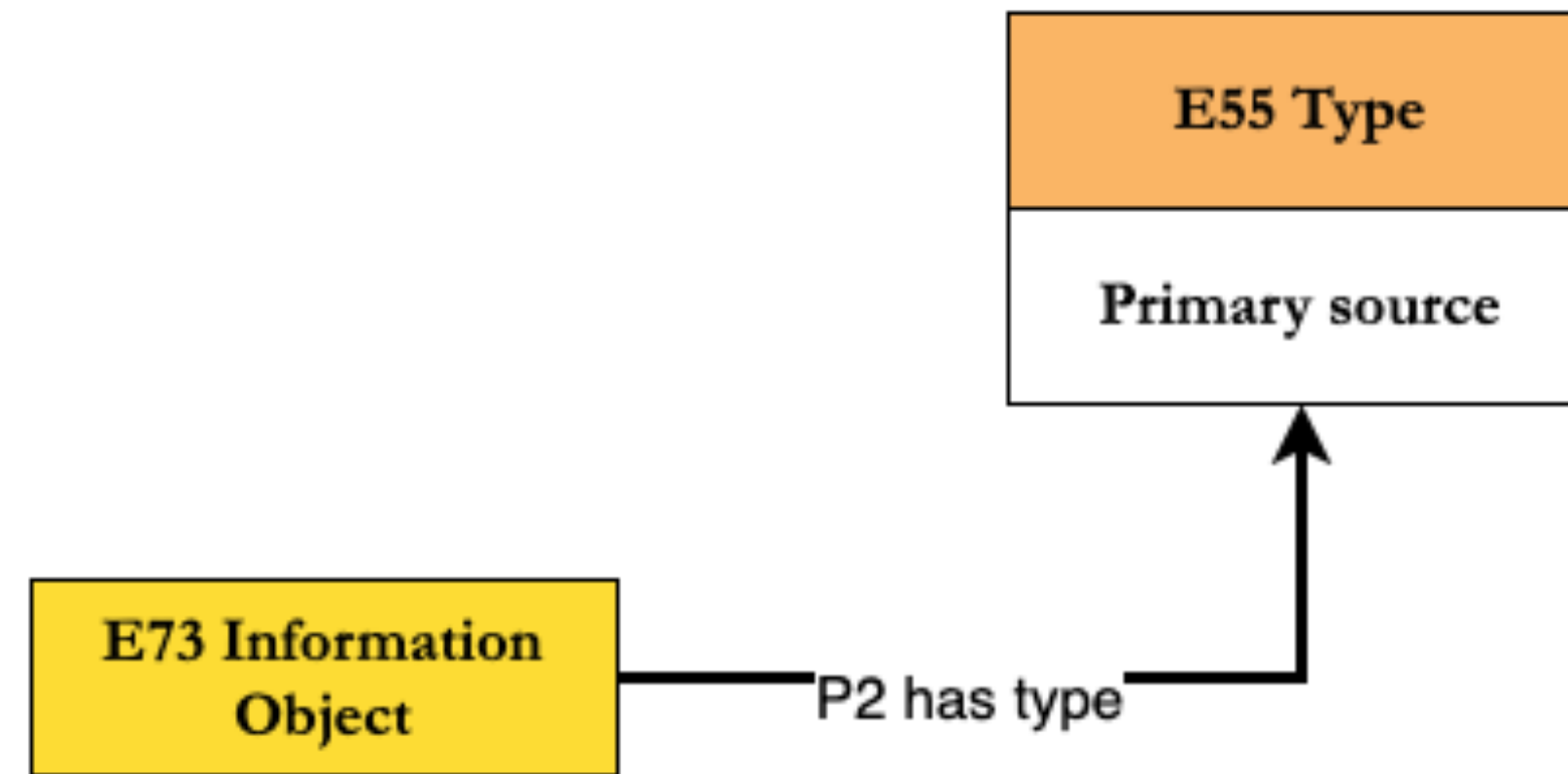
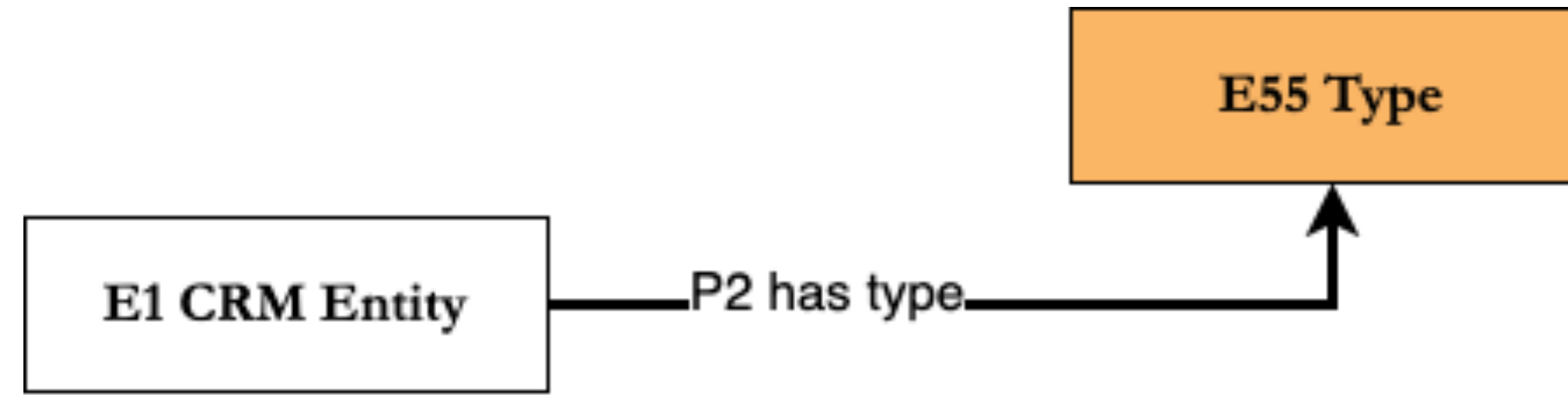
P128 carries

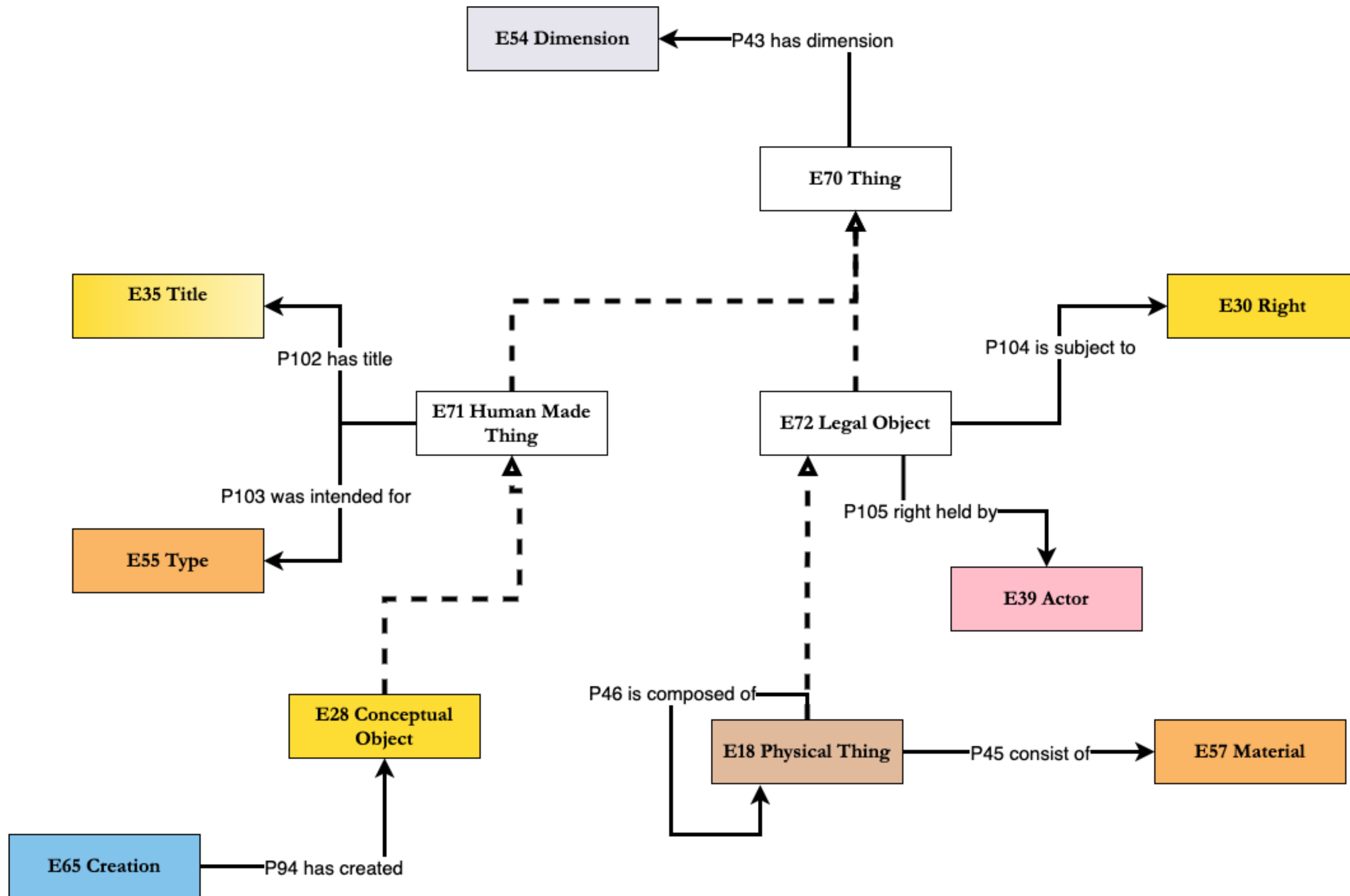
E36 Visual Item













Luis Go

braten ist nicht ein Leutnant von
Nobelpreis und Leutnant von
No Preis nicht gelobt
Nobelpreis, der Kugel und Kugel
und das Hauptband für Kugel
über sein willkürliches Leben
der Gaskocherischen Gaskocher-
bedingung des Gaskocherischen

Potnia

Lady Writers

Women social condition in the second half of the XIX Century, narrated through the pen of Lady writers and male correspondents.

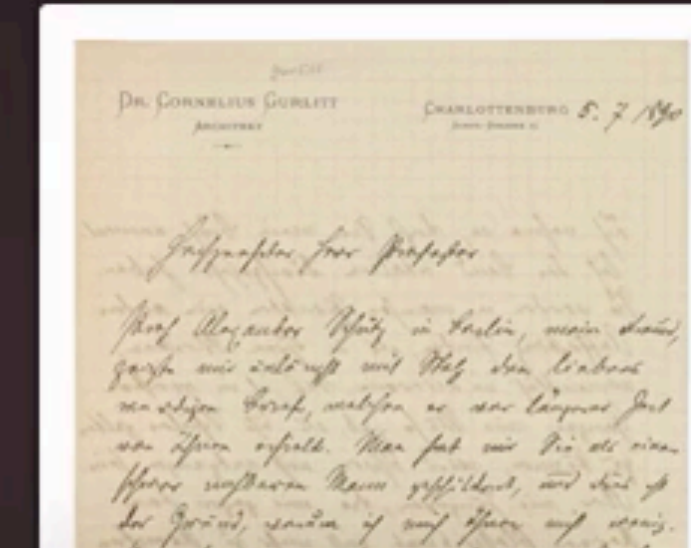


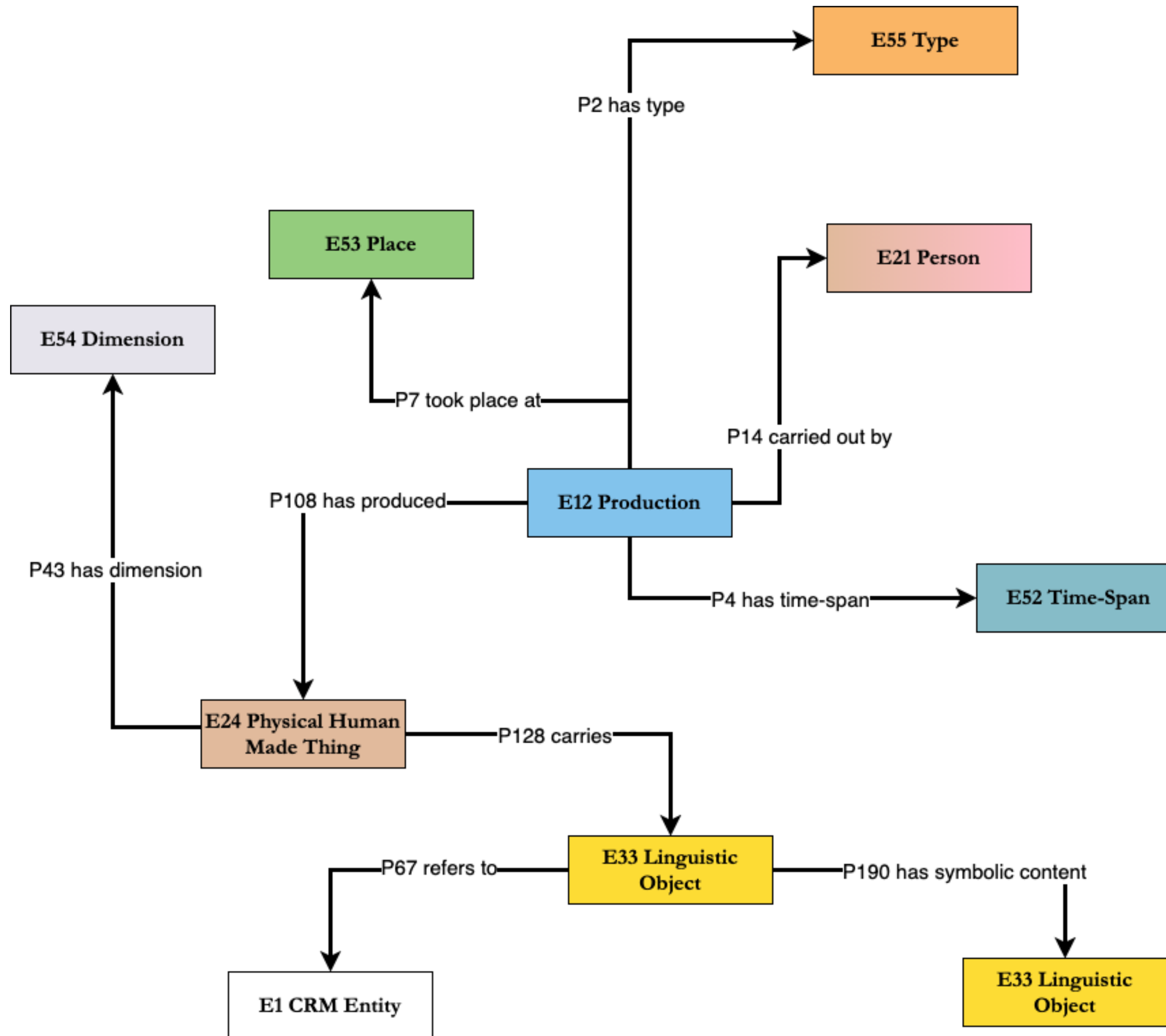
Click [here](#) to begin the platform test

Collections



Highlights

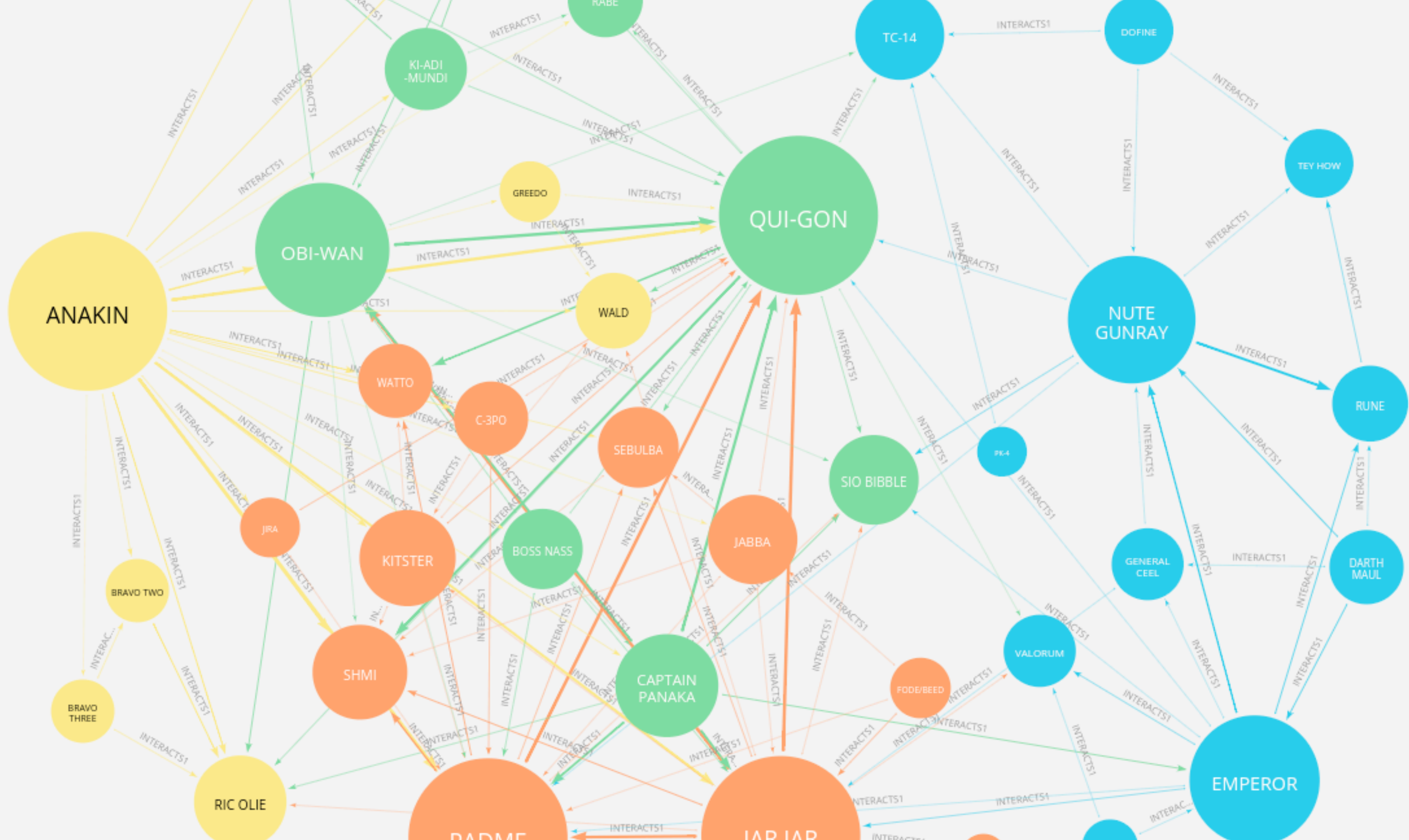


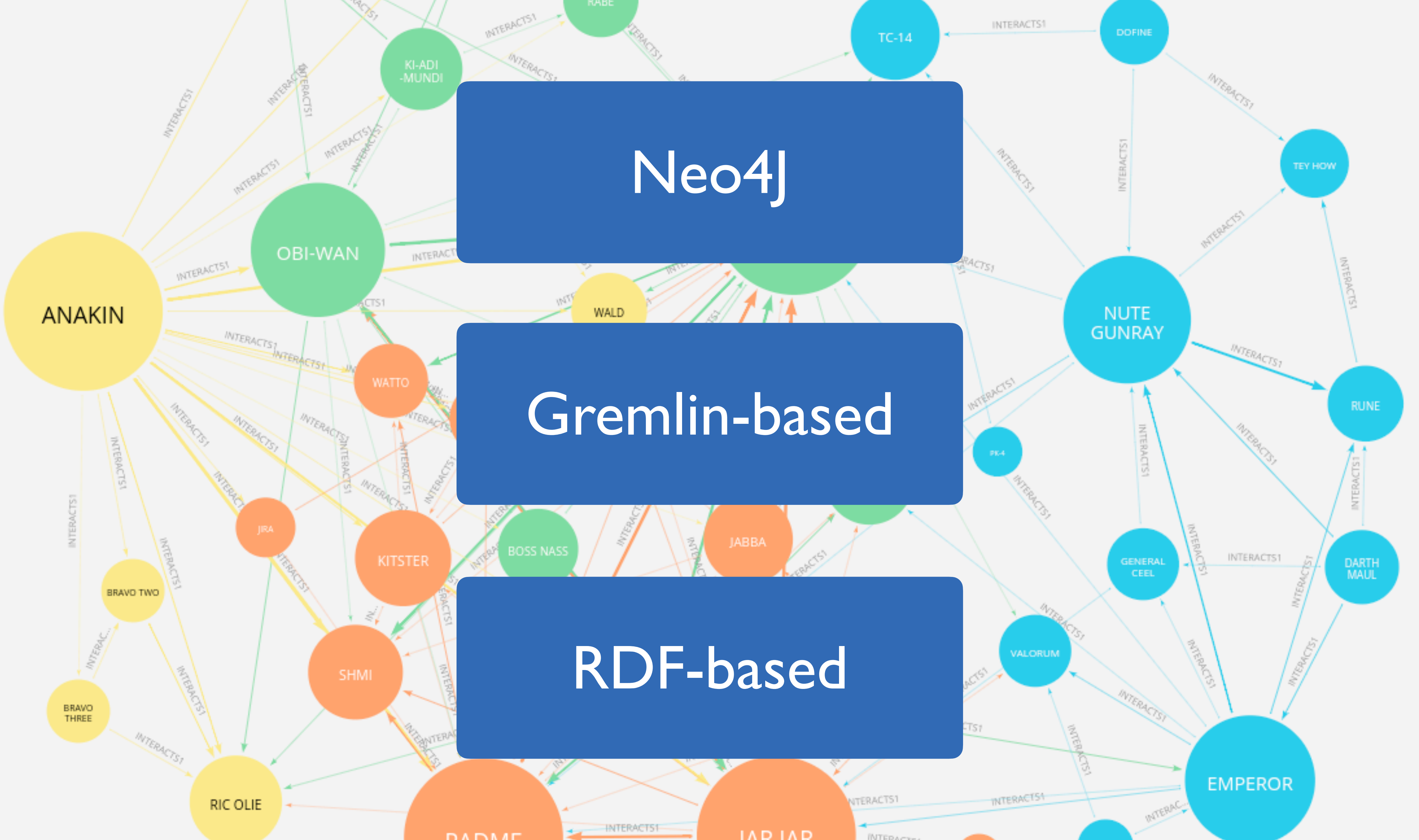


Where to find patterns

Model some data

SPARQL





Neo4J

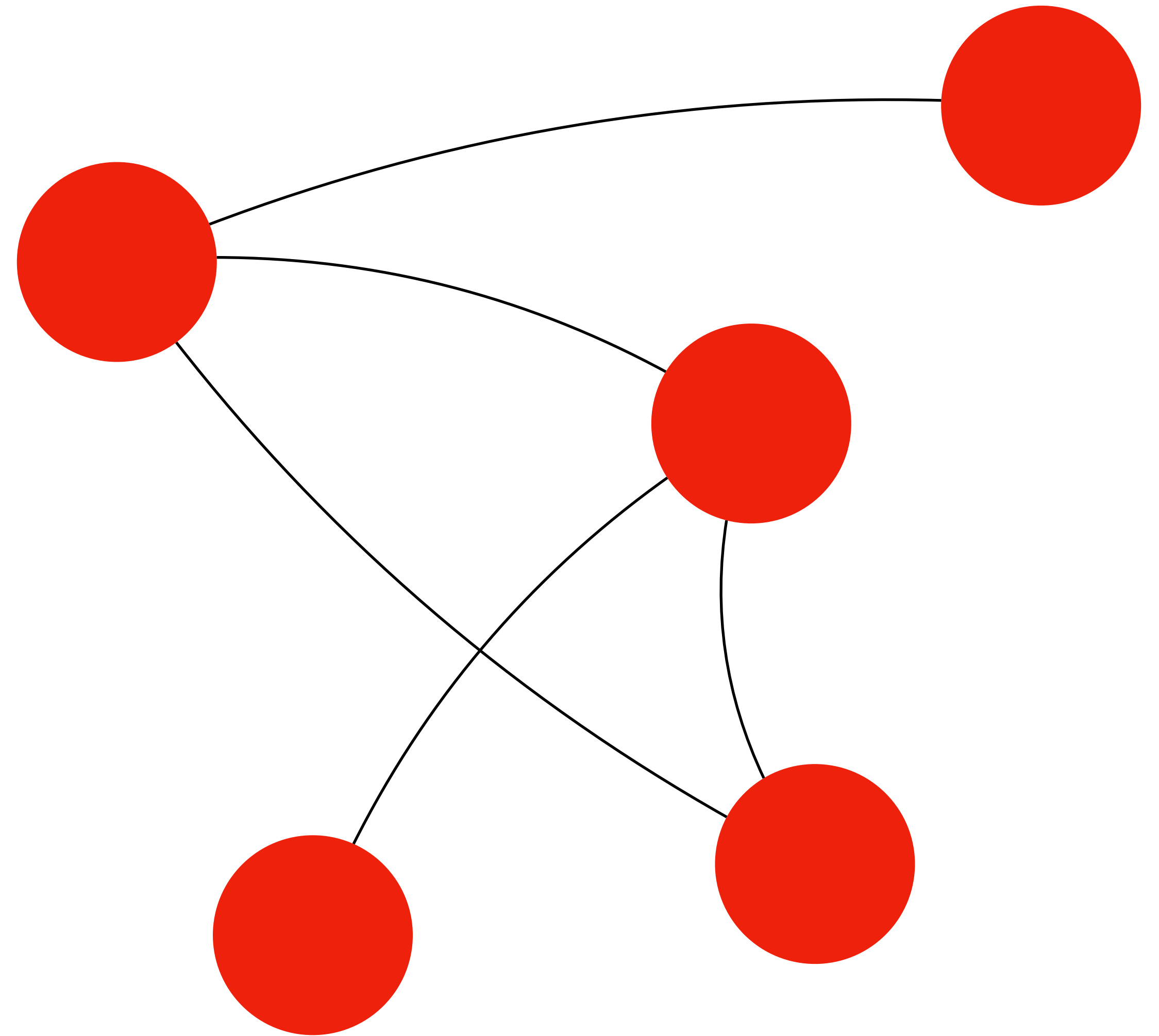
Gremlin-based

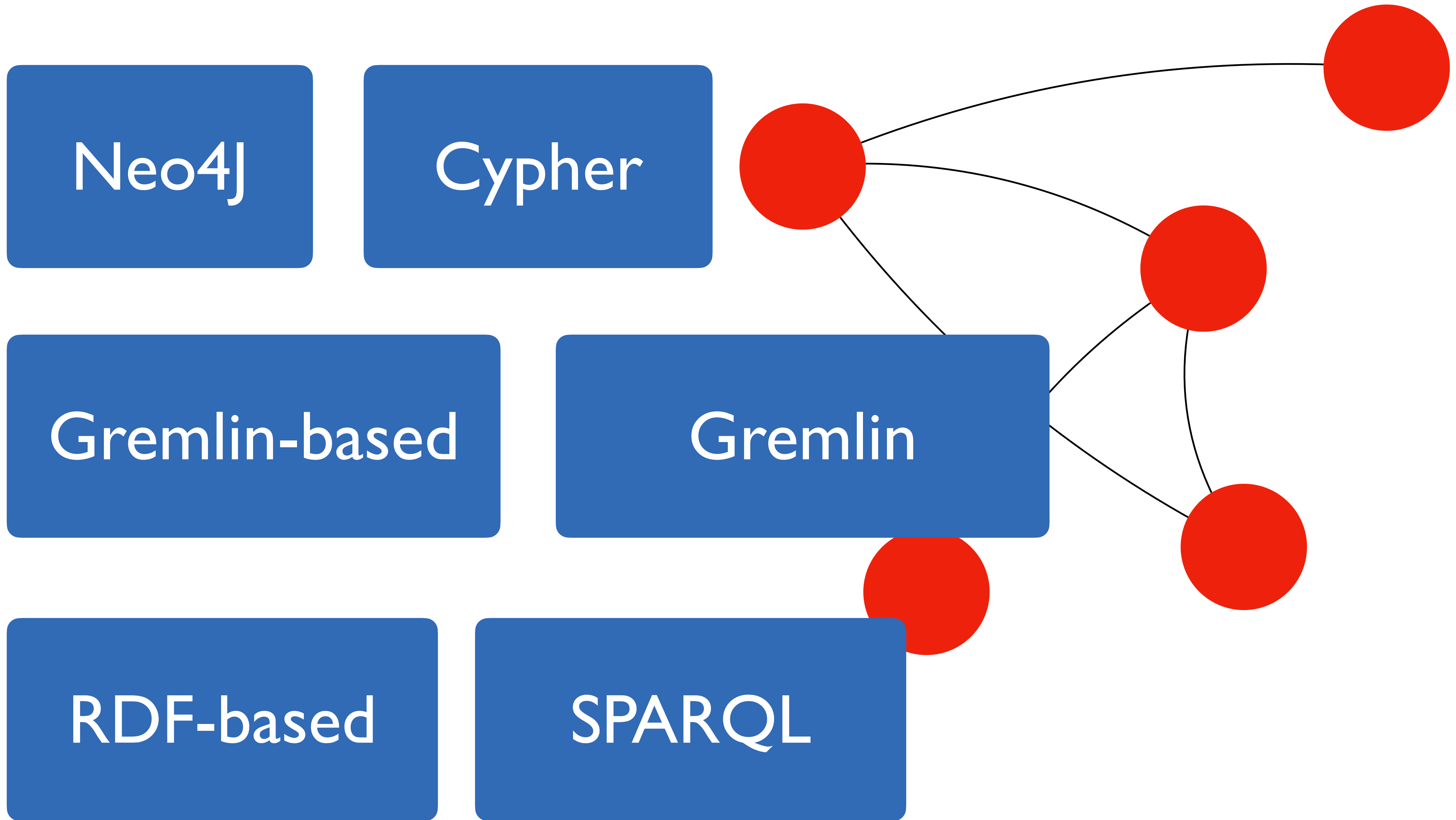
RDF-based

Neo4J

Gremlin-based

RDF-based





Neo4J

Cypher

```
(p:Person {name: "Jennifer"})-[rel:LIKES]->(g:Technology {type: "Graphs"})
```

Gremlin-based

Gremlin

```
gremlin>  
g.V().has('person','name',within('vadas','marko')).values('age').mean()
```

RDF-based

SPARQL



```
PREFIX schema: <http://schema.org/>
PREFIX gn: <http://www.geonames.org/ontology#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

SELECT DISTINCT ?district ?name
WHERE {

    ?district gn:featureCode gn:A.ADM2 ;
        a schema:AdministrativeArea ;
        schema:name ?name .

}
```



```
PREFIX schema: <http://schema.org/>  
PREFIX gn: <http://www.geonames.org/ontology#>  
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
```

```
SELECT DISTINCT ?district ?name  
WHERE {
```

```
?district gn:featureCode gn:A.ADM2 ;  
  a schema:AdministrativeArea ;  
  schema:name ?name .
```

```
}
```




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PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
```

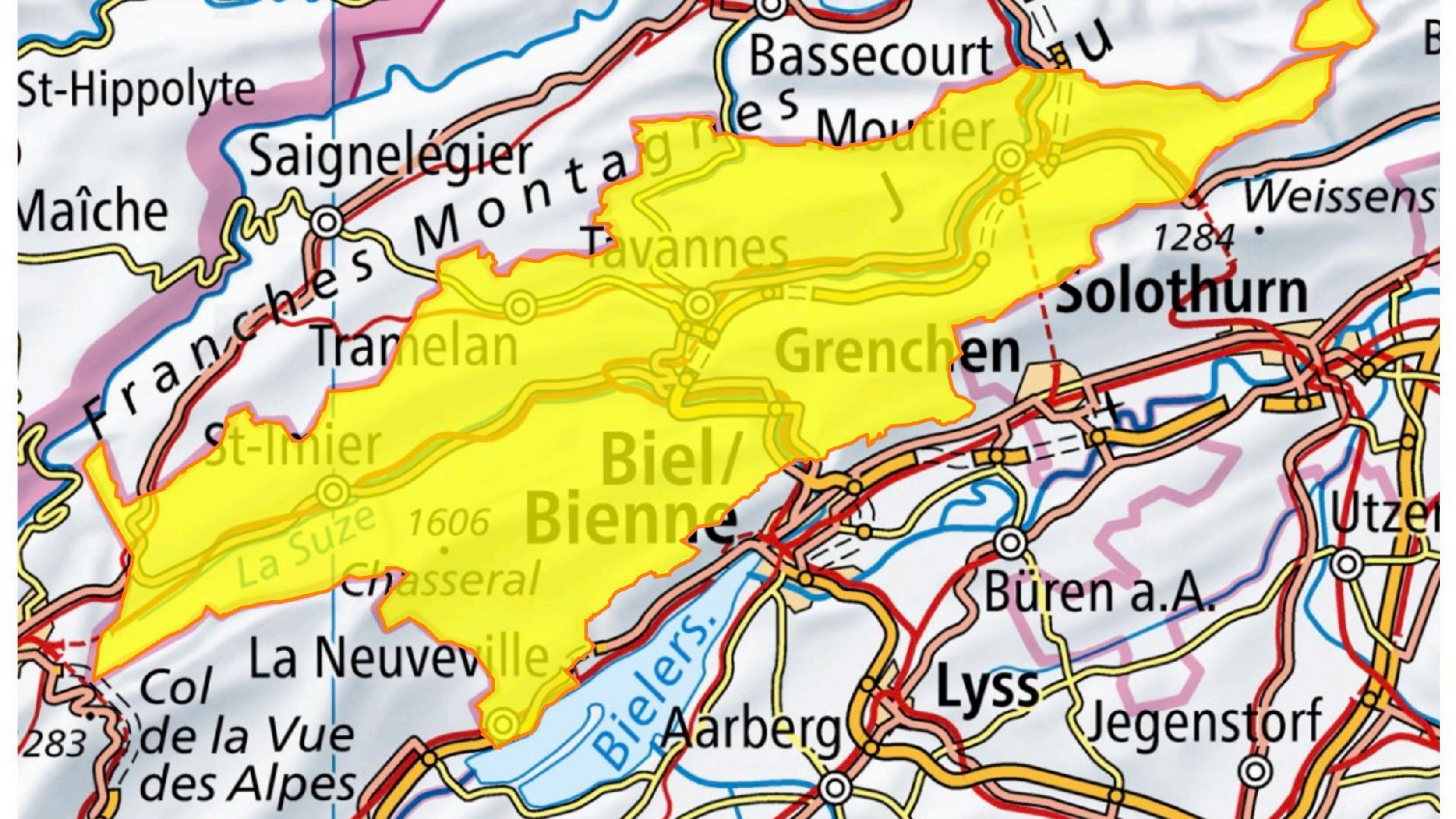
```
SELECT DISTINCT ?district ?name
```

```
WHERE {
```

```
?district gn:featureCode gn:A.ADM2 ;  
  a schema:AdministrativeArea ;  
  schema:name ?name .
```

```
}
```

	district	↕	name	↕
1	https://ld.geo.admin.ch/boundaries/district/241		Jura bernois	
2	https://ld.geo.admin.ch/boundaries/district/1842		Bernina	
3	https://ld.geo.admin.ch/boundaries/district/1005		See	
4	https://ld.geo.admin.ch/boundaries/district/2221		Aigle	
5	https://ld.geo.admin.ch/boundaries/district/1403		Schaffhausen	
6	https://ld.geo.admin.ch/boundaries/district/1904		Brugg	
7	https://ld.geo.admin.ch/boundaries/district/1910		Zofingen	
8	https://ld.geo.admin.ch/boundaries/district/112		Zürich	
9	https://ld.geo.admin.ch/boundaries/district/1101		Gäu	
10	https://ld.geo.admin.ch/boundaries/district/1107		Lebern	
11	https://ld.geo.admin.ch/boundaries/district/246		Bern-Mittelland	
12	https://ld.geo.admin.ch/boundaries/district/242		Biel/Bienne	
13	https://ld.geo.admin.ch/boundaries/district/1821		Albula	
14	https://ld.geo.admin.ch/boundaries/district/1822		Bernina	
15	https://ld.geo.admin.ch/boundaries/district/312		Luzern-Land	
16	https://ld.geo.admin.ch/boundaries/district/102		Andelfingen	



St-Hippolyte

Maîche

Saignelégier

Bassecourt

des Moutiers

Tramelan

Montagnes

Tavannes

Weissens

1284

Solothurn

Franches

Tramelan

Grenchen

St-Imier

Biel/
Bienna

La Suze 1606

Chasseral

Büren a.A.

Utzen

La Neuveville

Lyss

Jegenstorf

Col de la Vue des Alpes

Aarberg

SUBJECT

Confession of a Woman Raised from the Dead

madeBy

PREDICATE

Giotto

OBJECT

SUBJECT

Confession of a Woman Raised from the Dead

PREDICATE

hasDescription

madeBy

PREDICATE

Giotto

Nel borgo di Monte Marano, presso Benevento era morta una donna particolarmente devota di san Francesco. La sera vennero i chierici per le esequie e già apprestavano a celebrare la veglia con la recita dei salmi quando improvvisamente, alla vista di tutti, la donna si alzò sul letto e chiamò i sacerdoti presenti, che era il suo padrino, e gli disse: \"Padre, voglio confessarmi. Ascolta il mio peccato. Quando sono morta, io dovevo essere gettata in un carcere di prigionia, perché non avevo confessato il peccato che sto per dirti. Ma pregato san Francesco, che durante la vita ho sempre servito con devozione, mi è stato concesso di ritornare ora nel corpo, per confessare quel peccato e meritarmi la vita eterna. Dopo che lo avrò confessato, ecco, mi affrettavo alla pace promessa\". Tremando si confessò al sacerdote tremante, e ricevuta l'assoluzione, si stese in pace sul suo letto e s'addormentò felicemente nel Signore

OBJECT

OBJECT

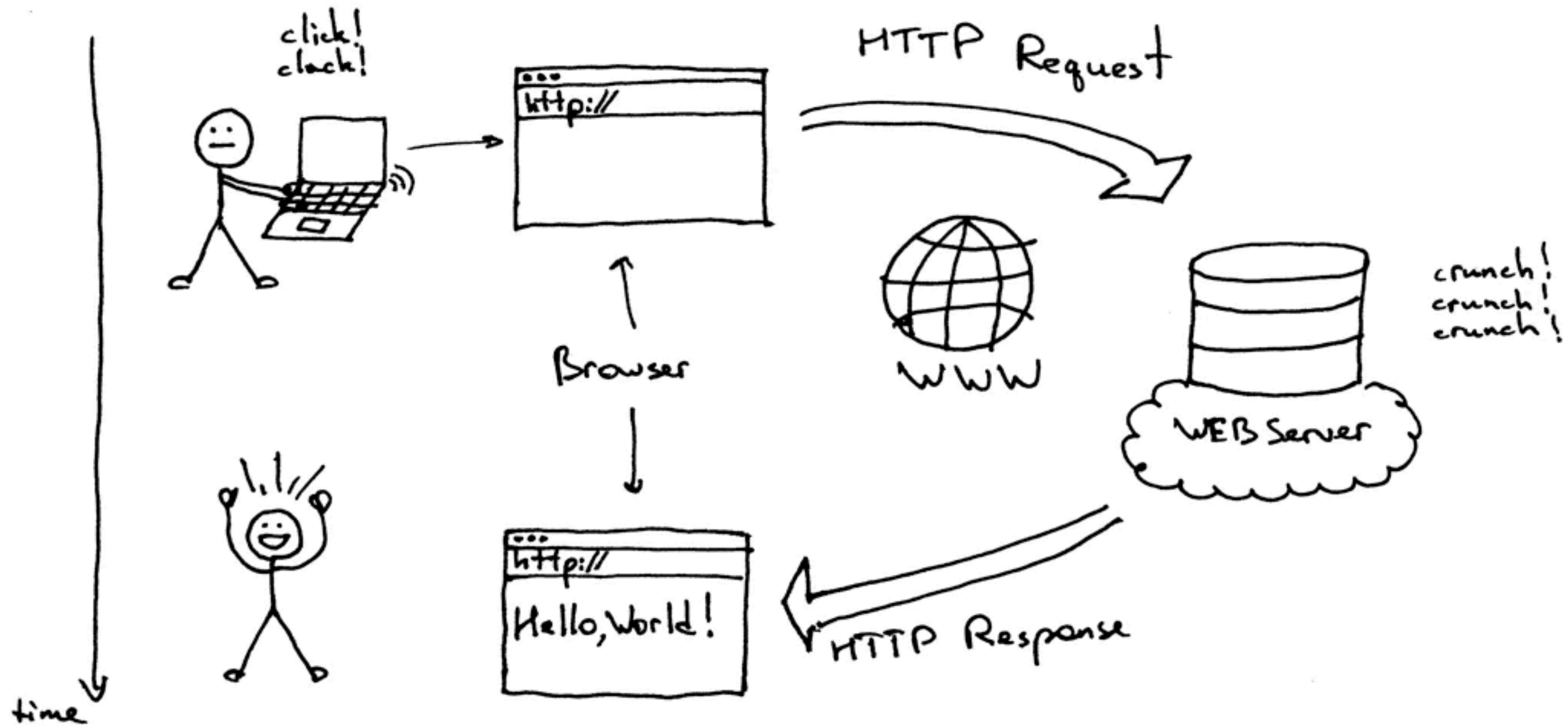
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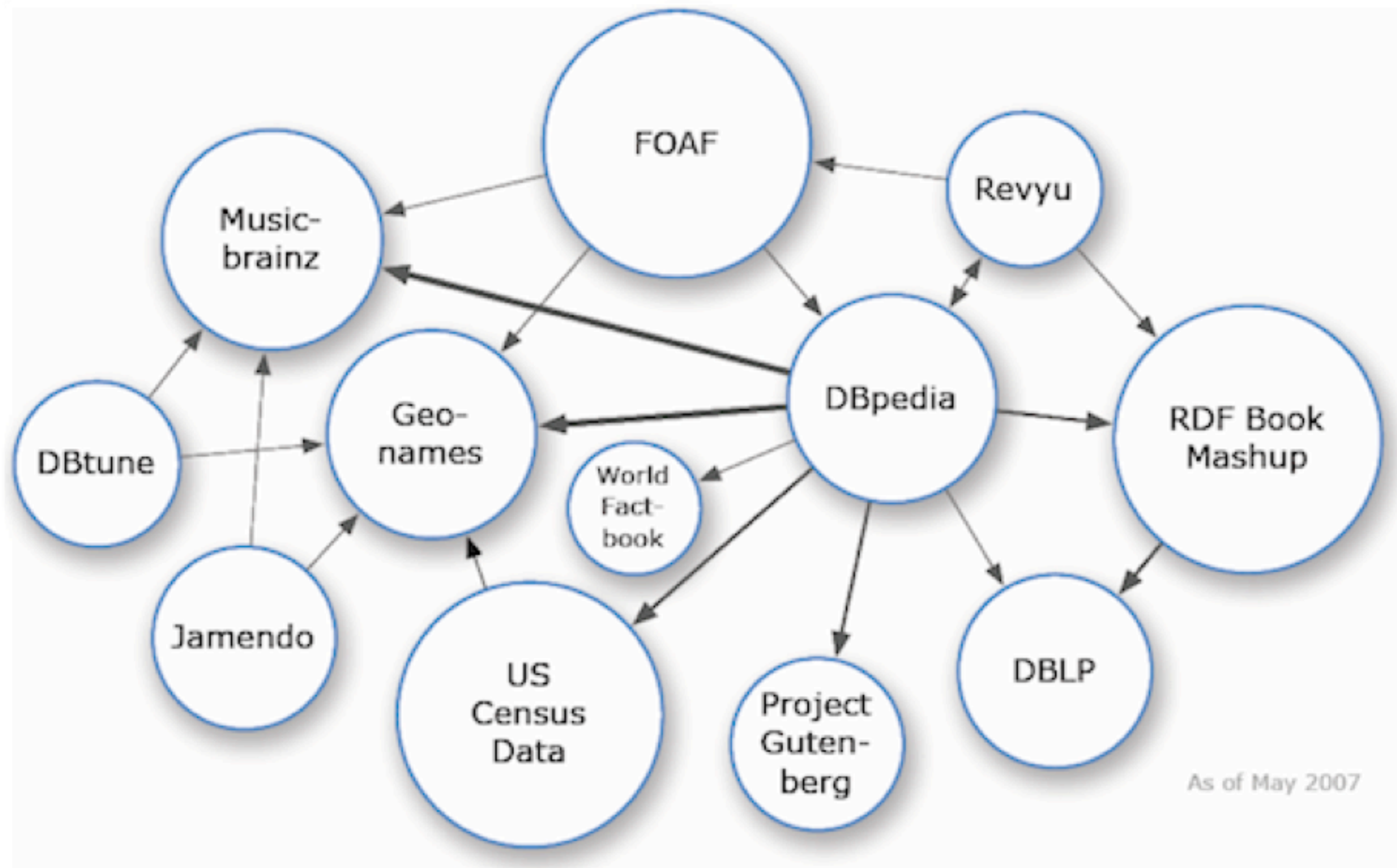
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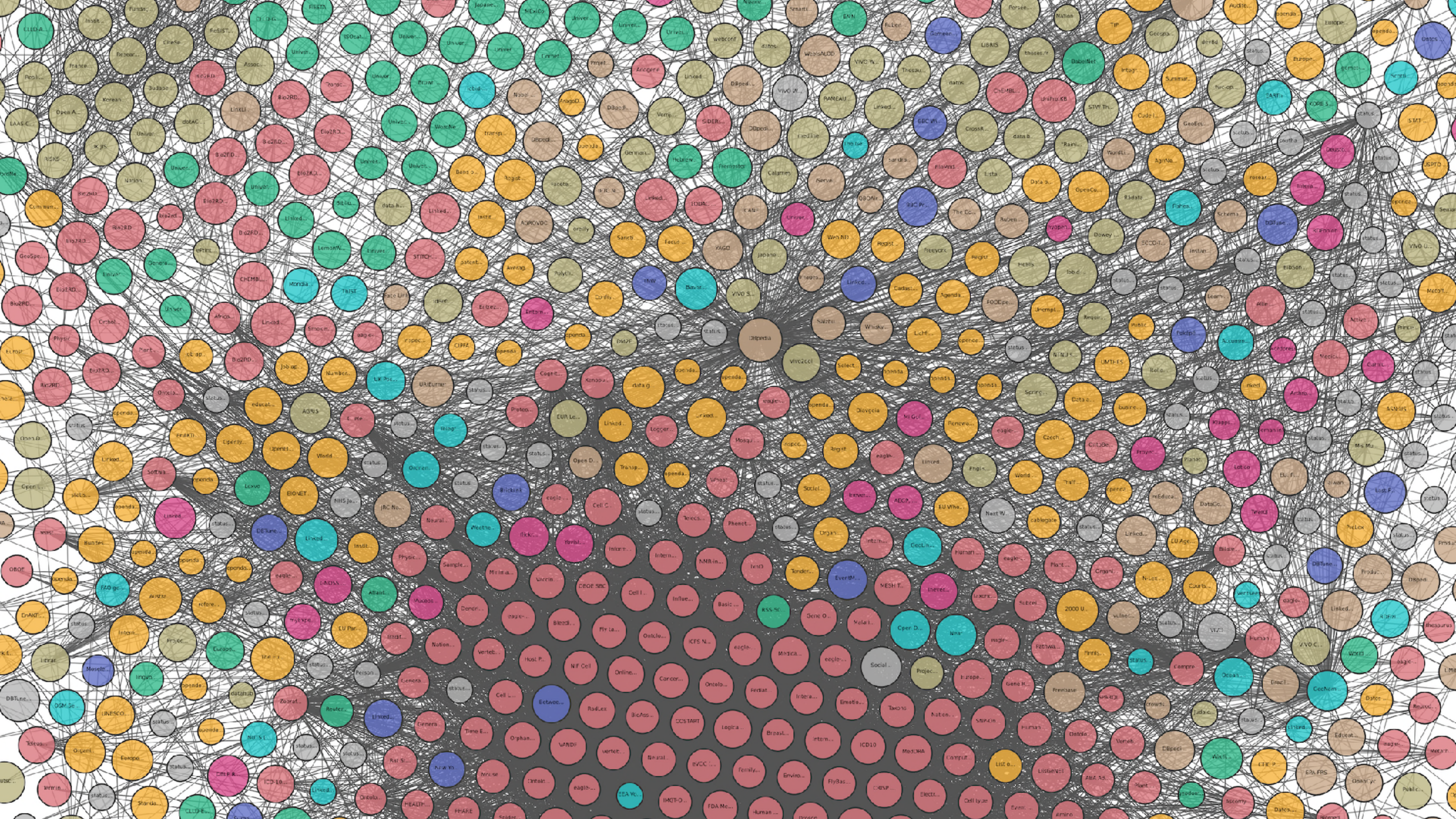
<http://lod.unige.ch/buonfresco/madeBy>

<http://lod.unige.ch/buonfresco/text/e5e01af8-aa6d-385a-ac98-529812bb50c9>

<http://lod.unige.ch/buonfresco/Q7814>







Ontologies

FOAF

Dublin Core

SKOS




```
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PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

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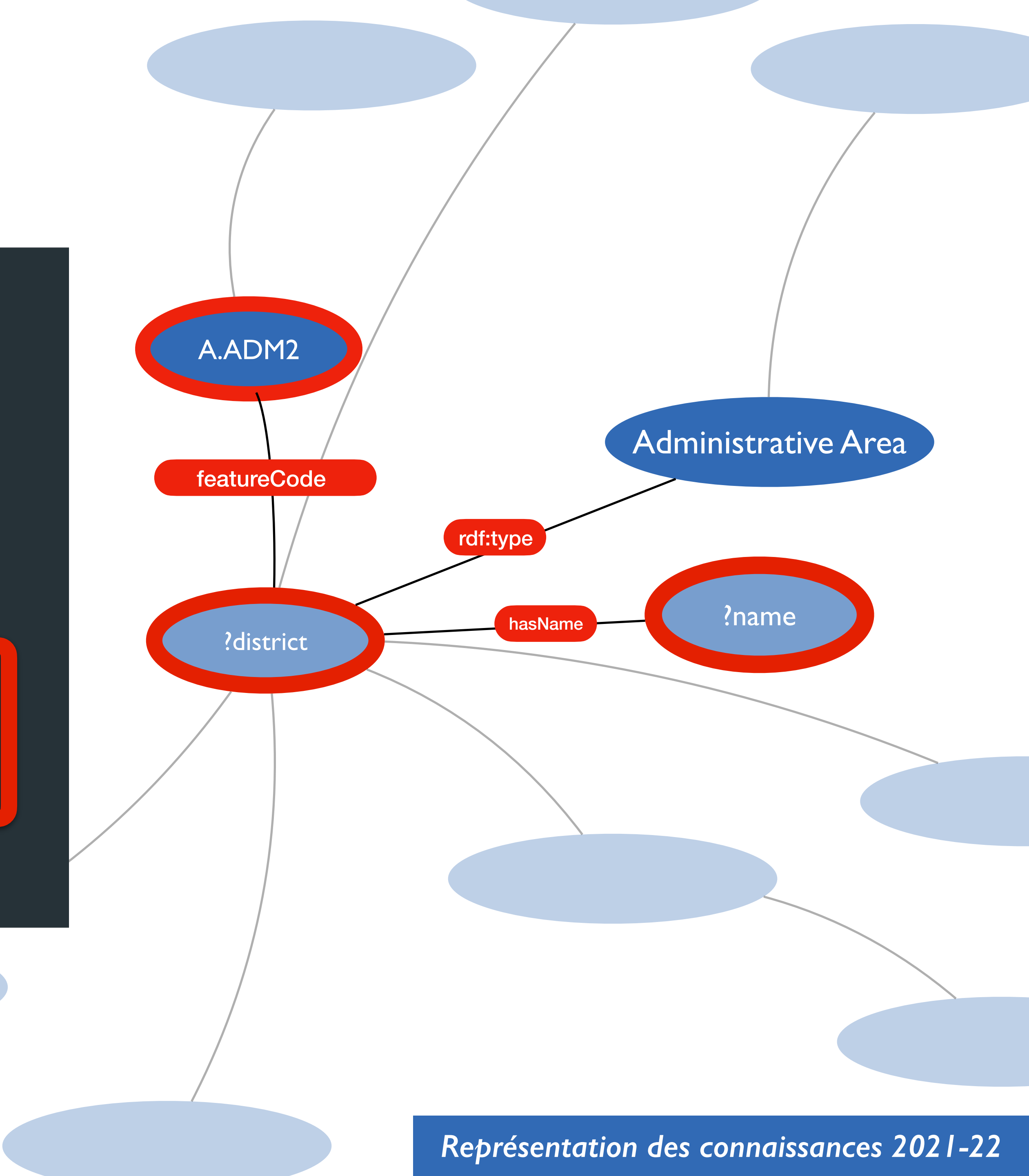
SELECT DISTINCT ?district ?name
WHERE {

    ?district gn:featureCode gn:A.ADM2 ;
        a schema:AdministrativeArea ;
        schema:name ?name .

}
```

```
PREFIX schema: <http://schema.org/>
PREFIX gn: <http://www.geonames.org/ontology#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

SELECT DISTINCT ?district ?name
WHERE {
  ?district gn:featureCode gn:A.ADM2 ;
  a schema:AdministrativeArea ;
  schema:name ?name .
}
```



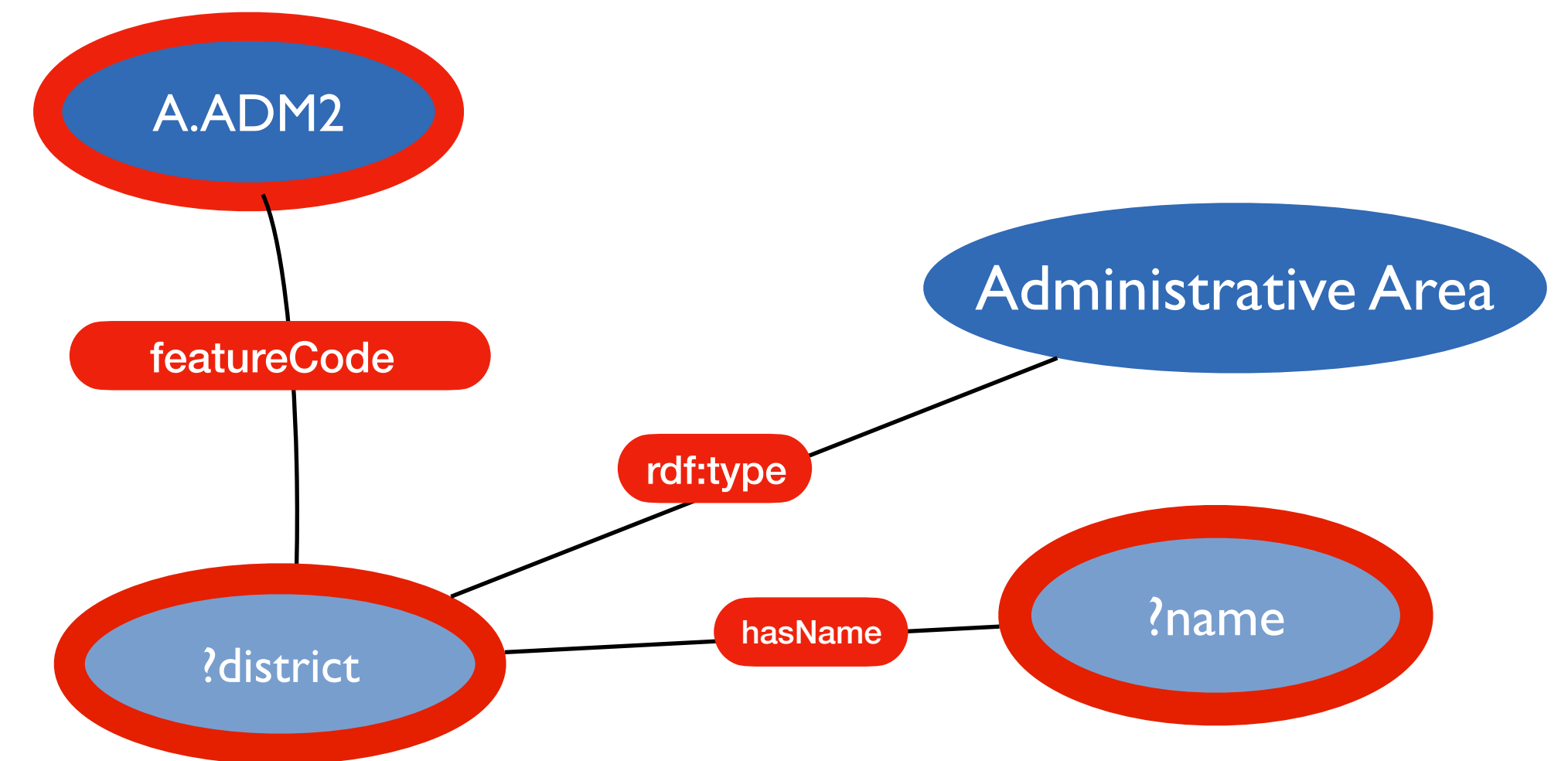


```
PREFIX schema: <http://schema.org/>  
PREFIX gn: <http://www.geonames.org/ontology#>  
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
```

```
SELECT DISTINCT ?district ?name  
WHERE {
```

```
?district gn:featureCode gn:A.ADM2 ;  
  a schema:AdministrativeArea ;  
  schema:name ?name .
```

```
}
```





```
SELECT * WHERE {
```

```
  ?a ?b ?c
```

```
}
```

```
LIMIT 100
```

A dark-themed terminal window with three colored window control buttons (red, yellow, green) at the top left. The terminal contains a SQL query with three parts highlighted by red rounded rectangles: 'SELECT *', '?a ?b ?c', and 'LIMIT 100'.

```
SELECT * WHERE {
```

```
?a ?b ?c
```

```
LIMIT 100
```



```
SELECT * WHERE {
```

```
?a ?b ?c
```

```
}
```

```
LIMIT 100
```




```
SELECT * WHERE {  
  ?a wdt:P31 wd:Q41298;  
}  
LIMIT 100
```

Give me everything about the resources which are instances of the class magazine. Limit the result to 100.



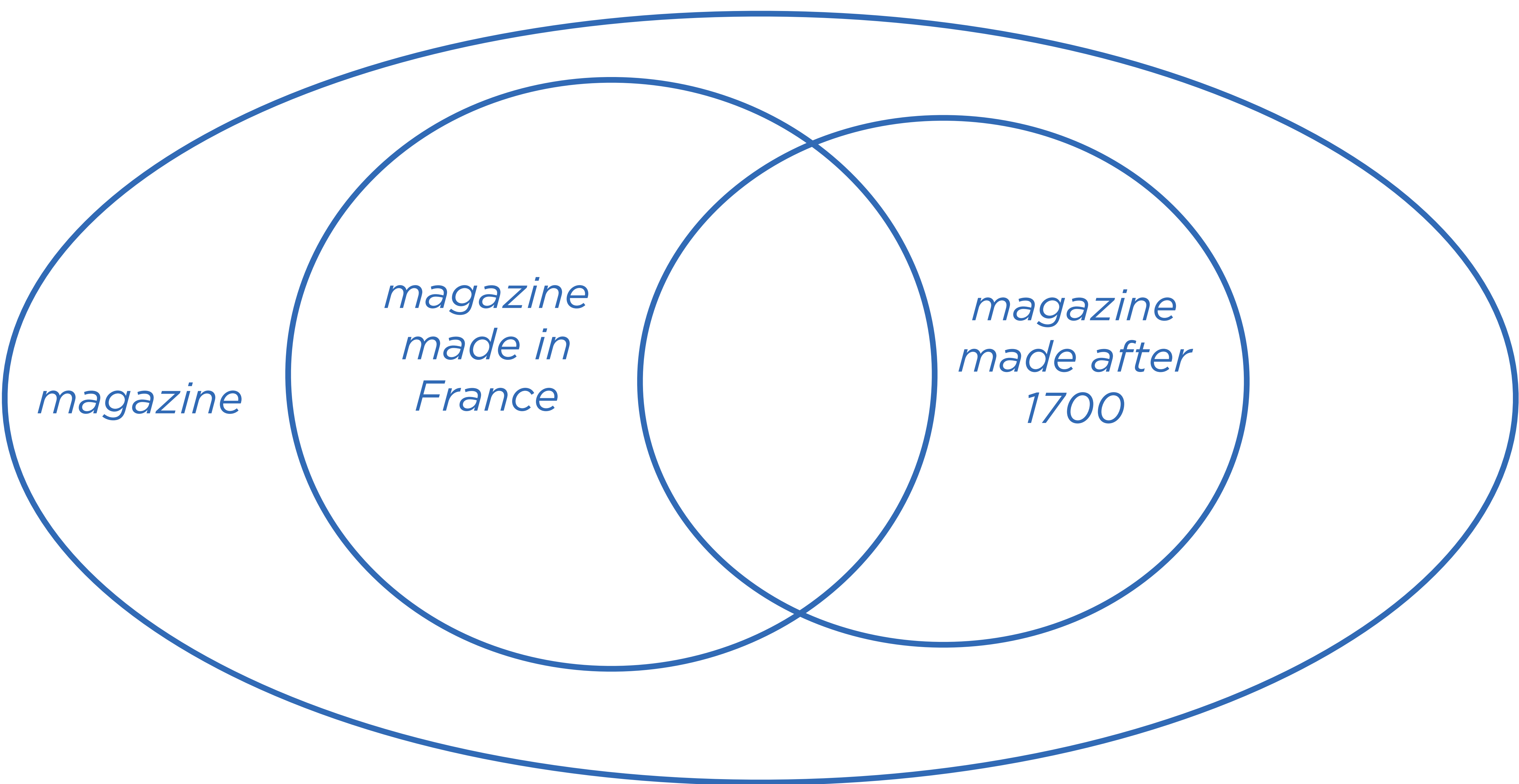
```
SELECT * WHERE {  
  ?a wdt:P31 wd:Q41298;  
     wdt:P17 wd:Q142.  
}  
LIMIT 100
```

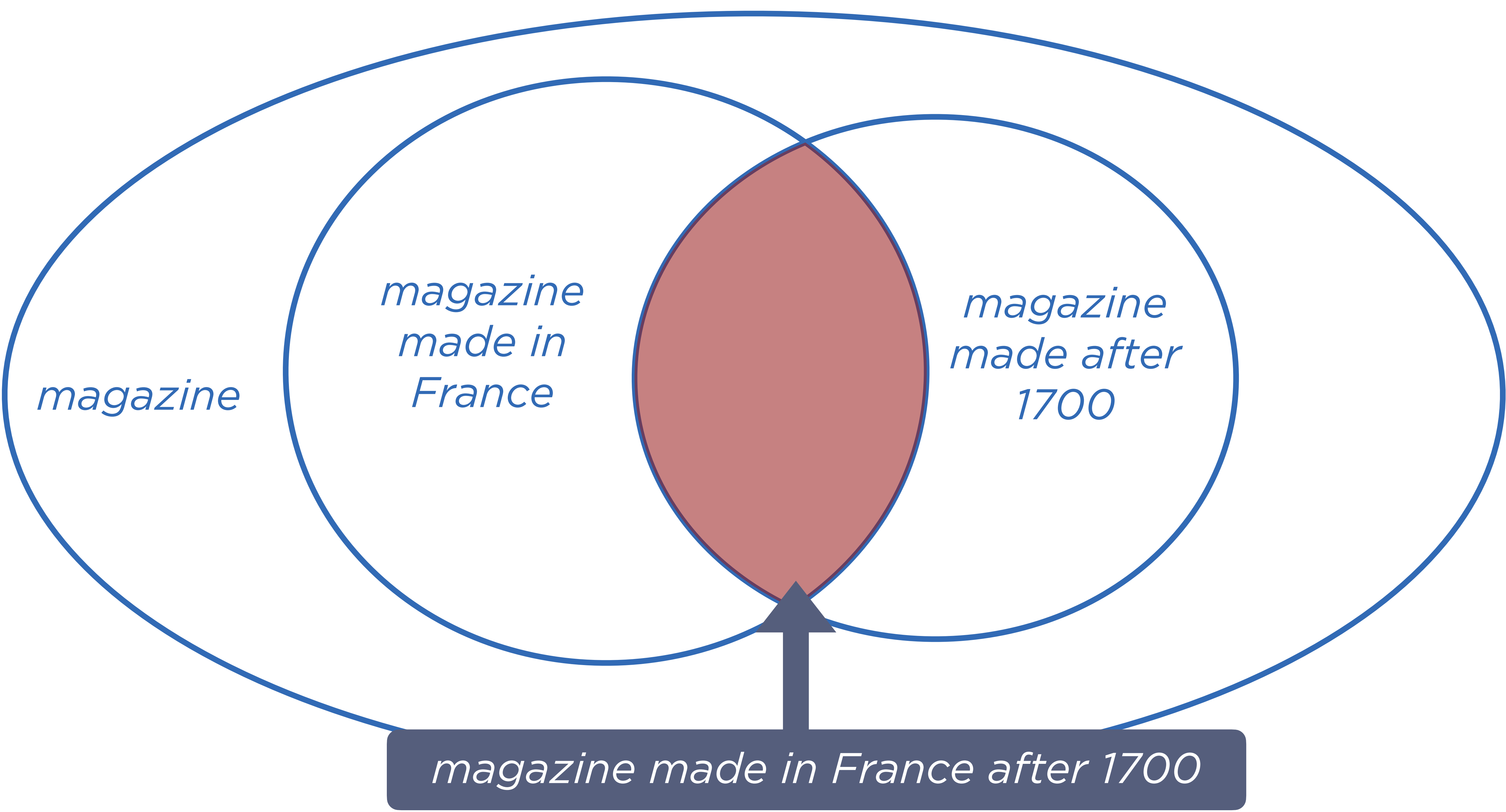
Give me everything about the resources which are instances of the class magazine and are made in France. Limit the result to 100.



```
SELECT * WHERE {  
  ?a wdt:P31 wd:Q41298;  
      wdt:P571 ?time ;  
      wdt:P17 wd:Q142.  
  
  FILTER(?time > "1700-01-01T00:00:00"^^xsd:dateTime)  
}  
LIMIT 100
```

Give me everything about the resources which are instances of the class magazine and are made in France after 1700. Limit the result to 100.







```
SELECT * WHERE {  
  
  ?a wdt:P31 wd:Q1002697 ;  
     wdt:P571 ?time.  
  
  FILTER(?time > "1700"^^xsd:dateTime && ?time < "1800"^^xsd:dateTime)  
  
}
```

Give me everything about the resources which are instances of the class *periodical* made in-between 1700 and 1800. Limit the result to 200.



```
SELECT ?label WHERE {  
  wd:Q83155 rdfs:label ?label .  
}
```

Give me the name of a resource



```
SELECT ?label WHERE {  
  wd:Q83155 rdfs:label ?label .  
  FILTER (lang(?label) = 'en')  
}
```

Give me the name of a resource in en

```
SELECT ?label_it ?label_en WHERE {  
  wd:Q83155 rdfs:label ?label_en, ?label_it ;  
  
  FILTER (lang(?label_en) = 'en')  
  FILTER (lang(?label_it) = 'it')  
}
```

Give me the name of a resource in english and italian


```

PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
SELECT DISTINCT ?fullName ?givenName ?familyName ?dbpedia ?birth ?death
?bio ?gender ?placeOfBirth ?placeOfDeath ?activity ?viaf
WHERE {

OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://vocab.org
/bio/0.1/birth> ?birth .
}
OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://vocab.org
/bio/0.1/death> ?death .
}
OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about>
<http://rdvocab.info/ElementsGr2/biographicalInformation> ?bio .
}
OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://xmlns.com
/foaf/0.1/gender> ?gender .
}
OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about>
<http://rdvocab.info/ElementsGr2/placeOfBirth> ?placeOfBirth .
}
OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about>
<http://rdvocab.info/ElementsGr2/placeOfDeath> ?placeOfDeath .
}
OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about>
<http://rdvocab.info/ElementsGr2/fieldOfActivityOfThePerson> ?activity .
  FILTER ( datatype(?activity) != '' )
}

OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://xmlns.com
/foaf/0.1/familyName> ?familyName .
}
OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://xmlns.com
/foaf/0.1/givenName> ?givenName .
}
OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://xmlns.com
/foaf/0.1/name> ?fullName .
}
OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://www.w3.org
/2002/07/owl#sameAs> ?dbpedia .
  FILTER ( contains(str(?dbpedia),'dbpedia'))
}
OPTIONAL {
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://www.w3.org
/2002/07/owl#sameAs> ?viaf .
  FILTER ( contains(str(?viaf),'viaf'))
}

}

```

```
SELECT DISTINCT ?fullName ?givenName ?familyName ?dbpedia ?birth ?death
?bio ?gender ?placeOfBirth ?placeOfDeath ?activity ?viaf
WHERE {

OPTIONAL {
    <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://vocab.org
/bio/0.1/birth> ?birth .
}
OPTIONAL {
    <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://vocab.org
/bio/0.1/death> ?death .
}
OPTIONAL {
    <http://data.bnf.fr/ark:/12148/cb12393105j#about>
<http://rdvocab.info/ElementsGr2/biographicalInformation> ?bio .
}
OPTIONAL {
    <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://xmlns.com
/foaf/0.1/gender> ?gender .
}
OPTIONAL {
    <http://data.bnf.fr/ark:/12148/cb12393105j#about>
<http://rdvocab.info/ElementsGr2/placeOfBirth> ?placeOfBirth .
}
OPTIONAL {
    <http://data.bnf.fr/ark:/12148/cb12393105j#about>
<http://rdvocab.info/ElementsGr2/placeOfDeath> ?placeOfDeath .
}
OPTIONAL {
    <http://data.bnf.fr/ark:/12148/cb12393105j#about>
<http://rdvocab.info/ElementsGr2/fieldOfActivityOfThePerson> ?activity
```

give me the birth date
only if it is available
if not move along


```
}  
OPTIONAL {  
  <http://data.bnf.fr/ark:/12148/cb12393105j#about>  
<http://rdvocab.info/ElementsGr2/fieldOfActivityOfThePerson> ?activity .  
  FILTER ( datatype(?activity) != '' )  
}
```

```
OPTIONAL {  
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://xmlns.com  
/foaf/0.1/familyName> ?familyName .  
}
```

```
OPTIONAL {  
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://xmlns.com  
/foaf/0.1/givenName> ?givenName .  
}
```

```
OPTIONAL {  
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://xmlns.com  
/foaf/0.1/name> ?fullName .  
}
```

```
OPTIONAL {  
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://www.w3.org  
/2002/07/owl#sameAs> ?dbpedia .  
  FILTER ( contains(str(?dbpedia), 'dbpedia'))  
}
```

```
OPTIONAL {  
  <http://data.bnf.fr/ark:/12148/cb12393105j#about> <http://www.w3.org  
/2002/07/owl#sameAs> ?viaf .  
  FILTER ( contains(str(?viaf), 'viaf'))  
}
```

**Give me a string that
contains the value
'viaf'**

SKOS

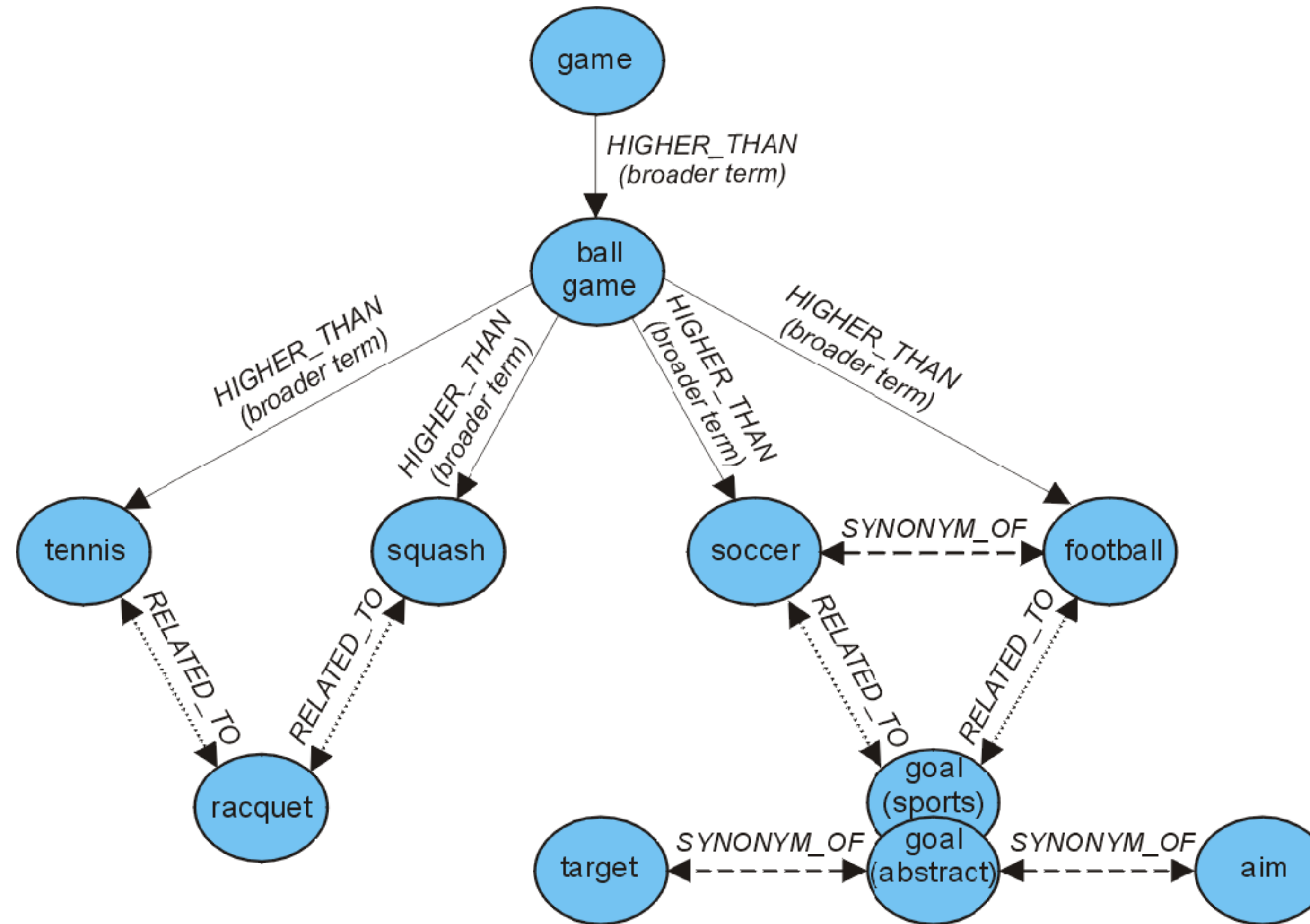
SKOS—Simple Knowledge Organization System is an ontology that can be used for thesauri, classification schemes, subject heading lists, taxonomies, folksonomies etc. (KOS).

The fundamental element of the SKOS vocabulary is the concept. Concepts are the units of thought which underlie many KOS

The first characterizations of concepts are the expressions that are used to refer to them in natural language: their labels. SKOS provides three properties to attach labels to conceptual resources: `skos:prefLabel`, `skos:altLabel` and `skos:hiddenLabel`.

In KOSs semantic relations play a crucial role for defining concepts:

- `skos:broader` and `skos:narrower` enable the representation of hierarchical links, such as the relationship between one genre and its more specific species, or, depending on interpretations, the relationship between one whole and its parts;
- `skos:related` enables the representation of associative (non-hierarchical) links



why semantics?
why not just graph