Semantic data and the representation of historical knowledge: the example of the LACRIMALit Ontology

M. Papadopoulou, E.-M. Tamiolaki

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http://new.condillac.org/

http://toth.condillac.org/

http://ketrc.com/

http://o4dh.com/

Agenda

- The LACRIMALit project ID
- Aim & Scope
- Domain
- Ontologies in DH
- State-of-Art
- The LACRIMALit model
- Crisis as Event in CIDOC
- Competency Questions
- Conclusion

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Project ID

LACRIMALit

Funding Agency

H.F.R.I. Hellenic Foundation for Research & Innovation

Host Institution

FORTH INSTITUTE FOR MEDITERRANEAN STUDIES

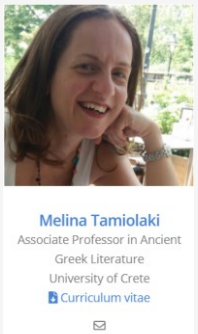
Collaborating Institution

UNIVERSITY OF CRETE

Project Duration

36 months
2022-2025

Project PI & Team



Principal Investigator

Dr. Eleni Melina Tamiolaki, Univ. of Crete, Greece

Team

- **Dr. Markus Zimmermann**, Univ. of Bayreuth, Germany
- **Dr. Maria Papadopoulou**, Univ. of Savoie, France
- **3 PhD students**

Project Website

https://www.ims.forth.gr/en/project/view?id=219

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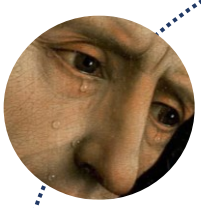
LACRIMALit

Leaders And CRIsis Management in Ancient Literature

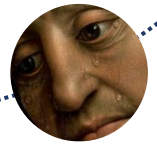
LACRIMALit aims to provide

1. a definition of "crisis" using modern theories



2. a classification of crisis incidents

3. a narratological analysis of the crisis episodes



4. a comparative examination of the role of leaders in crisis management

5. possible analogies between crises then and now

*lacrima (Latin) = tear (En), larme (Fr)

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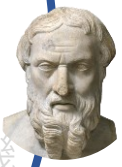
Domain

- Herodotus
- Thucydides
- Xenophon
- Polybius
- Diodorus Siculus
- Dionysius of Halicarnassus
- Plutarch
- Arrian



кризис
危機
संकट
crise
krise
кріcіс
кризис
أزمة
crisis
crisi
crisis
crisi
危機
संकट
crisis
кріcіс
crise
krise
кріcіс
crisis
危机
кріcіс
أزمة
кріση
crisis

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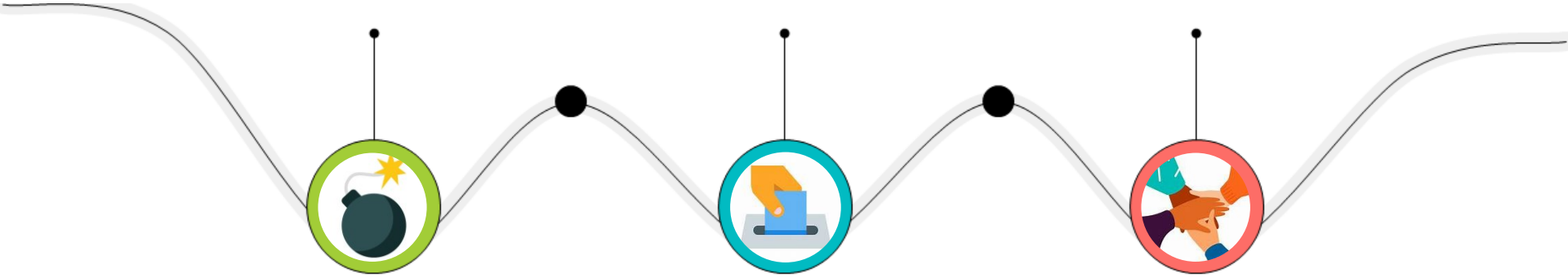
Types of crisis events

Emergency crisis incidents:
immediate measures required
e.g., disputes, military threats, wars, revolutions

Breaches of trust between leaders and their followers:
means used for restoring order,
e.g., harangues

Political crises:
overt challenges to governmental legitimacy, e.g., conspiracies, treasons, revolts



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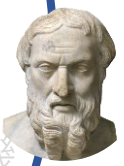
Domain



Primary focus: on the text not as a material object coming from a manuscript tradition, but as an information object, available in a open access print edition, which may or may not provide linguistic variants (‘readings’ or *lectiones*).

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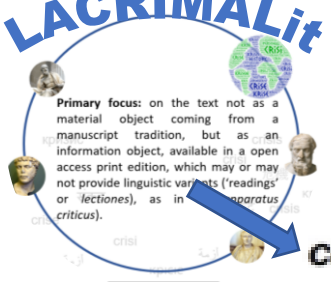
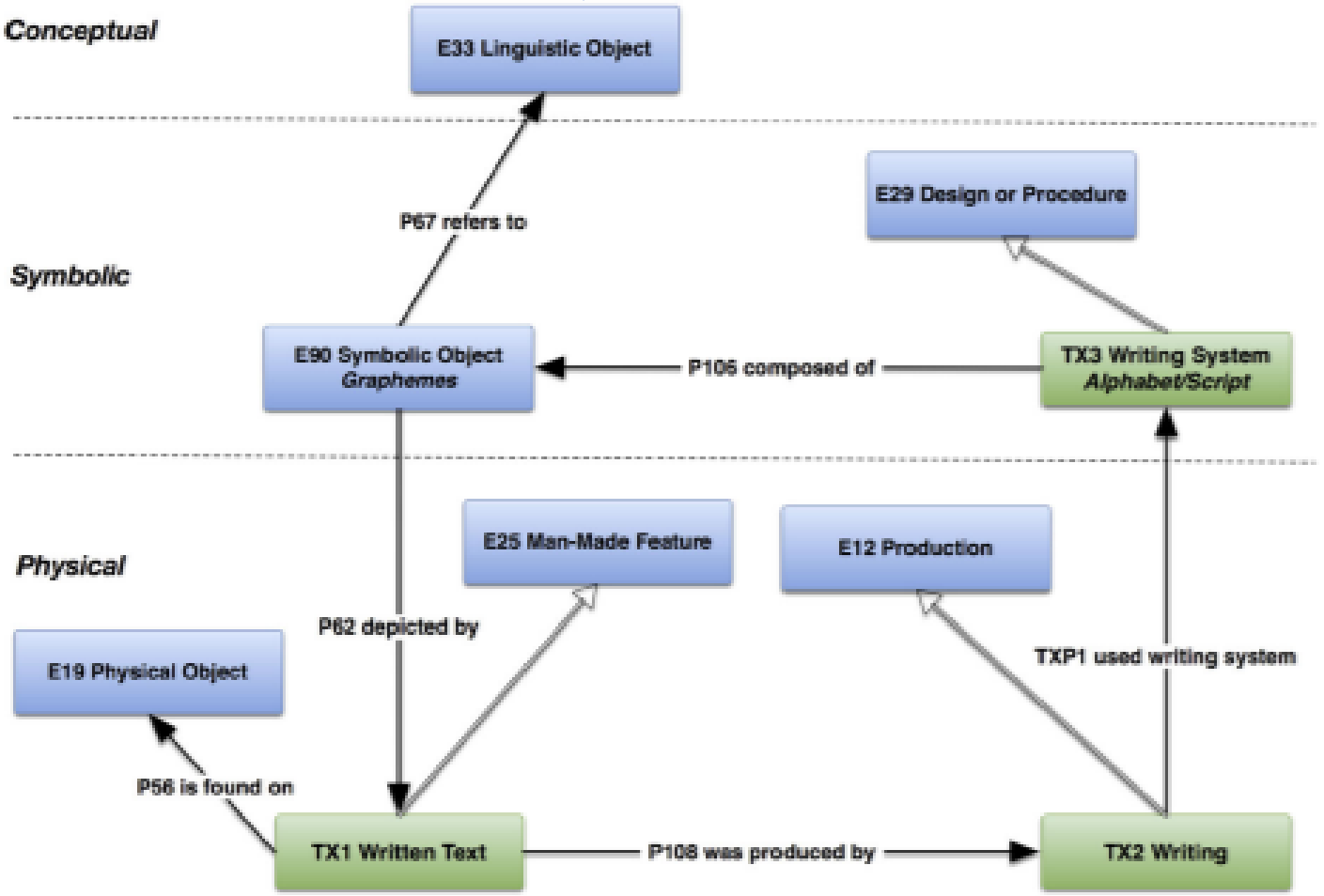


CIDOC CRM class E33 Linguistic Object represents the abstract linguistic expression, i.e. the message to be conveyed



CRMtex-Representation of the writing event, Felicetti & Murano 2017

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Ontology for data quality

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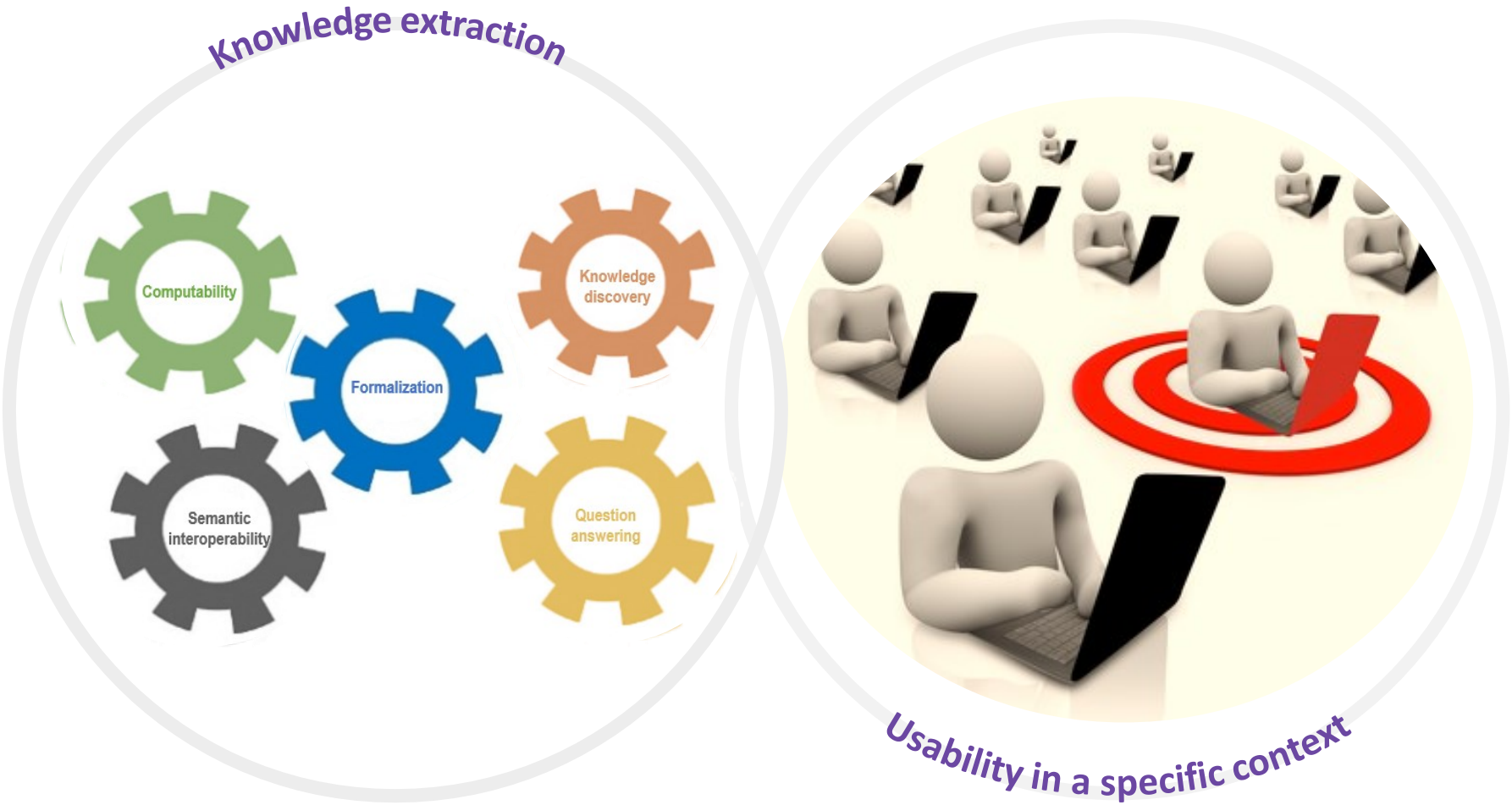
Ontology for data quality



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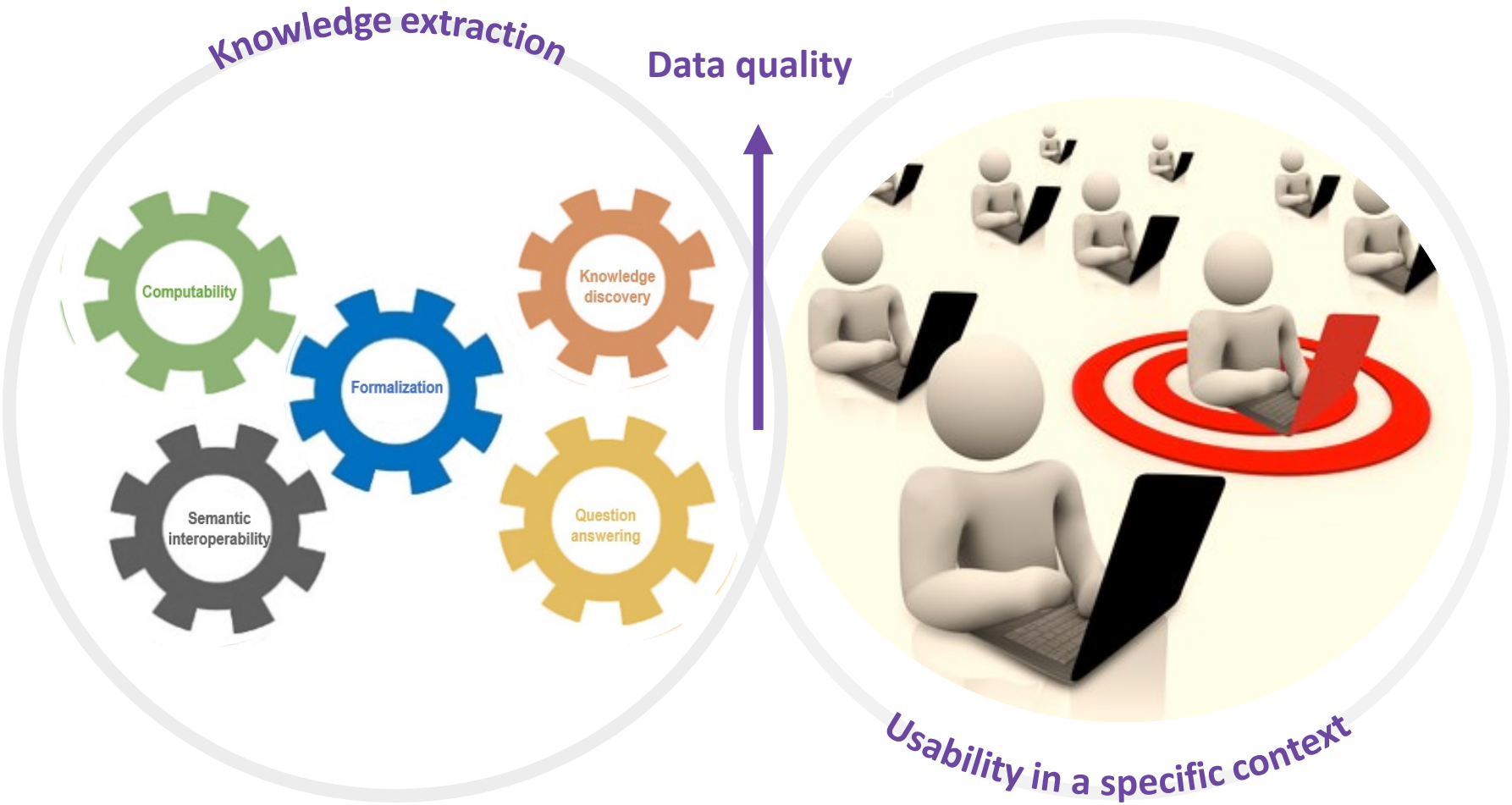
Ontology for data quality



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Ontologies in DH

Ontologies are more and more used in the Digital Humanities, although still in an unsystematic and uncoordinated fashion.

Jansen 2019

The ability to automatically determine relations between historical events and their sub-events over textual data, based on the relations between event participants, time markers and locations, will have important repercussions for the design of historical information retrieval systems.

Cybulska & Vossen 2010

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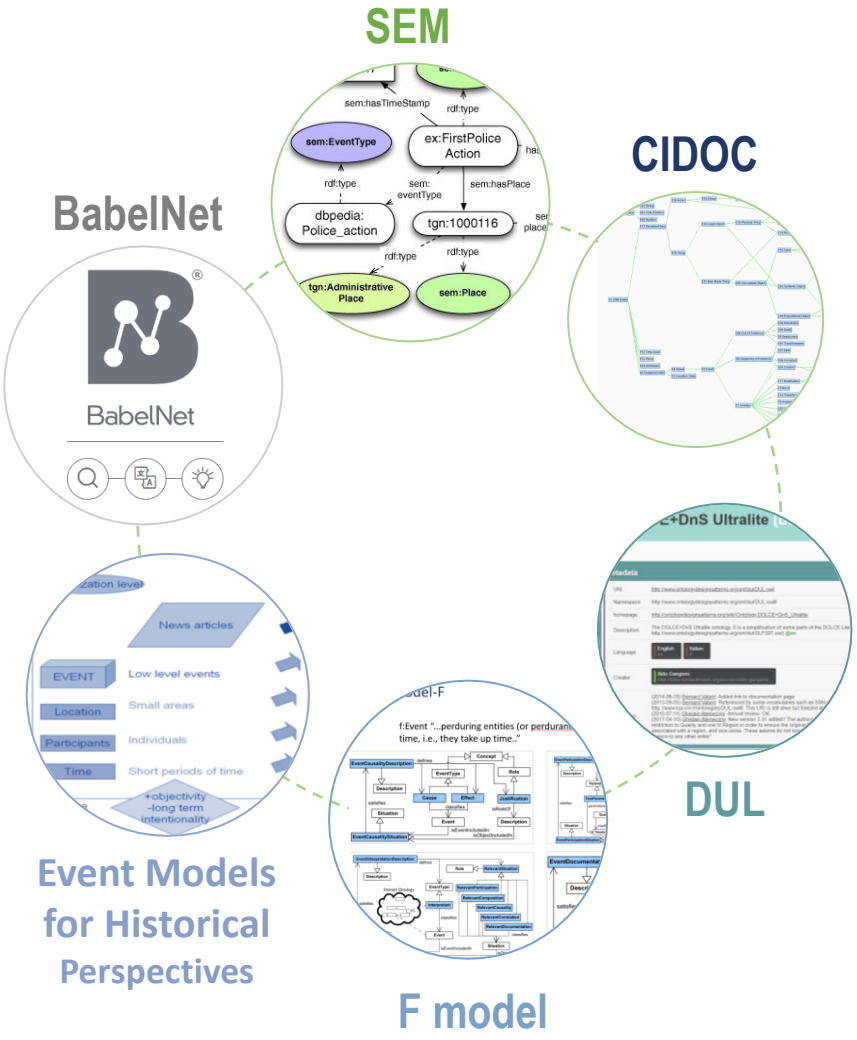
State-of-Art



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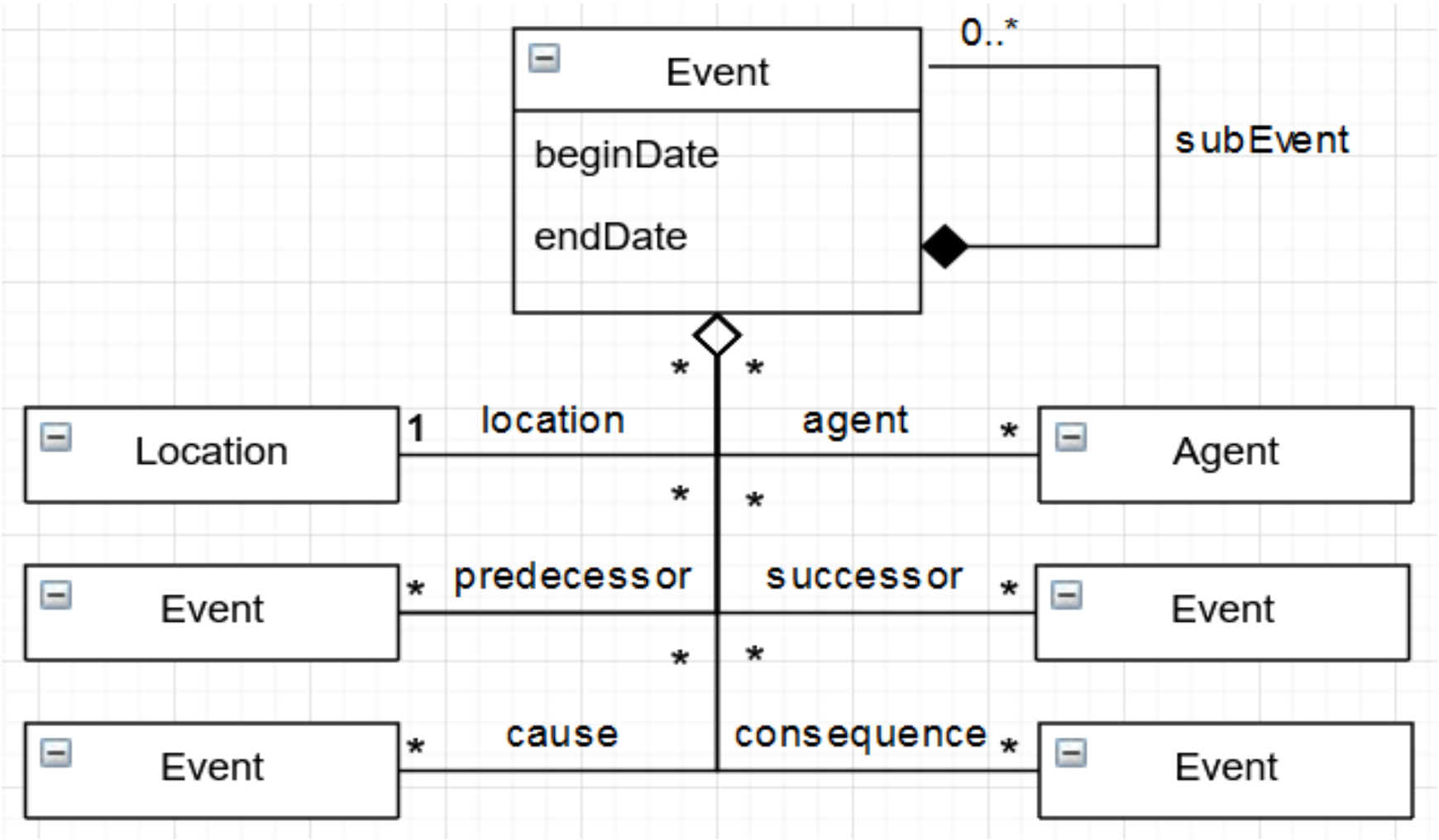
LACRIMALit Model



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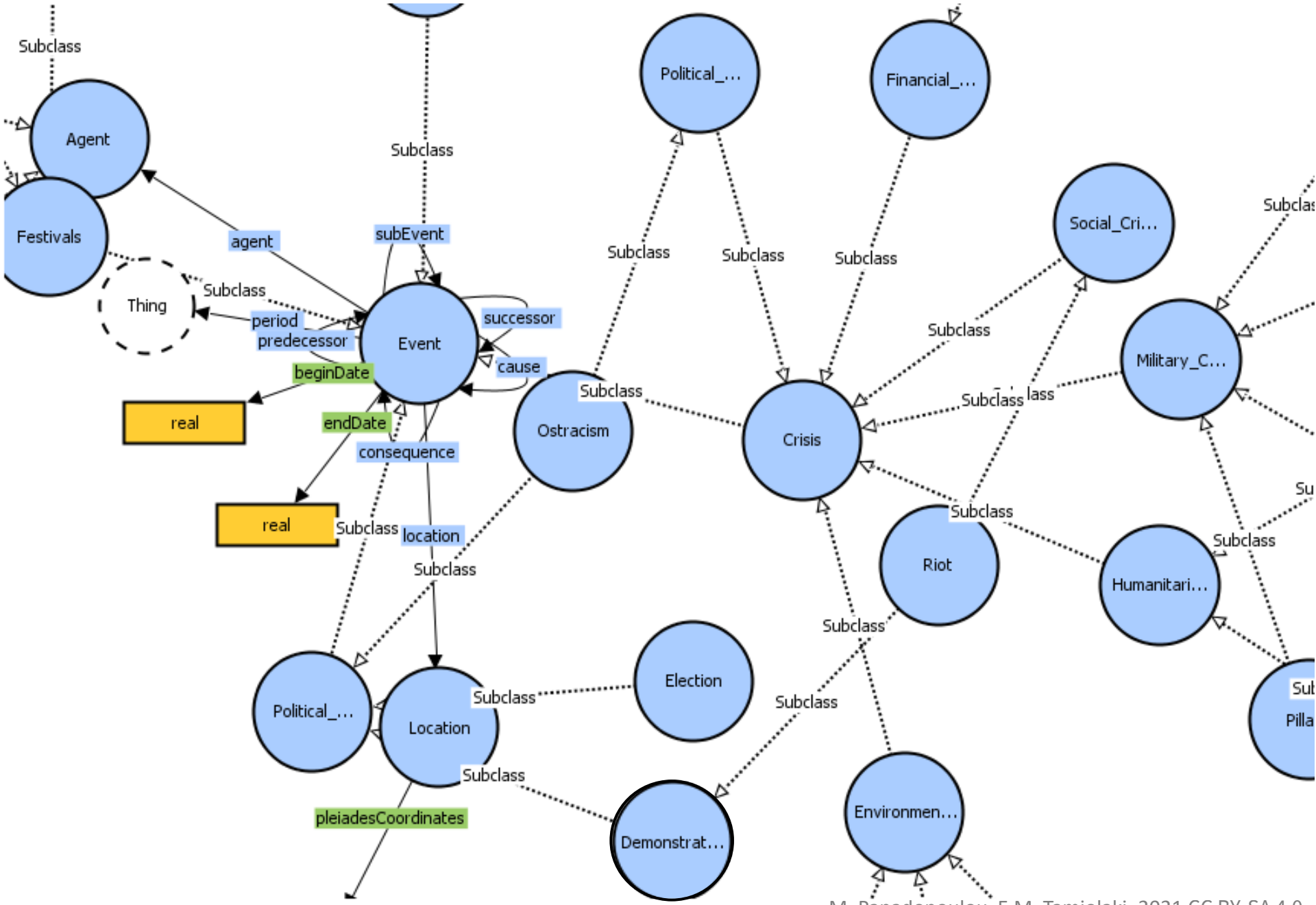
LACRIMALit Ontology



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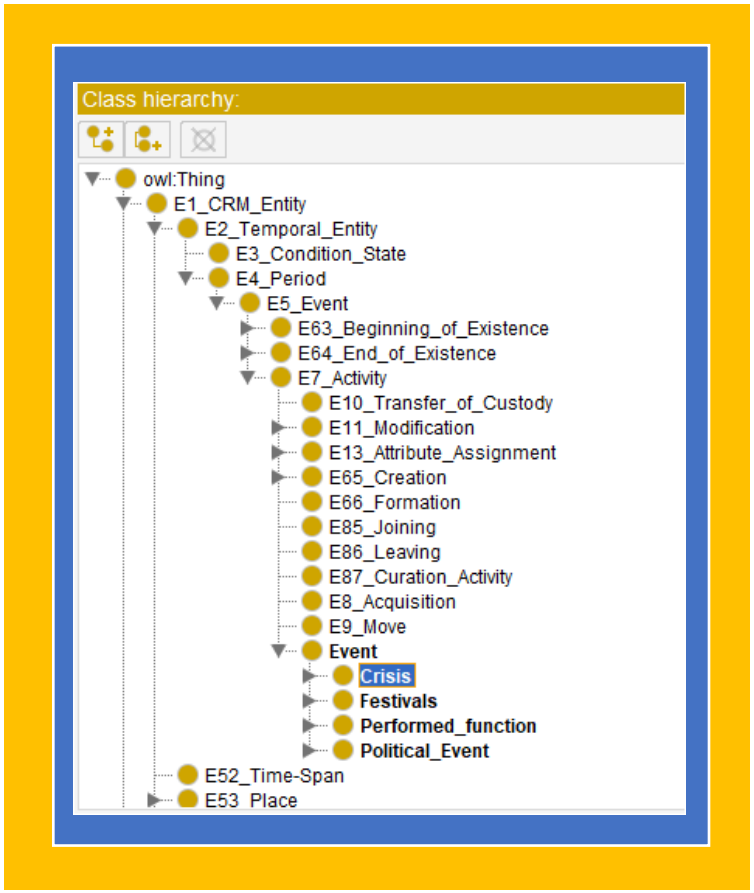
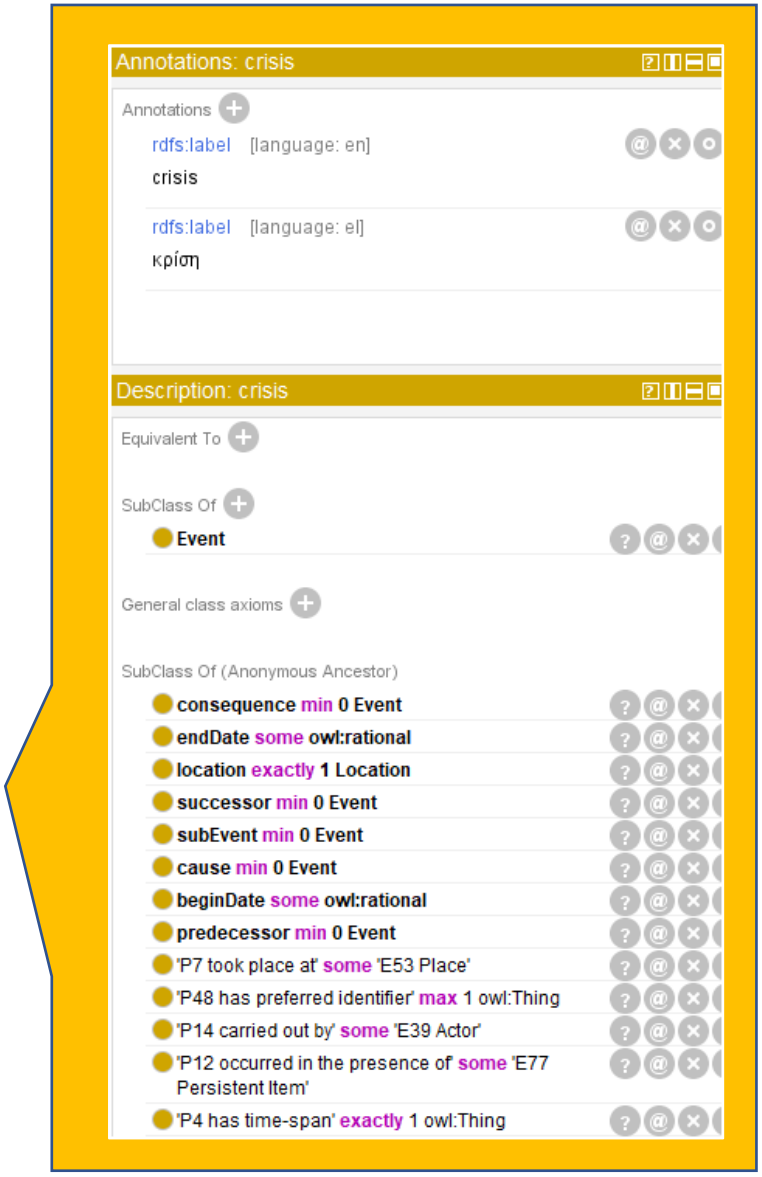
Formal definition of crisis events





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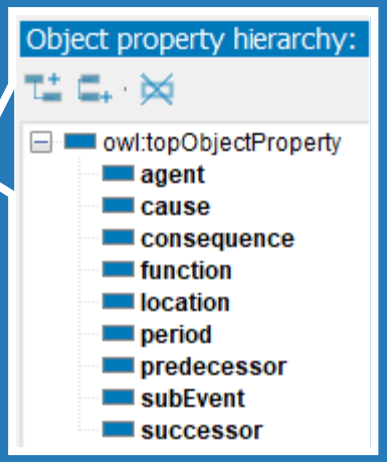
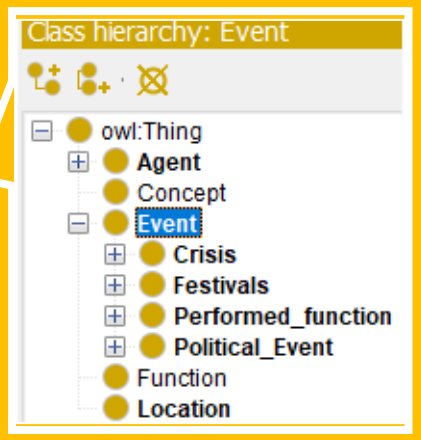
LACRIMALit Ontology

rdfs:comment
rdfs:label
rdfs:seeAlso
skos:altLabel
skos:definition
skos:exactMatch
skos:prefLabel

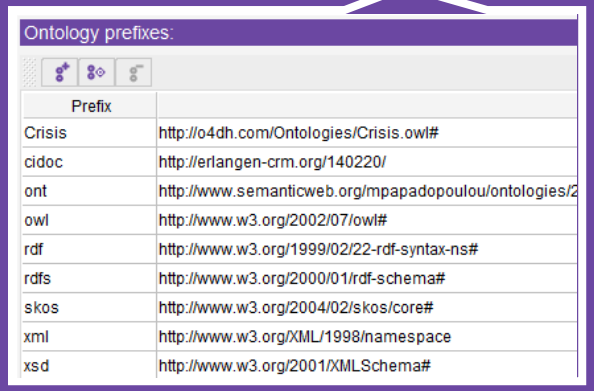
Object property hierarchy



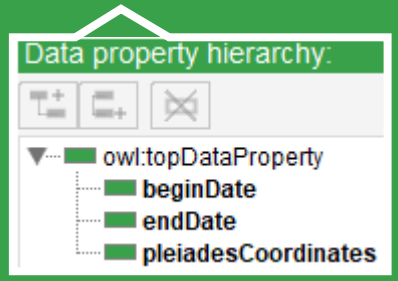
Class hierarchy



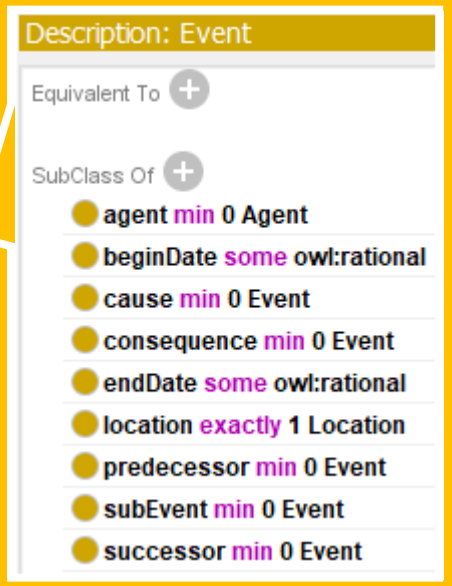
Ontology prefixes



Data property hierarchy



Formal definition of class Event



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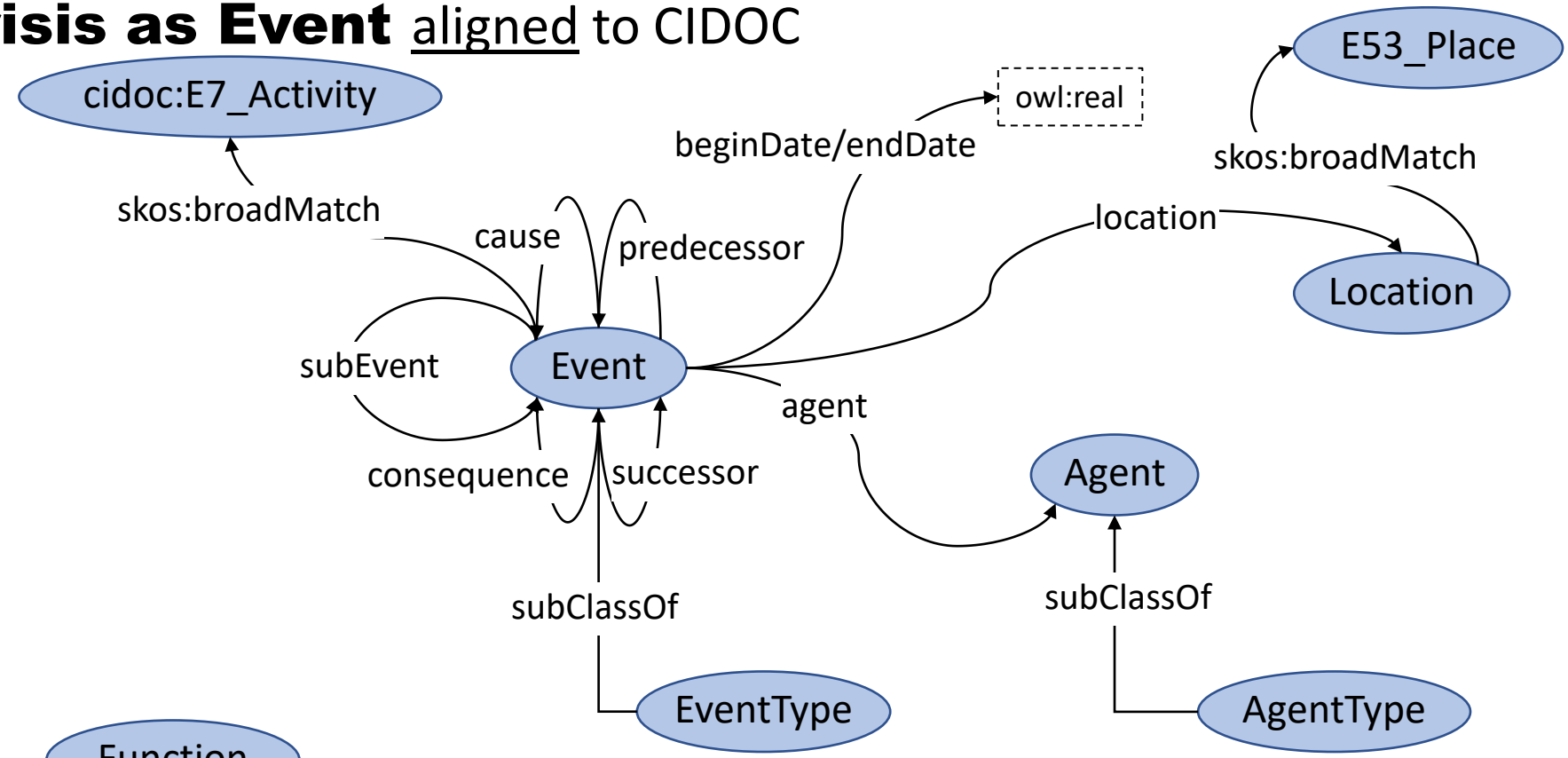
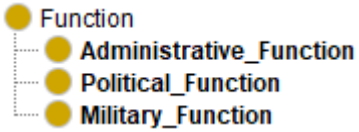
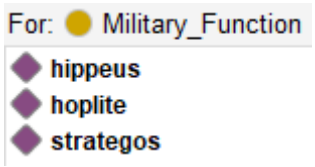
Crisis as Event aligned to CIDOC



Function





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Mapping to CIDOC E7

http://www.cidoc-crm.org/Entity/e7-activity/version-6.2 * no changes in version 7.2

Subclass of :
E5 Event

In First Order Logic:
E7(x) ⇒ E5(x)

Superclass of:
E8 Acquisition
E9 Move
E10 Transfer of Custody
E11 Modification
E13 Attribute Assignment
E65 Creation
E66 Formation
E85 Joining
E86 Leaving
E87 Curation Activity

Scope Note:
This class comprises actions intentionally carried out by instances of E39 Actor that result in changes of state in the cultural, social, or physical systems documented.
This notion includes complex, composite and long-lasting actions such as the building of a settlement or a war, as well as simple, short-lived actions such as the opening of a door.

Examples:
the Battle of Stalingrad (Hoyt, 1993)
the Yalta Conference (Harbutt, 2010)
my birthday celebration 28-6-1995
the writing of "Faust" by Goethe (E65) (Williams, 2020)
the formation of the Bauhaus 1919 (E66) (Droste, 2006)
calling the place identified by TGN '7017998' 'Quyunjig' by the people of Iraq
Kira Weber working in glass art from 1984 to 1993
Kira Weber working in oil and pastel painting from 1993

Properties:
P14 carried out by (performed) : E39 Actor,
P15 was influenced by (influenced) : E1 CRM Entity,
P16 used specific object (was used for) : E70 Thing,
P17 was motivated by (motivated) : E1 CRM Entity,
P19 was intended use of (was made for) : E71 Human-Made Thing,
P20 had specific purpose (was purpose of) : E5 Event,
P21 had general purpose (was purpose of) : E55 Type,
P32 used general technique (was technique of) : E55 Type,
P33 used specific technique (was used by) : E29 Design or Procedure
P125 used object of type (was type of object used in) : E55 Type,
P134 continued (was continued by) : E7 Activity

Inherited properties: ShowList of properties
Inherited references: ShowList of references

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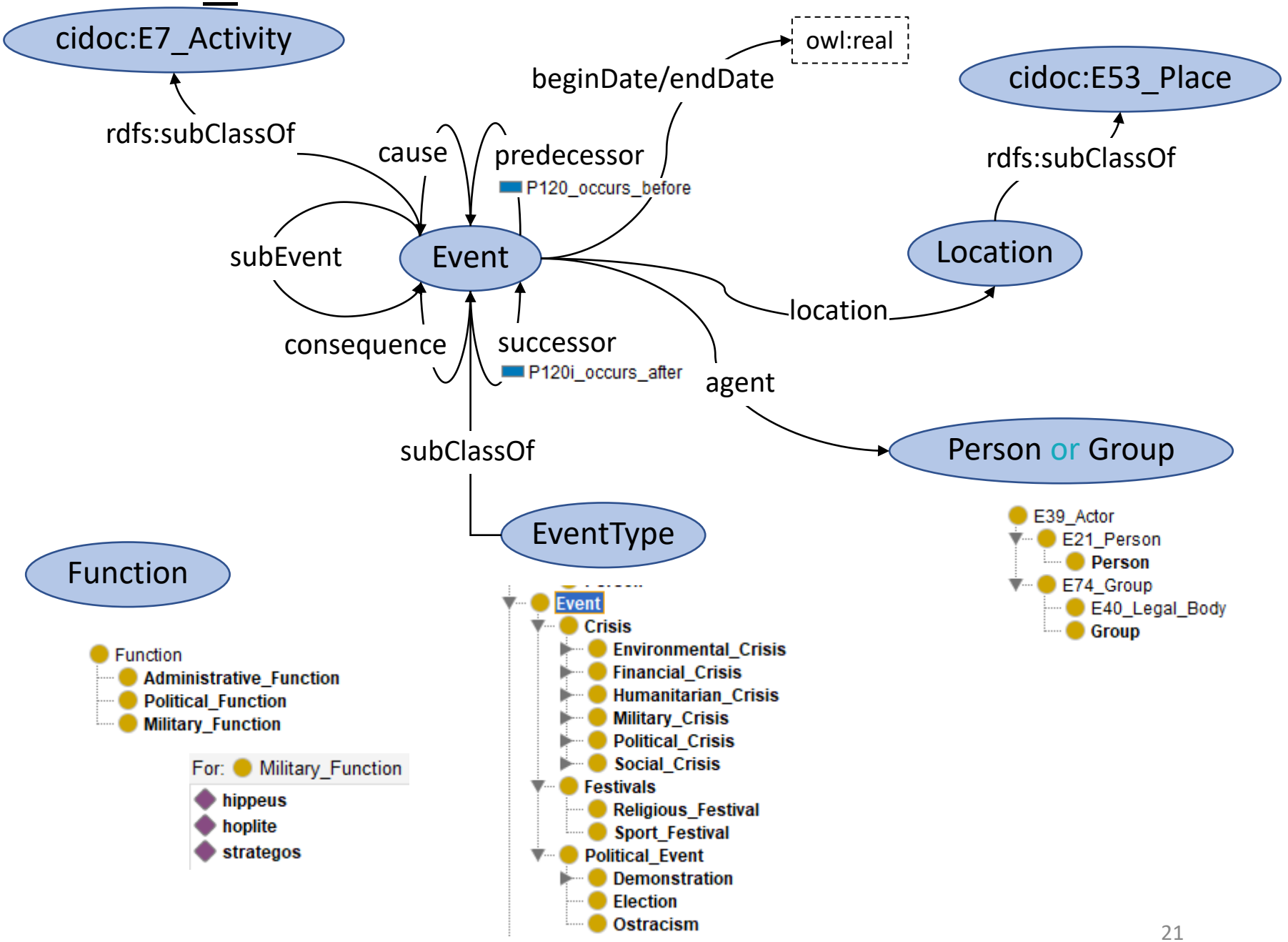
Crisis as Event in CIDOC



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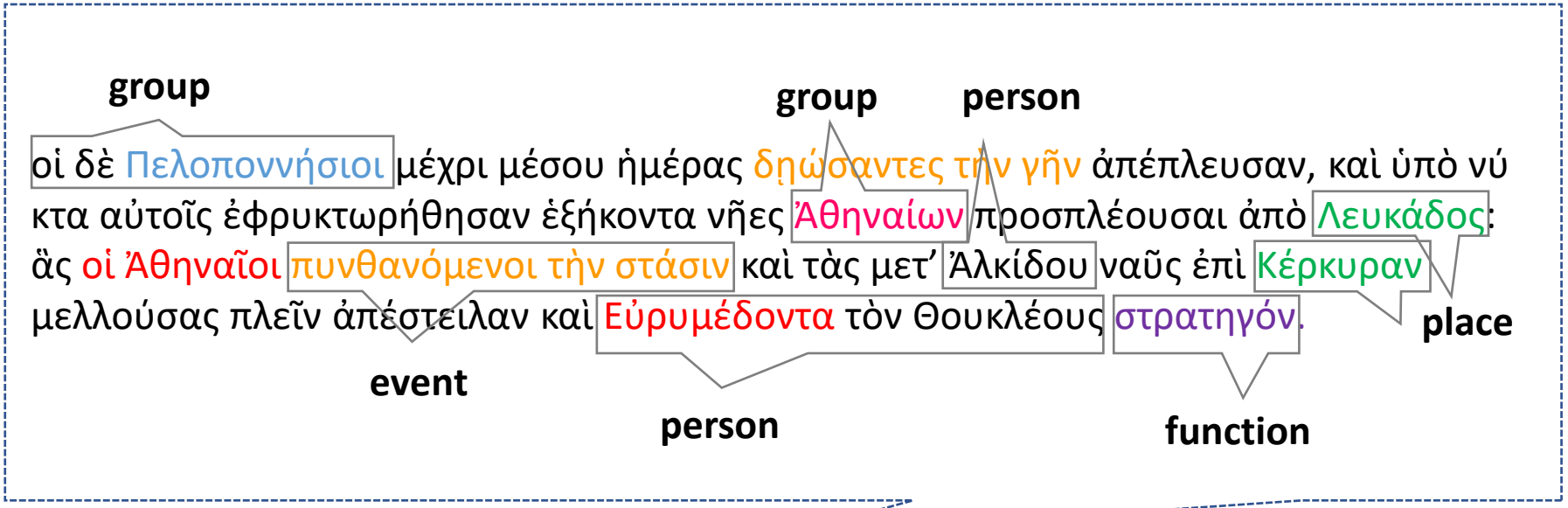
What to consider about crisis events

Thuc. 3.80.2



[3.80.2] But the Peloponnesians, after devastating the land till about midday, retired. And at nightfall the approach of sixty Athenian vessels was signalled to them from Leucas. These had been sent by the Athenians under the command of Eurymedon the son of Thucles, when they heard of the revolution and of the intended expedition of Alcidas to Corcyra.

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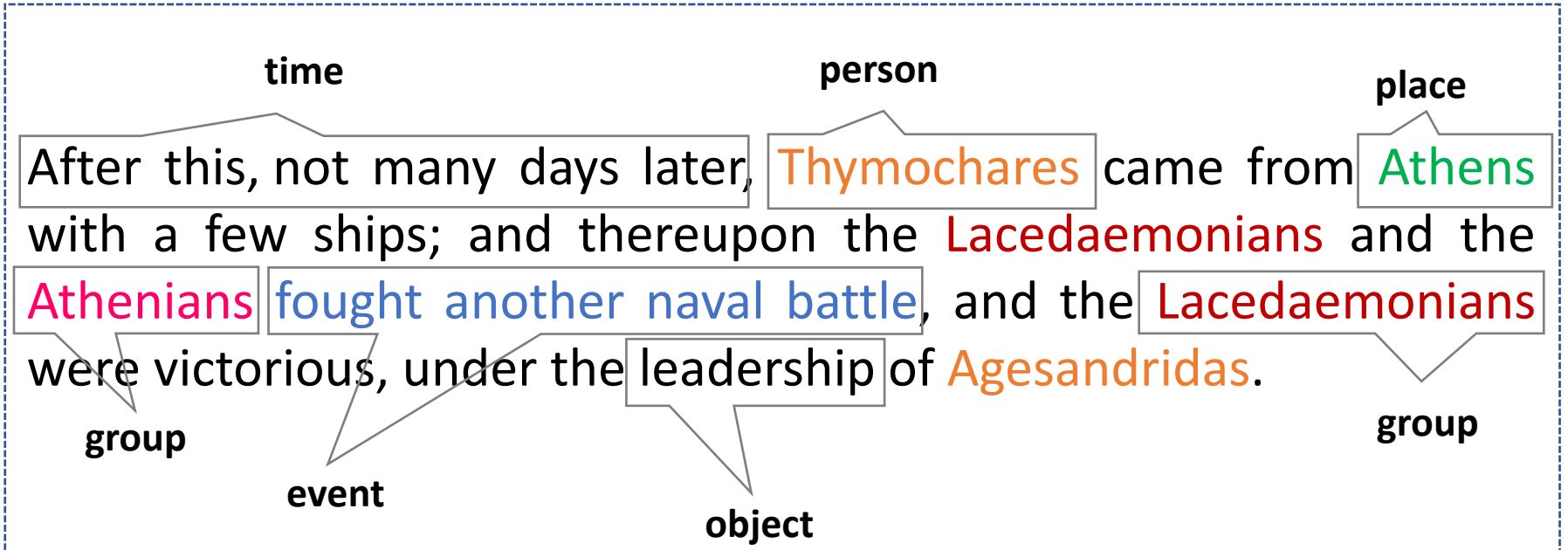
What to consider about crisis events

Xen. *Hell*. 1.1.1



URI: http://www.perseus.tufts.edu/hopper/text?doc=urn:cts:greekLit:tlg0032.tlg001.perseus-eng1

μετὰ δὲ ταῦτα οὐ πολλαῖς ἡμέραις ὕστερον ἦλθεν ἐξ Ἀθηνῶν Θυμοχάρης ἔχων ναῦς ὀλίγας: καὶ εὐθὺς ἐναυμάχησαν αὖθις Λακεδαιμόνιοι καὶ Ἀθηναῖοι, ἐνίκησαν δὲ Λακεδαιμόνιοι ἡγουμένου Ἀγησανδρίδου.

URI: http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0205%3Abook%3D1%3Achapter%3D1%3Asection%3D1

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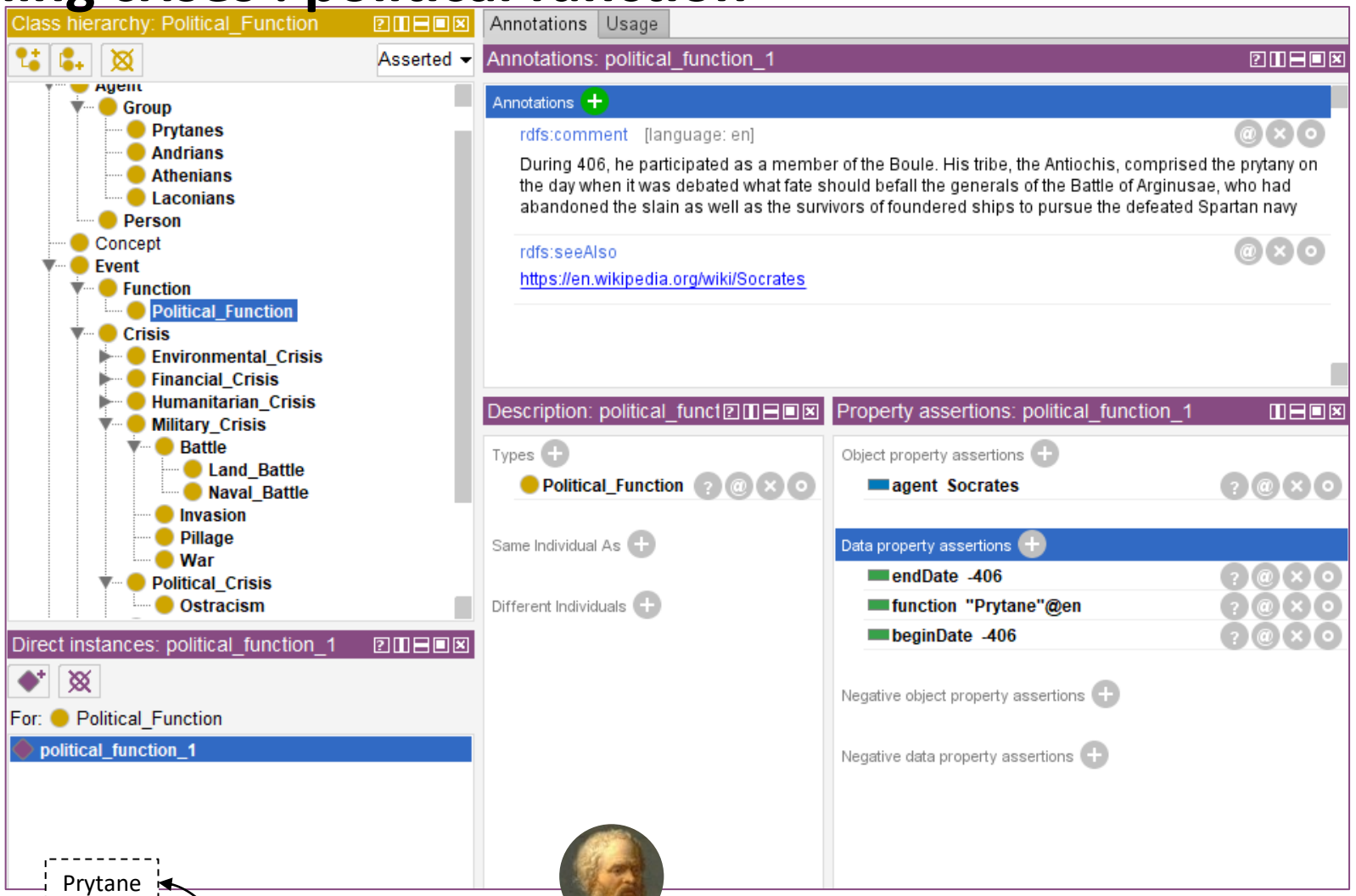
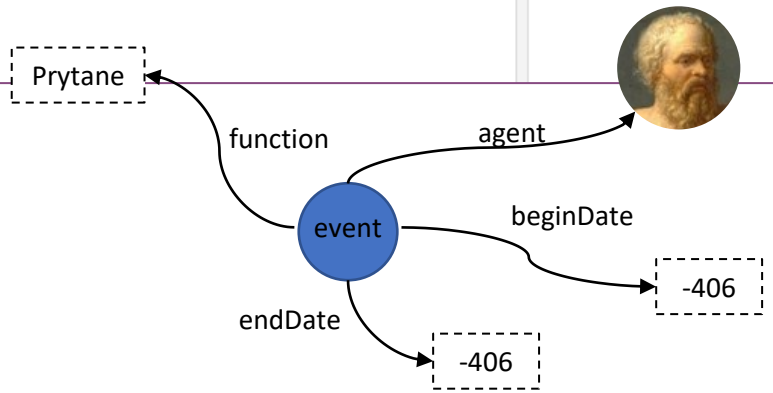
Modeling crises : political function





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The Battle of Aegospotami was a naval confrontation that took place in 405 BC and was the last major battle of the Peloponnesian War.

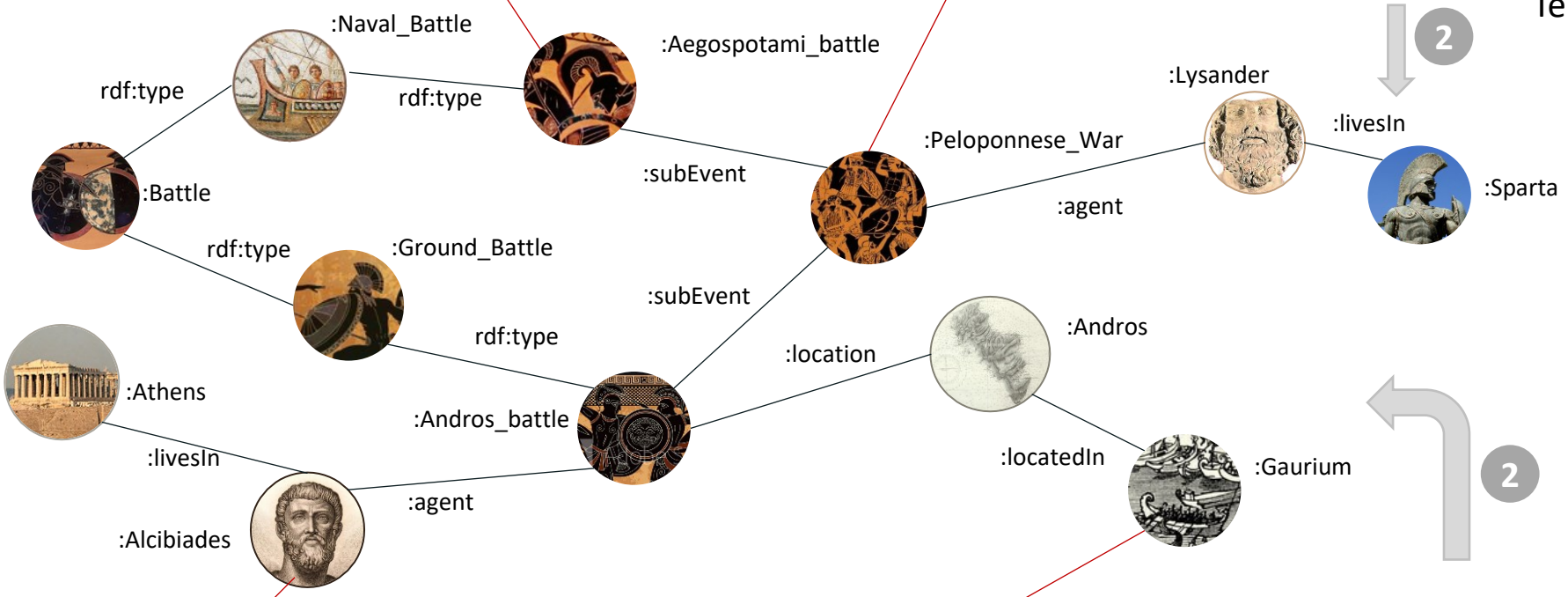
https://en.wikipedia.org/wiki/Battle_of_Aegospotami

1

- battle of Aegospotami
- Peloponnesian War
- naval battle

Terms

2



2

Xen. Hell. 1.4 Alcibiades disembarked his army at Gaurium, in the territory of Andros; and when the men of Andros and the Laconians who were there came forth to meet him, the Athenians routed them, shut them up in their city, and killed some few of them.

http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0206%3Abook%3D1%3Achapter%3D4

Ἀλκιβιάδης δὲ τὸ στράτευμα ἀπεβίβασε τῆς Ἀνδρίας χώρας εἰς Γαύριον: ἐκβοηθήσαντας δὲ τοὺς Ἀνδρίους ἐτρέψαντο καὶ κατέκλεισαν εἰς τὴν πόλιν καί τινας ἀπέκτειναν οὐ πολλούς, καὶ τοὺς Λάκωνας οἳ αὐτόθι ἦσαν.

http://www.perseus.tufts.edu/hopper/text?doc=urn:cts:greekLit:tlg0032.tlg001.perseus-grc1:1.4

1

Terms

- Alcibiades
- Gaurium
- Andros
- Laconians
- Athenians

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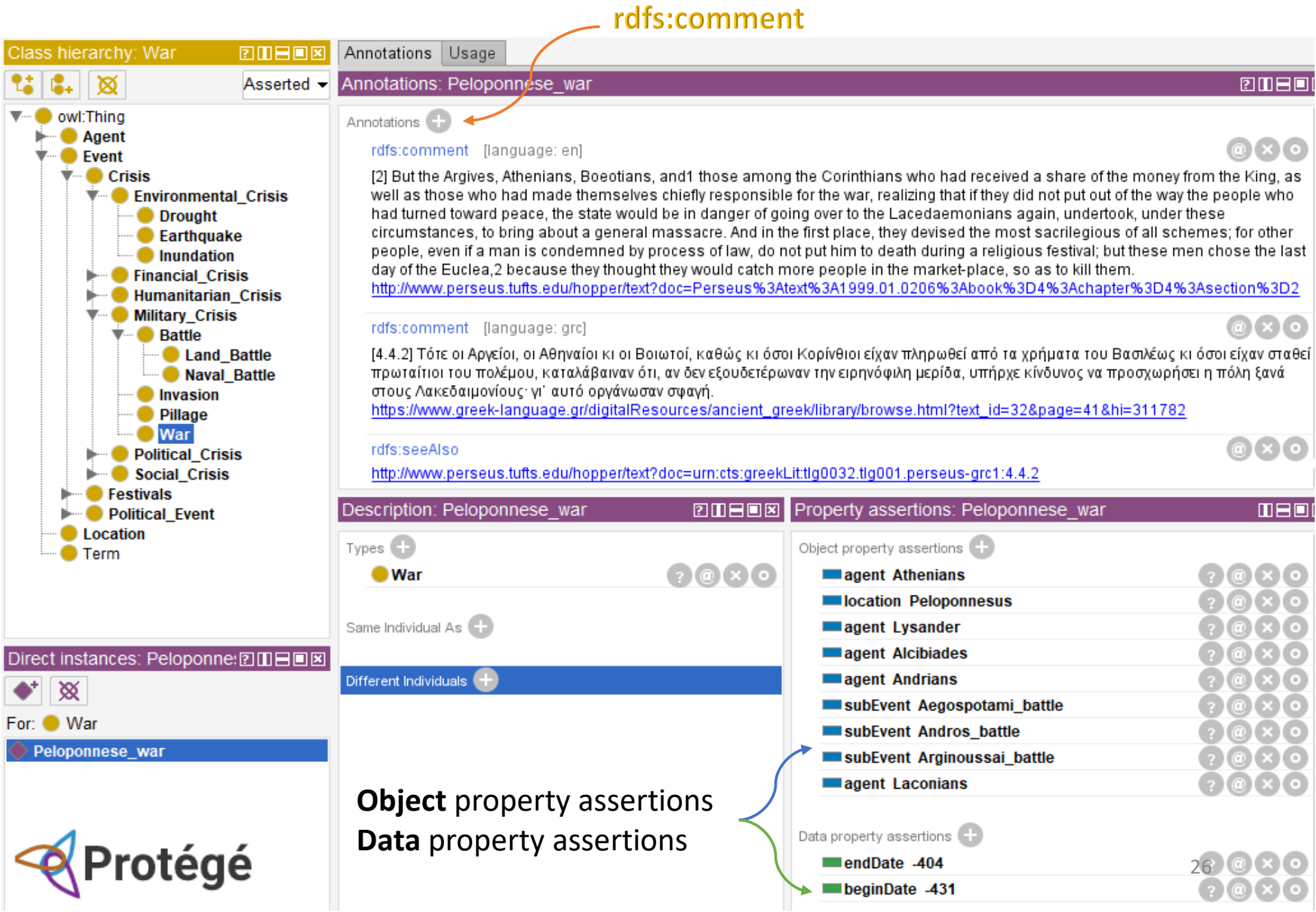
LACRIMALit in Protégé

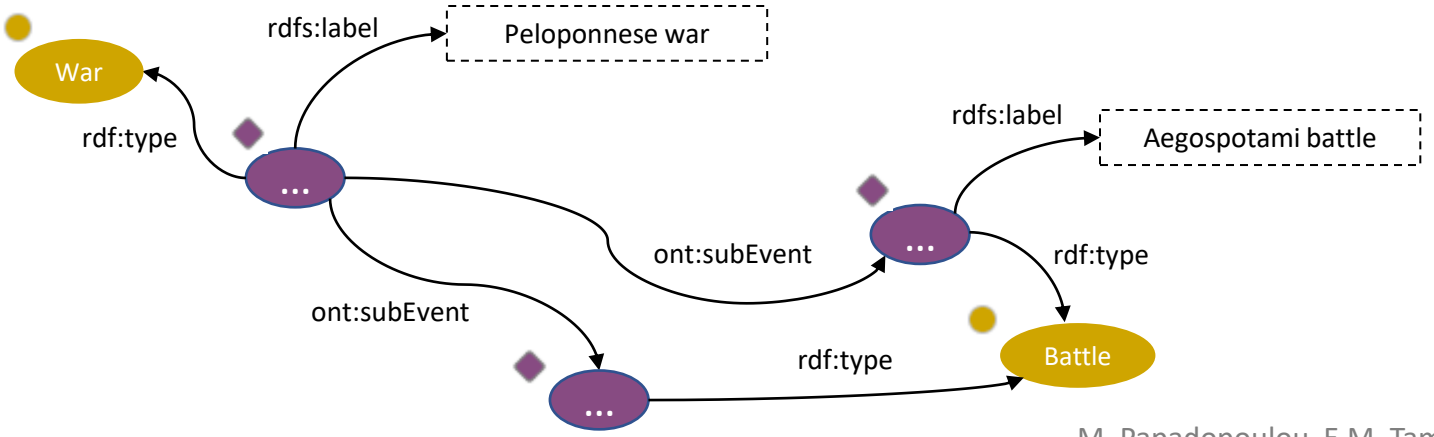


Competency Question

What are the battles of the Peloponnese War?

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX ont: <http://o4dh.com/Ontologies/Crisis.owl#>
SELECT ?battleName
        WHERE {    ?war rdf:type ont:War.
                   ?war rdfs:label "Peloponnese war" @en.
                   ?war ont:subEvent ?battle.
                   ?battle rdf:type ont:Battle.
                   ?battle rdfs:label ?battleName
}
ORDER BY ?battleName
```

battleName
"Aegospotami battle"@en
"Andros battle"@en
"Arginoussai battle"@en



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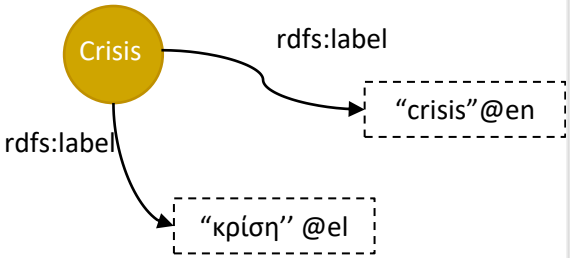
SPARQL query

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX ont: <http://o4dh.com/Ontologies/Crisis.owl#>
SELECT DISTINCT *
        WHERE {
                ?crisis rdfs:subClassOf* ont:Crisis.
                ?crisis rdfs:label ?crisis
}
ORDER BY ?crisis
```

Terms are labels on concepts



SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX ont: <http://o4dh.com/Ontologies/Crisis.owl#>
SELECT DISTINCT *
        WHERE {
                ?crisis rdfs:subClassOf* ont:Crisis.
                ?crisis rdfs:label ?crisisLabel
}
ORDER BY ?crisis
```

crisis	crisisLabel
Crisis	"κρίση"@el
Crisis	"crisis"@en
Drought	"drought"@en
Environmental_Crisis	"environmental crisis"@en
Environmental_Crisis	"περιβαλλοντική κρίση"@el
Financial_Crisis	"finanical crisis"@en
Financial_Crisis	"οικονομική κρίση"@el
Humanitarian_Crisis	"humanitarian crisis"@en
Humanitarian_Crisis	"ανθρωπιστική κρίση"@el

Execute

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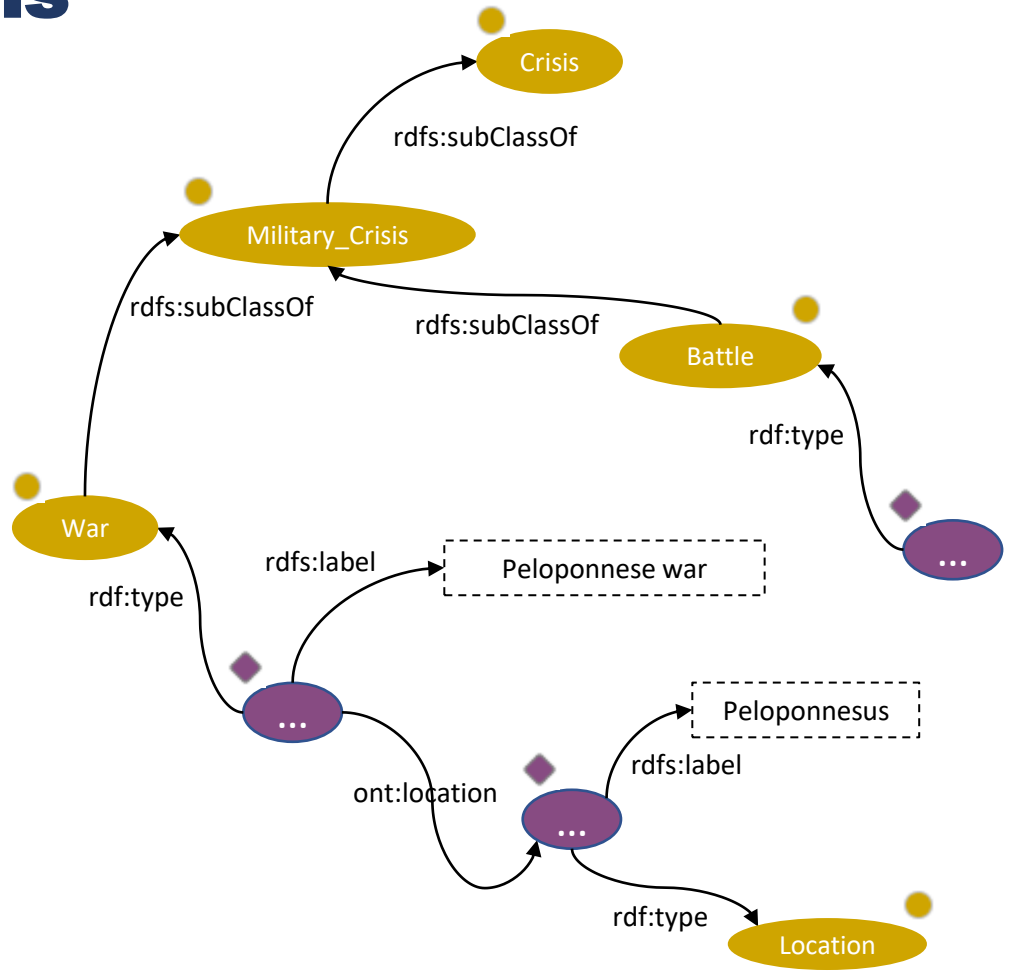
Competency Questions

Crises and locations?

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX ont: <http://o4dh.com/Ontologies/Crisis.owl#>
SELECT DISTINCT ?crisisLabel ?crisisType ?location
        WHERE {  ?Crisis rdfs:subClassOf* ont:Crisis.
                 ?crisis rdf:type ?Crisis.
                 ?crisis rdfs:label ?crisisLabel.
                 ?crisis ont:location ?location.
                 ?crisis rdf:type ?crisisType.
                 FILTER (?crisisType != owl:NamedIndividual)
}
ORDER BY ?crisisLabel
```



crisisLabel	crisisType	location
"Aegospotami battle"@en	Battle	Aegospotami
"Andros battle"@en	Battle	Gavrion
"Arginoussai battle"@en	Battle	Arginusae
"Arginoussai battle"@en	Naval_Battle	Arginusae
"Peloponnese war"@en	War	Peloponnesus

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SPARQL query: concepts and terms of crises

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX ont: <http://o4dh.com/Ontologies/Crisis.owl#>
SELECT DISTINCT *
        WHERE {
                ?crisis rdfs:subClassOf* ont:Crisis.
                ?crisis rdfs:label ?crisisLabel
}
ORDER BY ?crisisLabel
```

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX ont: <http://o4dh.com/Ontologies/Crisis.owl#>
SELECT DISTINCT *
        WHERE {
                ?crisis rdfs:subClassOf* ont:Crisis.
                ?crisis rdfs:label ?crisisLabel
}
ORDER BY ?crisisLabel
```

crisis	crisisLabel
Crisis	"crisis"@en
Drought	"drought"@en
Environmental_Crisis	"environmental crisis"@en

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The Linguistic Dimension?

Ontolex-Lemon: Lexicon Model for Ontologies

https://www.w3.org/2016/05/ontolex/

Ontologies are an important component of the Semantic Web but current standards such as OWL only support the addition of a simple label to entities in the ontology. It is not currently possible to add inflected forms, different genders, usage notes or create a full lexical resource such as Princeton WordNet.

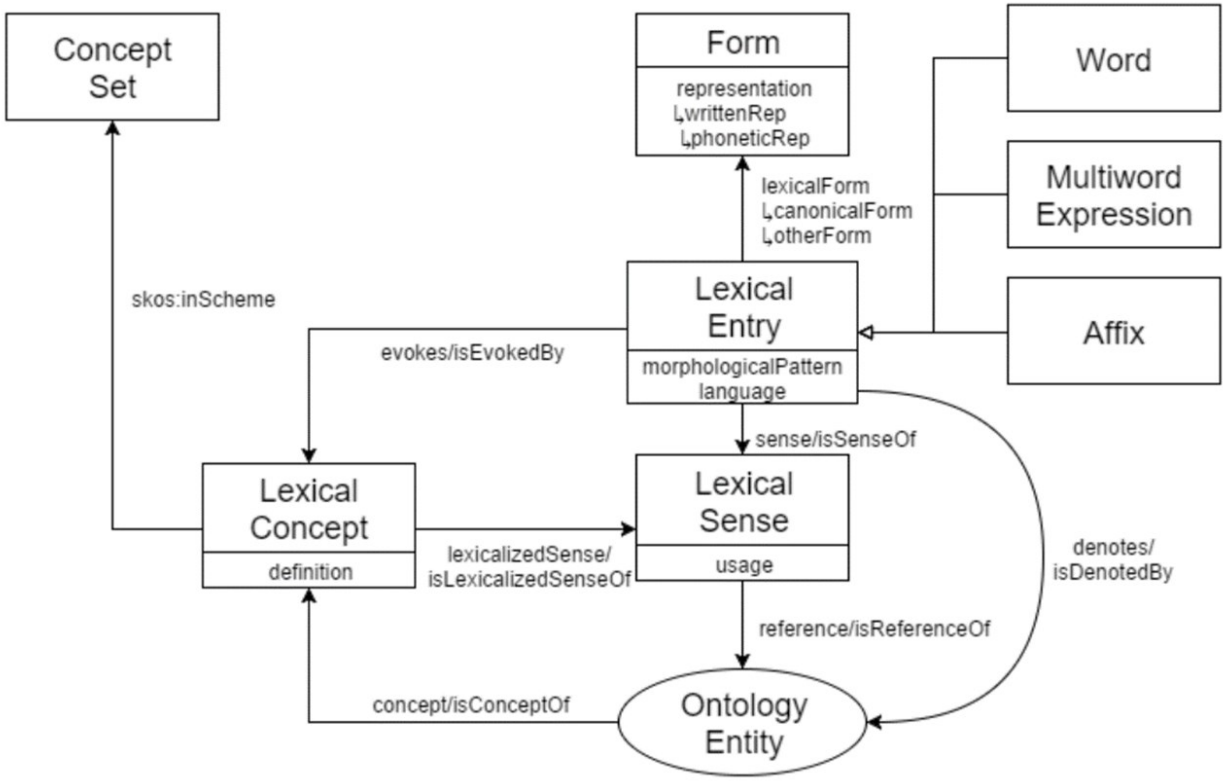

Figure 1 Lemon_OntoLex_Core.png

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The Linguistic Dimension?

Ontolex-Lemon: Lexicon Model for Ontologies

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Ontologies are an important component of the Semantic Web but current standards such as OWL only support the addition of a simple label to entities in the ontology. It is not currently possible to add inflected forms, different genders, usage notes or create a full lexical resource such as Princeton WordNet, or the Open Ancient Greek Wordnet.

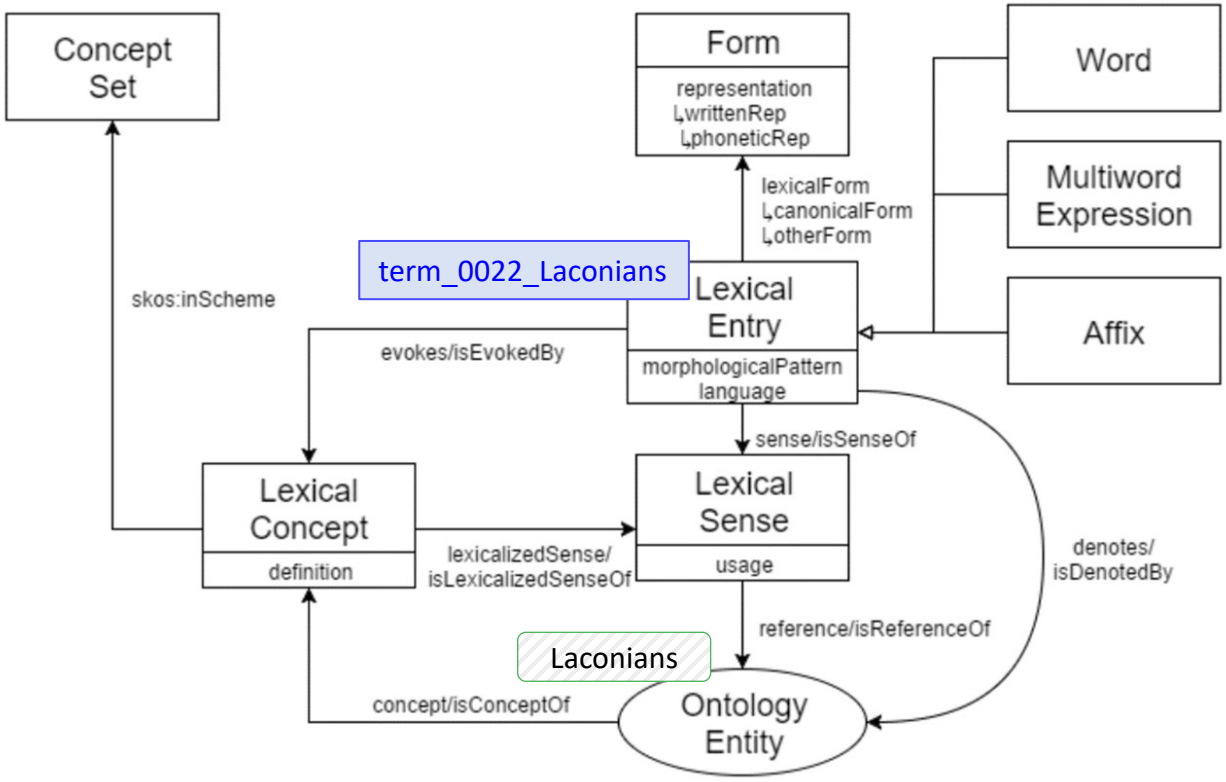

Figure 1 Lemon_OntoLex_Core.png

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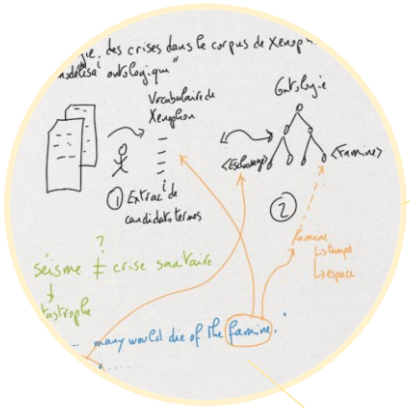
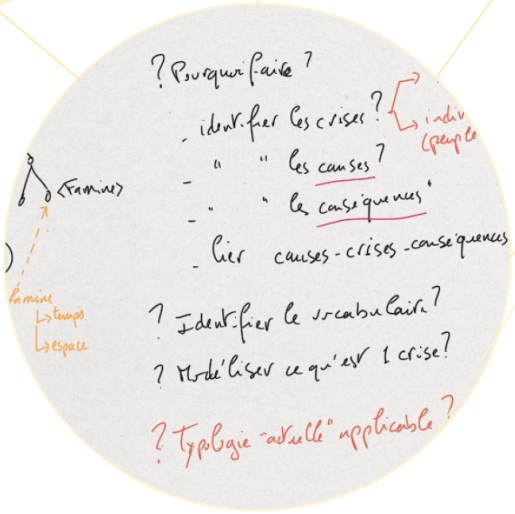
Conclusion





A model of different crisis events and subevents

Easy-to-use, yet sophisticated enough that will enable to represent the complexity of historiographical accounts

Terminological dimension?

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http://o4dh.com/

THANK YOU

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