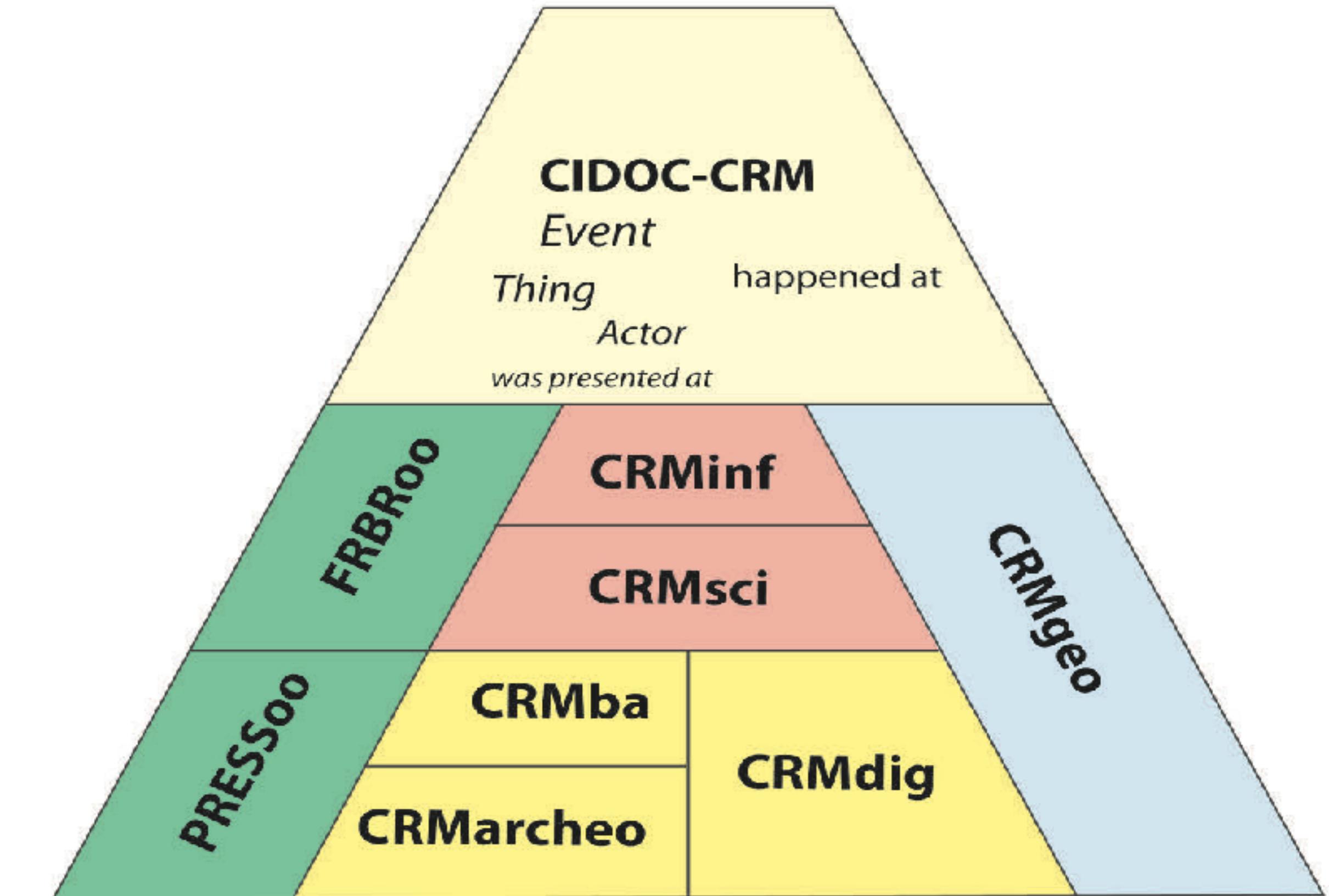


# Extensions

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	<a href="http://www.cidoc-crm.org/">http://www.cidoc-crm.org/</a>



- Digital Provenance (CRMdig)
- Scientific discourse (CRMsci)
- Archeology and Building Archeology (CRMarcheo & CRMba)
- Geo-spatial science (CRMgeo)



- Focus on **Data Provenance**, which may indicate:
  - WHY: why we obtain something (*the tuples involved in the computation of a result tuple*)
  - WHERE: where the result comes from (*where these tuples reside*)
  - HOW: how we obtain a specific result and not another - replication  
(*the query operators used to obtain the result tuple*)



- Follow the digitisation/geometrical documentation efforts by the CH community
- Developed during 3D COFORM
- Trace the process itself, and allow for documentation of its steps (scientifically evaluate the outcome and drawback of its analysis)





Widening access

**THE LONDON CHARTER****FOR THE COMPUTER-BASED VISUALISATION OF CULTURAL HERITAGE**

Establishing internationally-recognised principles for the use of computer-based visualisation by researchers, educators and cultural heritage organisations.

[A New Introduction to The London Charter](#)[Download The London Charter \(2.1, February 2009\)](#)**NEWS**

- [The Portuguese translation](#) is created by Botelho, Dias, Madeira & de Almeida, November 2014
- [The Hungarian translation](#) is created by Kelemen, Kavanagh, Szenes & Rácz, October 2014
- [The German translation](#) is updated by Susanne Krömker, July 2013
- [The Bosnian translation](#) is created by Selma Rizvić, November 2012
- [The Japanese translation](#) is created by Go Sugimoto & Reiko Kadobayashi, November 2012
- [The Farsi \(Persian\) translation](#) is created by Mahdokht Farjamirad & Morteza Lak, November 2012
- [The Chinese translation](#) is launched in Beijing, 18 October 2012

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**PARTNERS**

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**“Ensure that digital heritage visualisation is, and is seen to be, at least as intellectually and technically rigorous as longer established cultural heritage research and communication methods”**

**Nicola Carboni****European Summer University in Digital Humanities "Culture & Technology"**

23-27 July 2018, Leipzig





*“using a virtual model to visually recover a building or object made by humans at a given moment in the past from available physical evidence of these buildings or objects, scientifically reasonable comparative inferences and in general all studies carried out by archaeologists and other experts in relation to archaeological and historical science”*



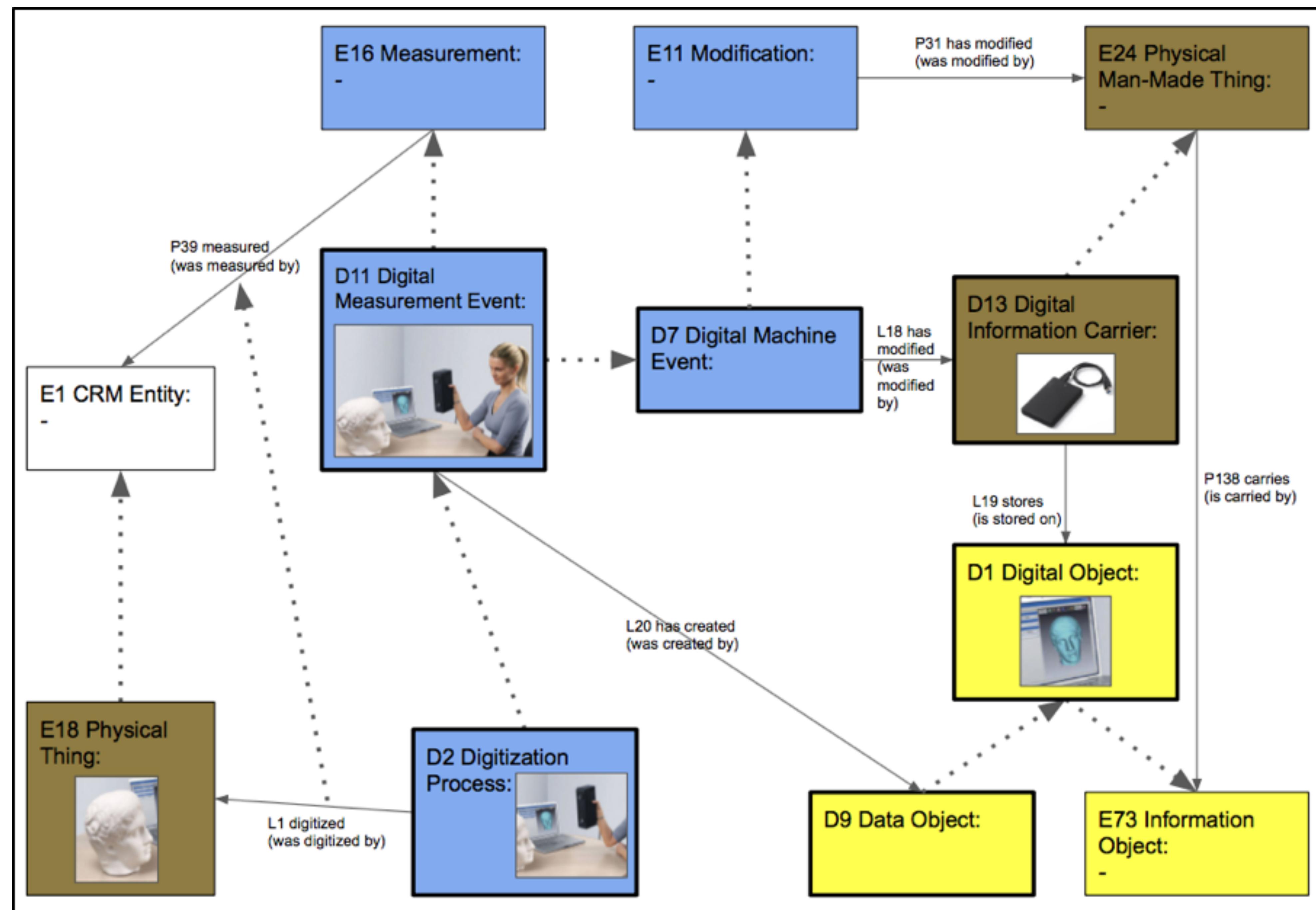
Deal mainly with:

- Data quality & reliability
- Audit trail
- Replication recipes
- Attribution



- Focus on the transition between the physical and digital world to the many transformations that occur to digital objects once stored in some digital environment
- Helpful for eventual reasoning over properties propagated through digital transformation
- Digital Transformation Event are documented according to their relations to digital inputs and outputs - other instances of digital objects - and the effective parameters.
- We need to know the conditions under which digitization took place also as a physical event in order to evaluate the end product

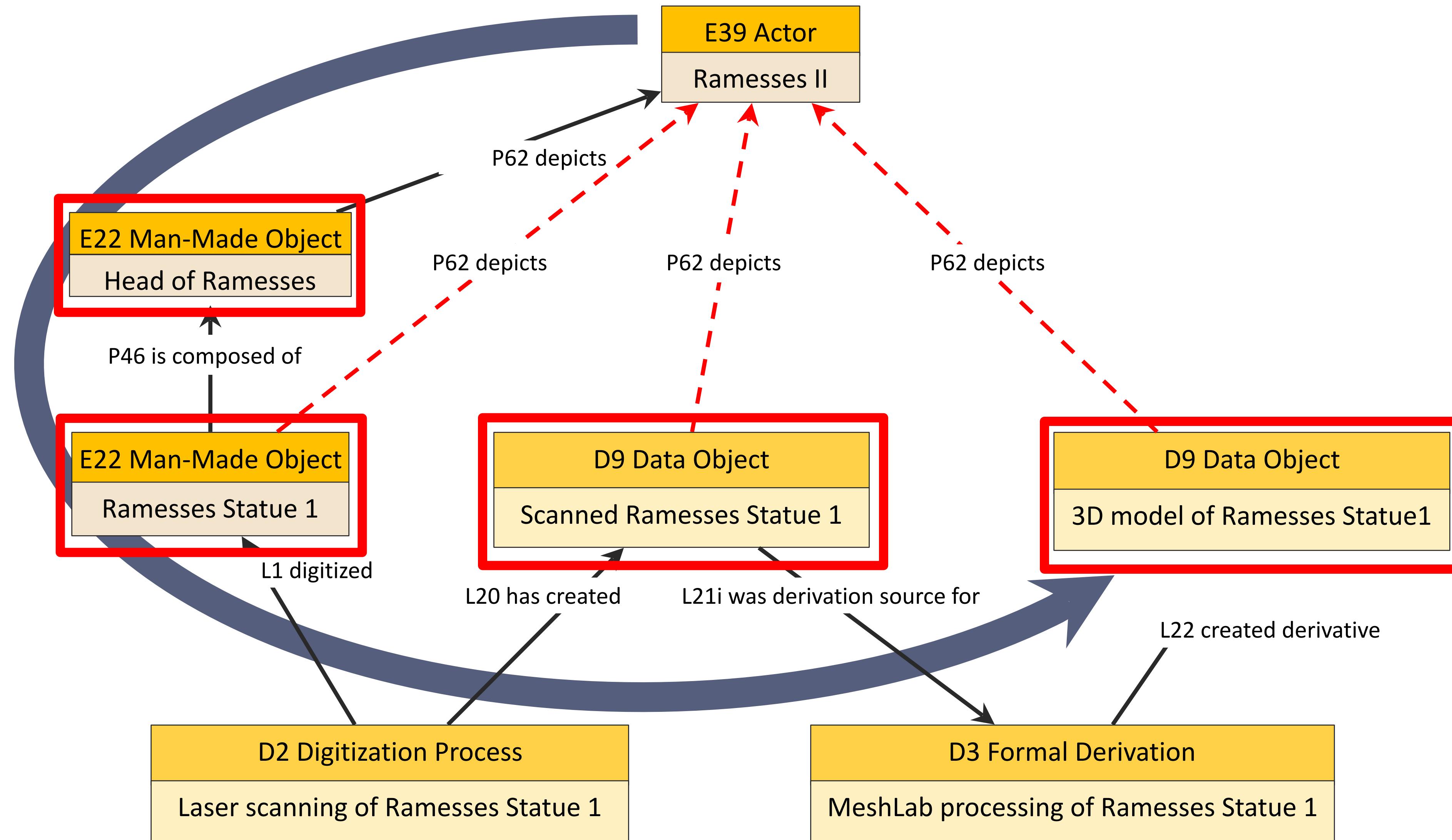




- Digital objects are always the results of a Digital Machine Event
- Digital Machine Event could, or could not, involve the reproduction of a physical object
- Digital objects are always stored in Digital Information Carriers
- Digital Objects can have derivatives preserving the representation of some things but in a different form.



# Query: FIND *things* (?) that refer to *Ramesses II*



## Alternative:

- PROV-O (check the primer!)
- Provenir Ontology



- For scientific observations in geology, biology, archaeological excavations, digital productions and medicine
- Describe the workflow of forming of a hypothesis to perform and explain observations that are made, the gathering of data, and the drawing of conclusions that confirm or deny the original hypothesis



- Has been developed bottom up from specific metadata examples such as water sampling in aquifer systems, earthquake shock recordings, landslides, excavation processes, species occurrence and detection of new species, tissue sampling in cancer research, 3D digitization,
- Describes, together with the CIDOC CRM, a discipline neutral level of genericity, which can be used as a general ontology of human activity, things and events happening in spacetime



- Form of a hypothesis to perform an observation (select parameters, properties, signals and the way of converting these to data)
- Perform the observations. (They are only concerned with objects or events that are observable, either directly or indirectly )
- Explain the observations made and the gathering of data
- Draw conclusions based upon this data, (make a scientific hypothesis - tentative explanations about the observations made)
- Deduce the implications (test them through further observation, compare the results)
- Confirm, deny, re-evaluate the original hypothesis
- Formulate valid theories (allow others to repeat the observations)



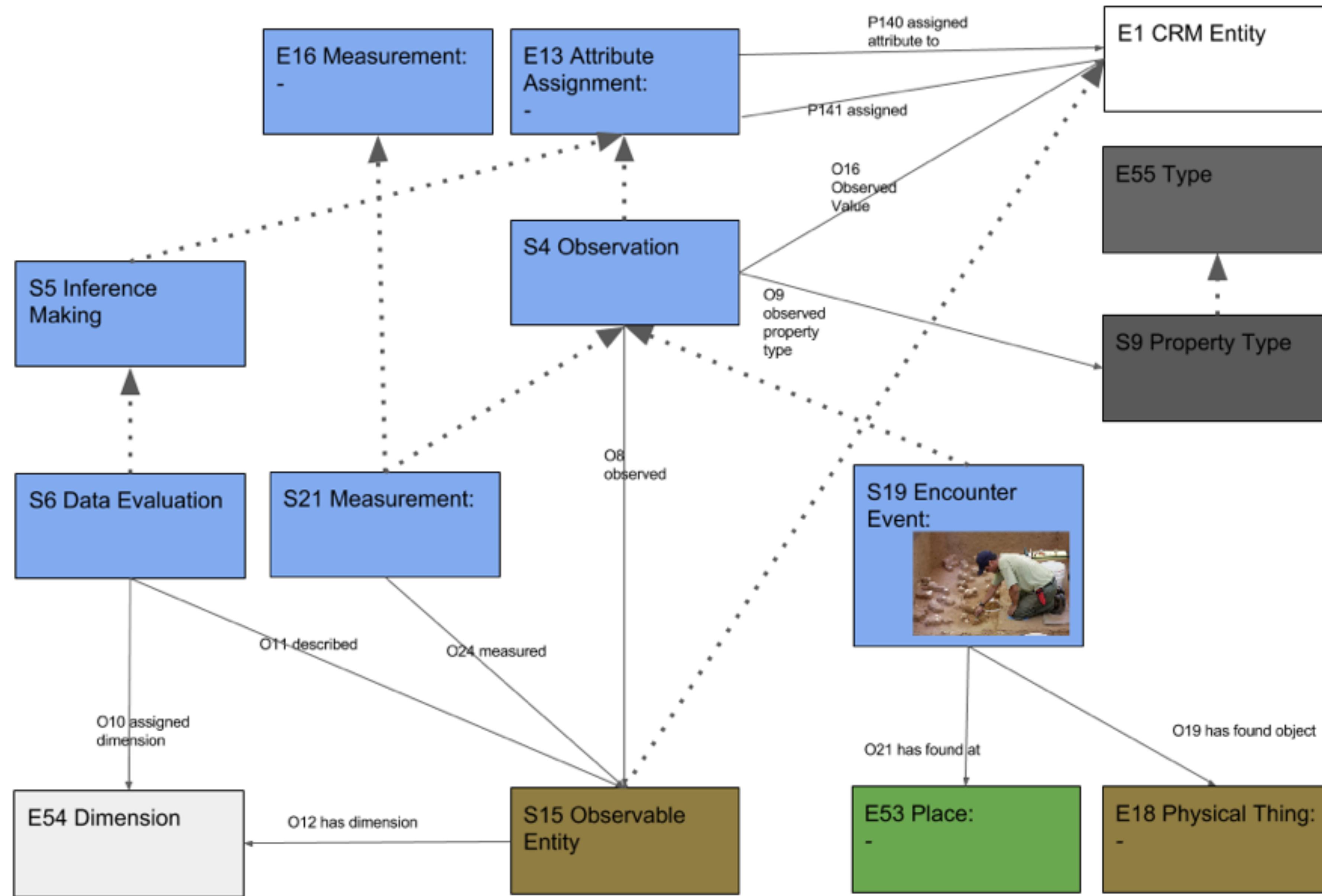
- The **human observer**
- The **object of observation** (a “thing”, “something”, a process or a state?),
- The **observation hypothesis** (choice of parameters),
- The **environment**
- The **identity of the object**, if any,
- The **time and location**
- The **condition of the thing**,
- The **instrumentation and method used**
- The **identity, authenticity and transmission of the produced records**
- The **inference making**







# CRMsci: Observation Processes



Heavily grounded in observations, sampling and evaluation...

They decided to extract the classes dealing with argumentation over factual states of affairs and develop a separate extension in order to allow for a complete documentation of inferential argument and belief adoption: CRMinf



- inconsistencies & confusion about the meaning of terms such as argument, premise, conclusion, issue, etc...
- confuse the argument with the fact used as an argument (argument is relationships, not classes)
- connecting argumentation models with information systems: none or unable to fully support or understand human argumentation



Fact

Rick has fair skin, red hair and freckles, and he sunbathed all day yesterday.

(probably) Conclusion

Rick will probably get seriously sunburnt.

Warrant

People with fair skin, red hair and freckles usually get sunburnt easily.

Backing

Those people have little melanin in their skin.  
Melanin protects against sunburn.

Rebuttal

Rick's parents both have fair skin, red hair and freckles, and they never seem to get sunburnt however much they sit outside.

- Based on traditional premises-conclusions enriched with elements such as warrant, backing, and rebuttal
- he has only discussed the structure of arguments. He failed to analyze the problem-solving process.
- Toulmin's approach does not support reinstatements and does not discuss the evaluation status of arguments.
- Static



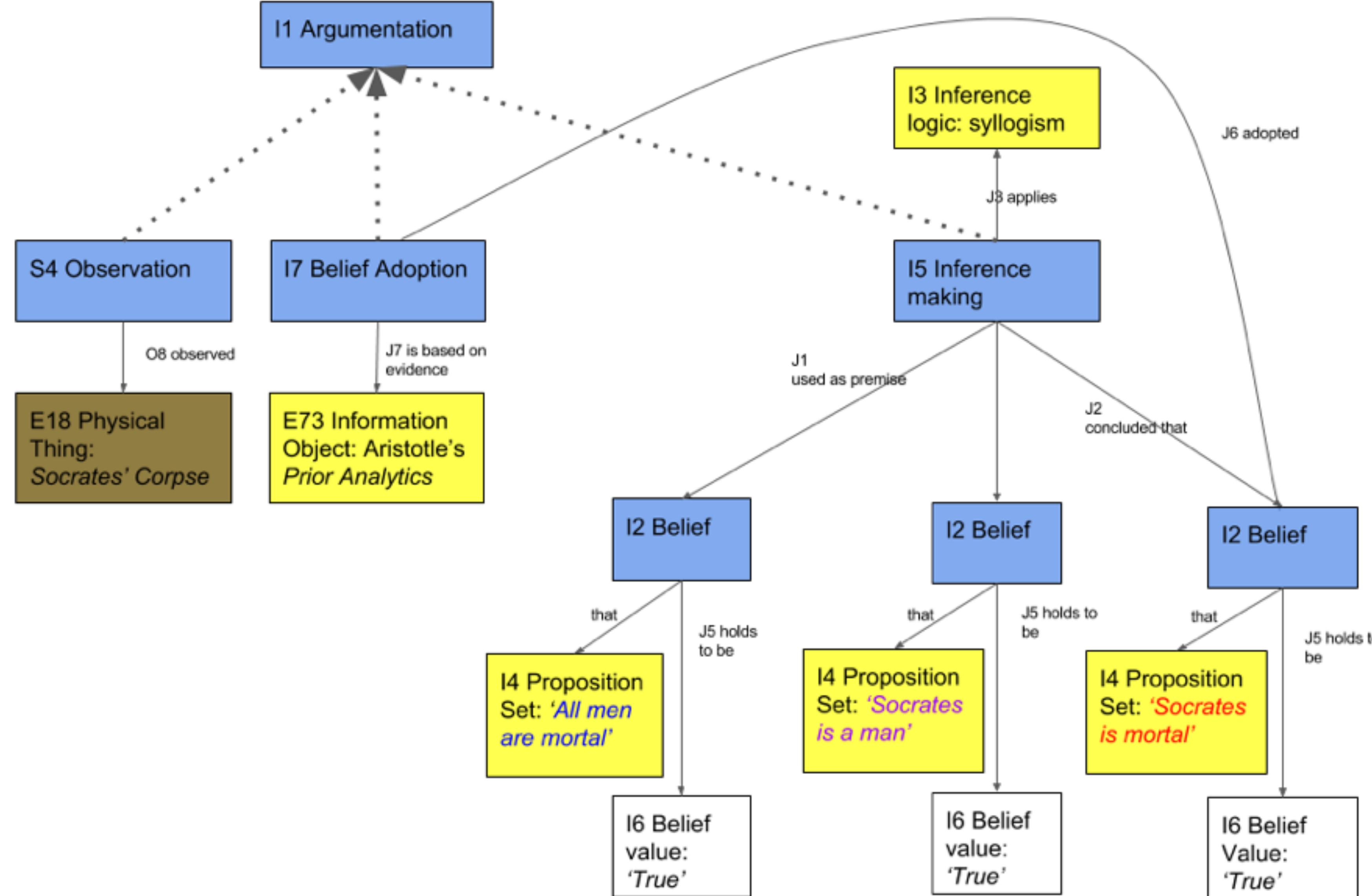
## Argument:

- An individual structure (using proposition as premises to justify a concluding belief) that is used or produced by an argumentation process (of employing arguments to achieve a particular state of knowledge)
- An argument can come at any time and place in a reasoning chain, regardless logical order.



- Difference between the class Argument and the class of propositions set who support it.
- The class Belief, allows for the documentation not of the truth or falsity of propositions, which would imply an absolute and completed process, but rather the documentation of the states of belief in the truth or falsity of propositions held by certain actors for certain periods of time based on certain logics - I3 Inference Logic - and certain sets of evidence - I4 Proposition Set





CRMinf

- Reasoning over space in the geophysical sense
- Integrate the OGC/ISO standards (GeoSPARQL)



## Problem:

Both CRM and GeoSPARQL standards do not allow for expressing objectively where something is in a way which is robust against any change of spatial scale and time

CRM properties such as “has former or current location” does not allow for declaring if the location is or was the extent of the object, was within the extent of the object or included its extent

GeoSPARQL allows for assigning one or more precise “geometries” to a “feature”, but does not say, how the real matter of the thing with its smaller irregularities relates to those



According to CIDOC CRM a *Period* is:

- “a set of coherent phenomena or cultural manifestations”
- bounded in space and time
- approximated by empirical evidence through observations
- e.g., Jurassic era, Mink dynasty, Caesar’s lifetime, etc.

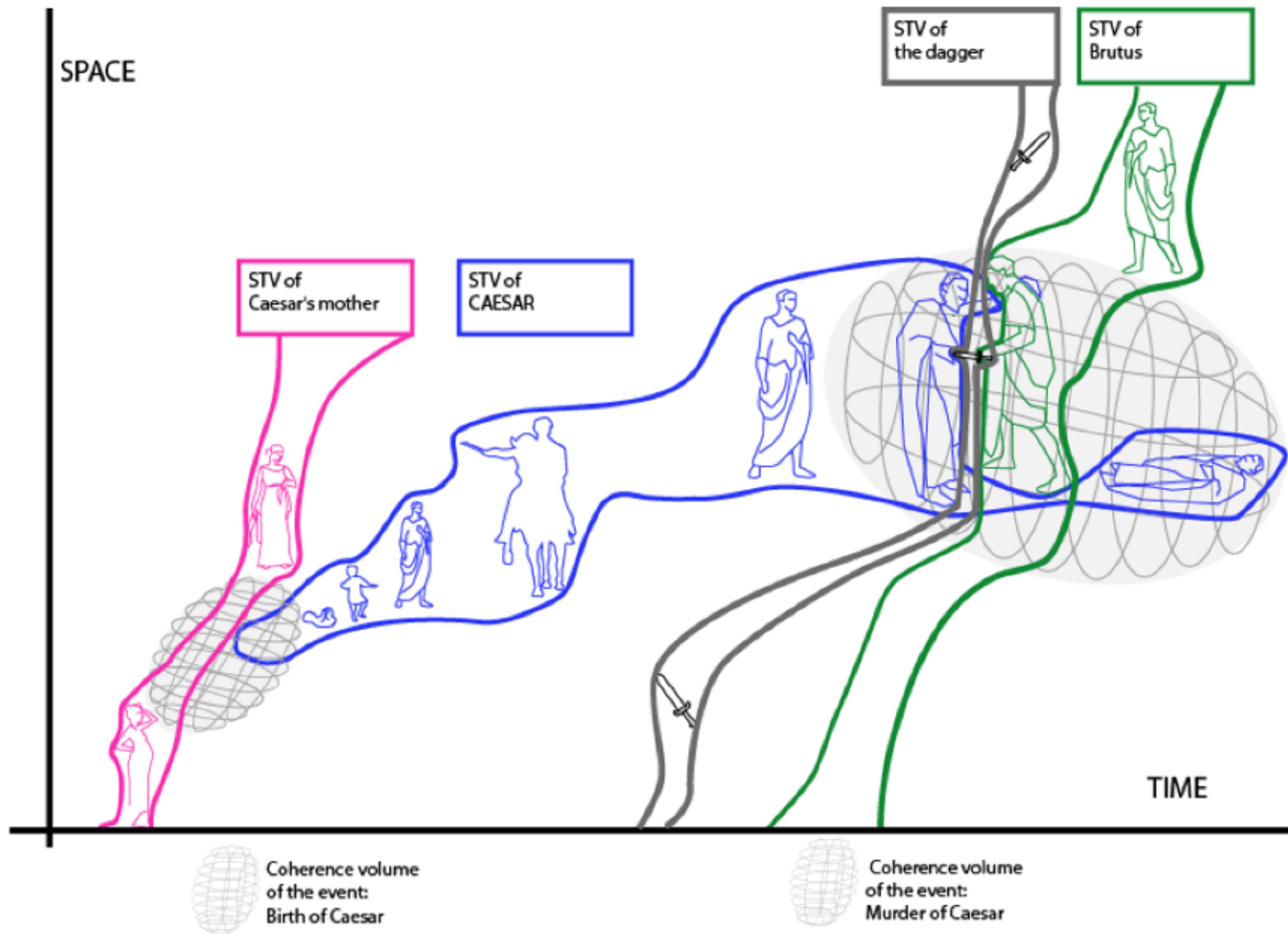
An *Event* is a *Period* that brings about a change

- e.g., Trojan war, earthquakes, volcanic eruptions, etc.

**Space-time Volume (STV):**

- spatiotemporal confinement of a period
- time projection: time frame in which the period is active
- space projection: region where the period is located





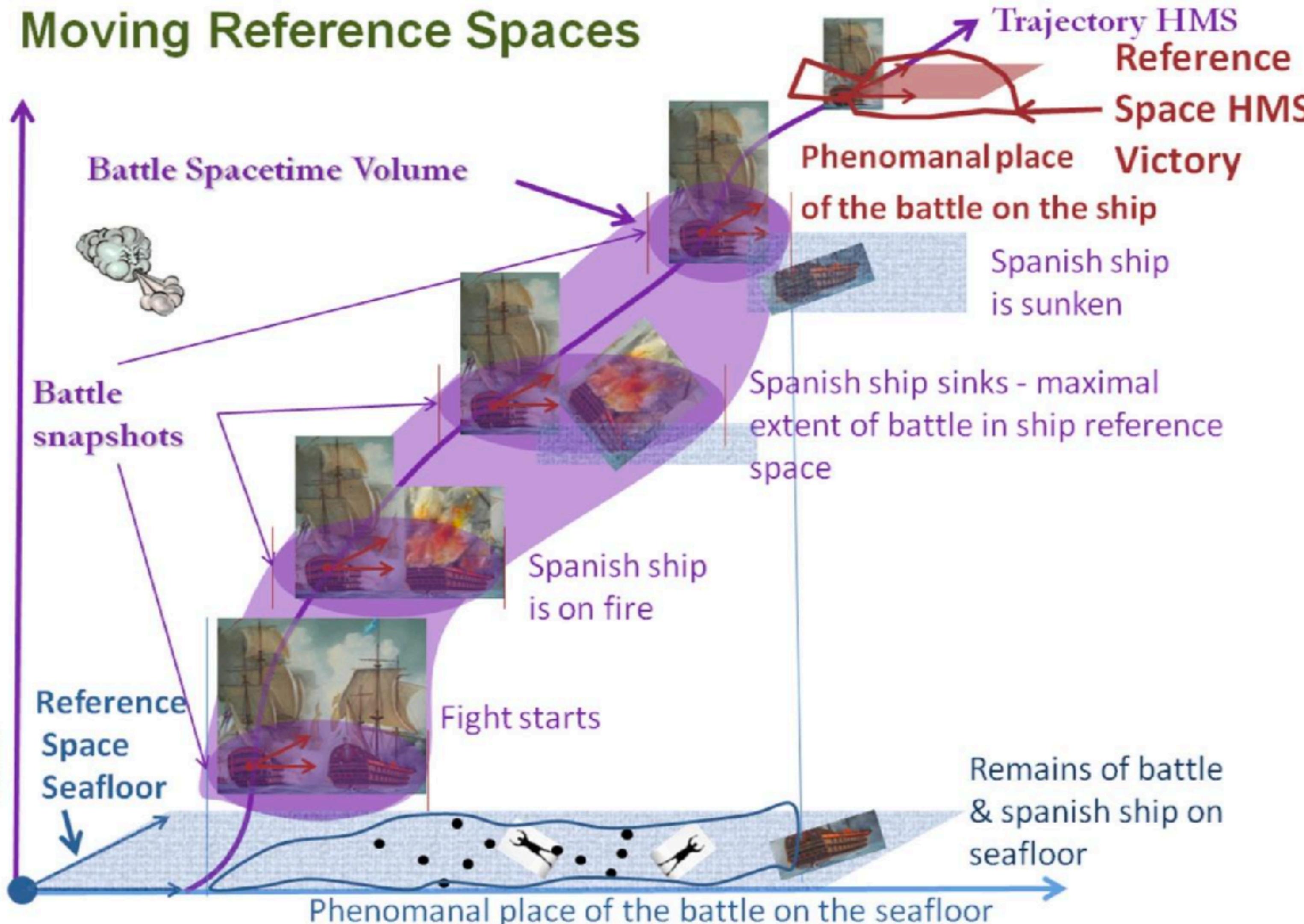
Distinction between the **Phenomenal place** (real-world phenomena) and the **Declarative place** (human-defined).

**Phenomenal Space:** where the phenomenon took place - Space Time Volume defined as a 4 dimensional fuzzy point set which material phenomena like Events or Physical Things occupy in the Space-Time. It is regarded to be unique but unknown and unobservable in its exact extent.

**Declarative Space:** the one we studied (slice of a SpaceTime Volume), approximating with a Reference Space defined by Geometric place expression or Natural Language Place Expressions.



## Moving Reference Spaces

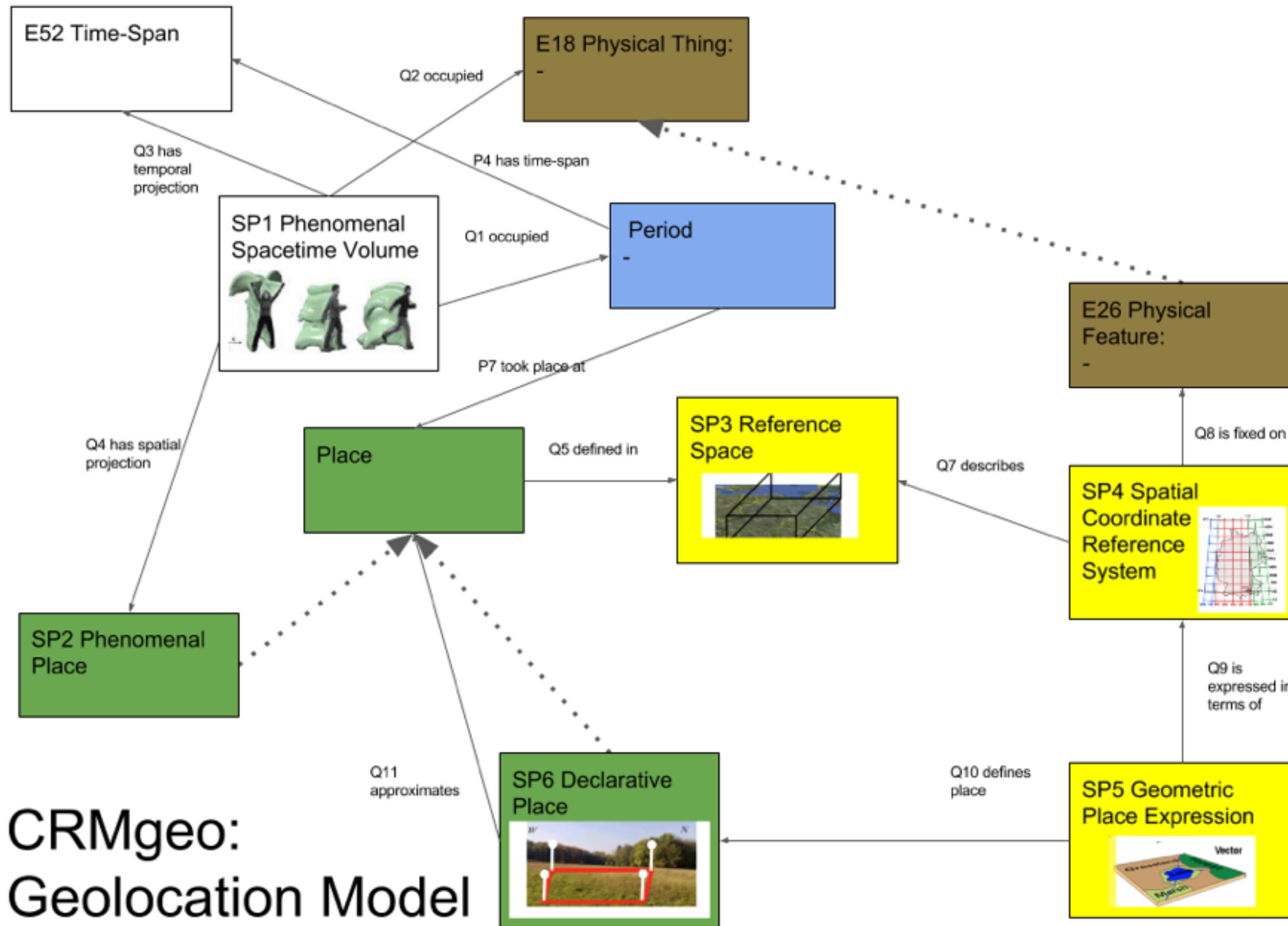


An event can have multiple reference space. Can either be projected on the seafloor as Reference Space or on the Reference Space of the ship, thus creating two Phenomenal Places of one unique Space Time Volume.



An event can have multiple reference space. Can either be projected on the seafloor as Reference Space or on the Reference Space of the ship, thus creating two Phenomenal Places of one unique Space Time Volume.





# CRMgeo: Geolocation Model