

CCO design patterns

- The following slides contain design patterns for CCO and BFO to be vetted and translated into Mermaid.
- In some cases, big design patterns need to be split into more simple patterns. In other cases, they need to be made more or less general.

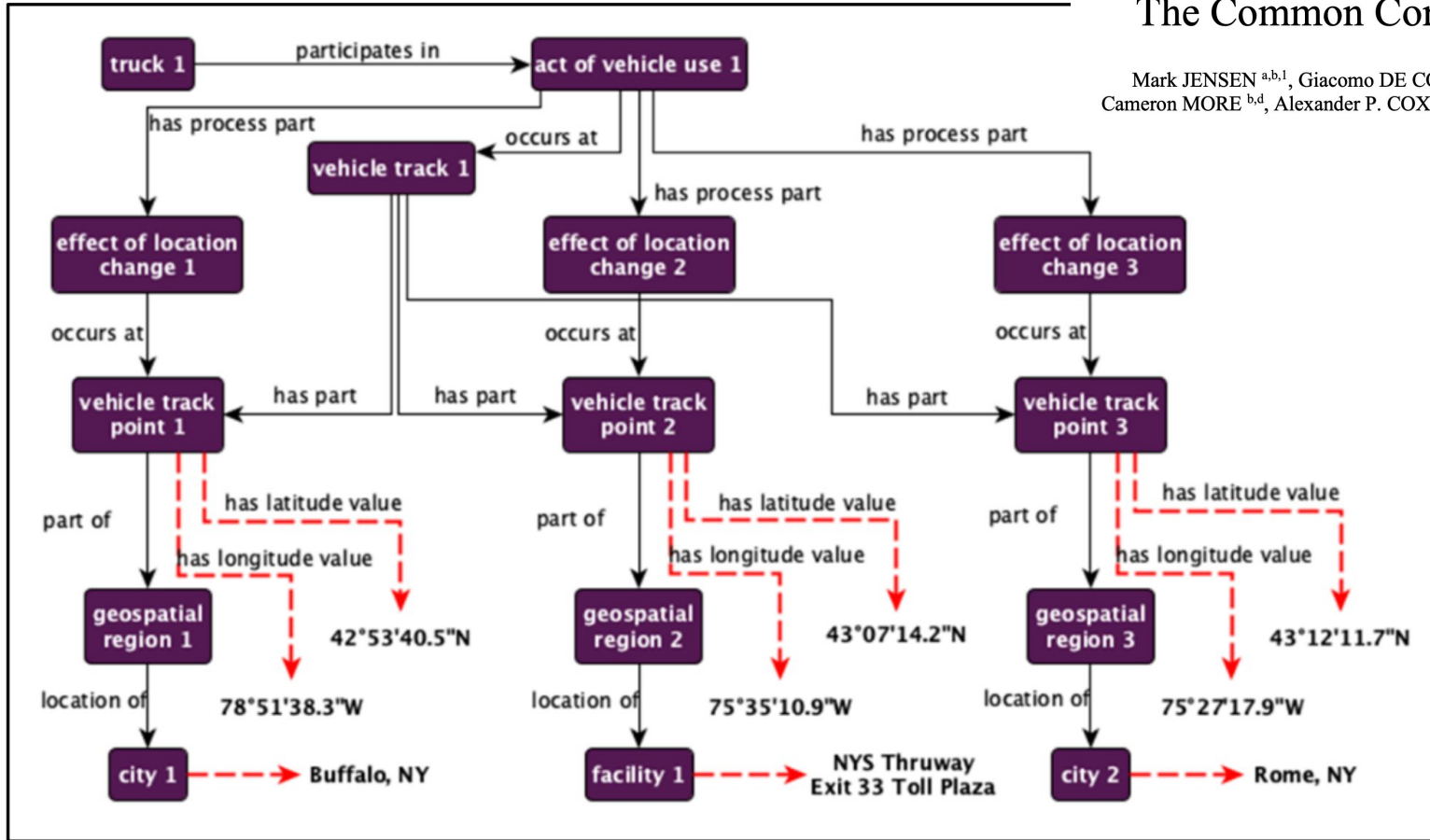
- The sources of these design patterns are varied (papers, independent work of researchers, presentations). When possible, provenance of the images is shown. All credits are due to the authors of the respective patterns.

## To Do:

- Gather competency questions/use cases (IES, CUBRC (Giacomo), BORO, SOSA, Ryan Cybersecurity (Ryan), etc.)
- Categorize design patterns (Giacomo) (time, space, time+space, roles, dispositions, information,...)
- Homework (Greg and Elena get some first design patterns done)

# The Common Core Ontologies

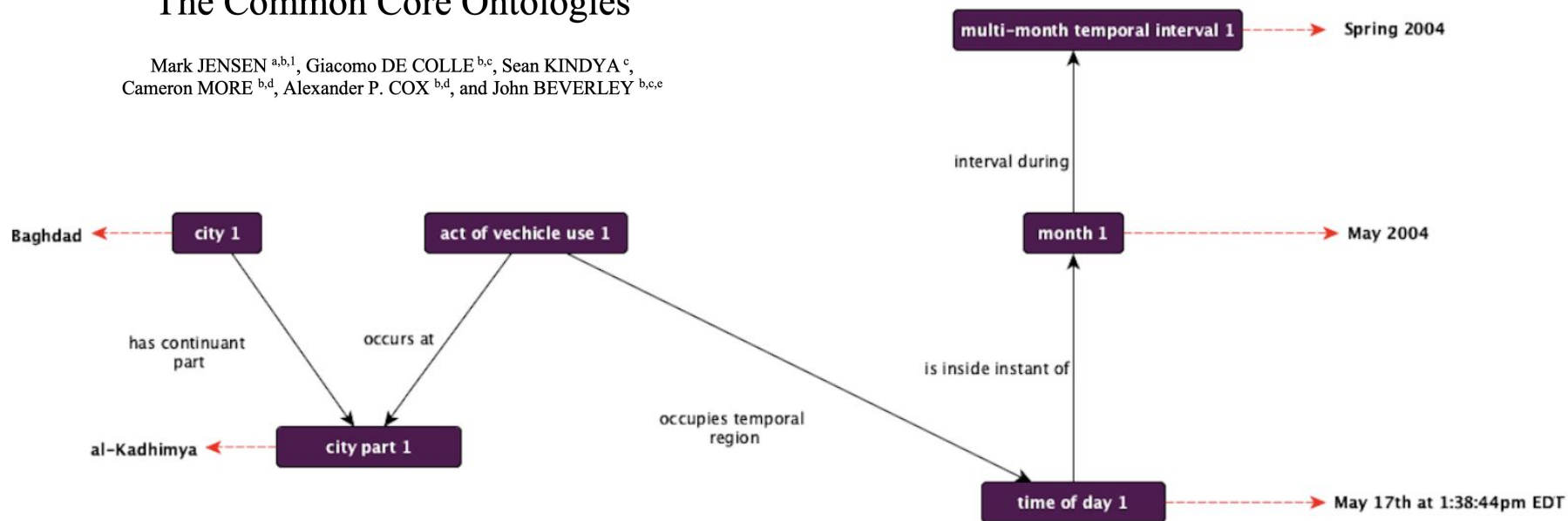
Mark JENSEN <sup>a,b,1</sup>, Giacomo DE COLLE <sup>b,c</sup>, Sean KINDYA <sup>c</sup>,  
Cameron MORE <sup>b,d</sup>, Alexander P. COX <sup>b,d</sup>, and John BEVERLEY <sup>b,c,e</sup>



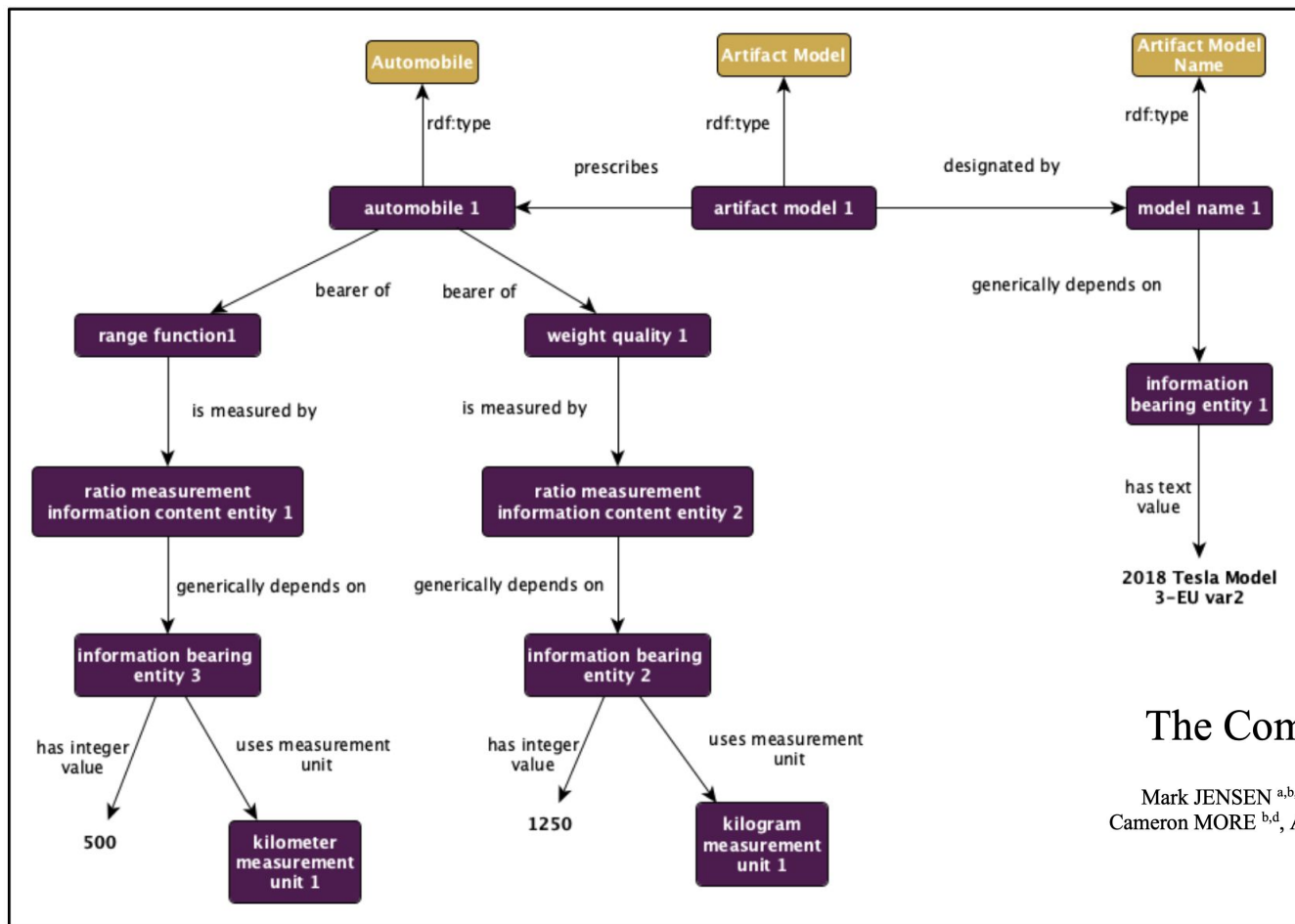
**Figure 1:** Tracing a Truck across Geospatial Regions

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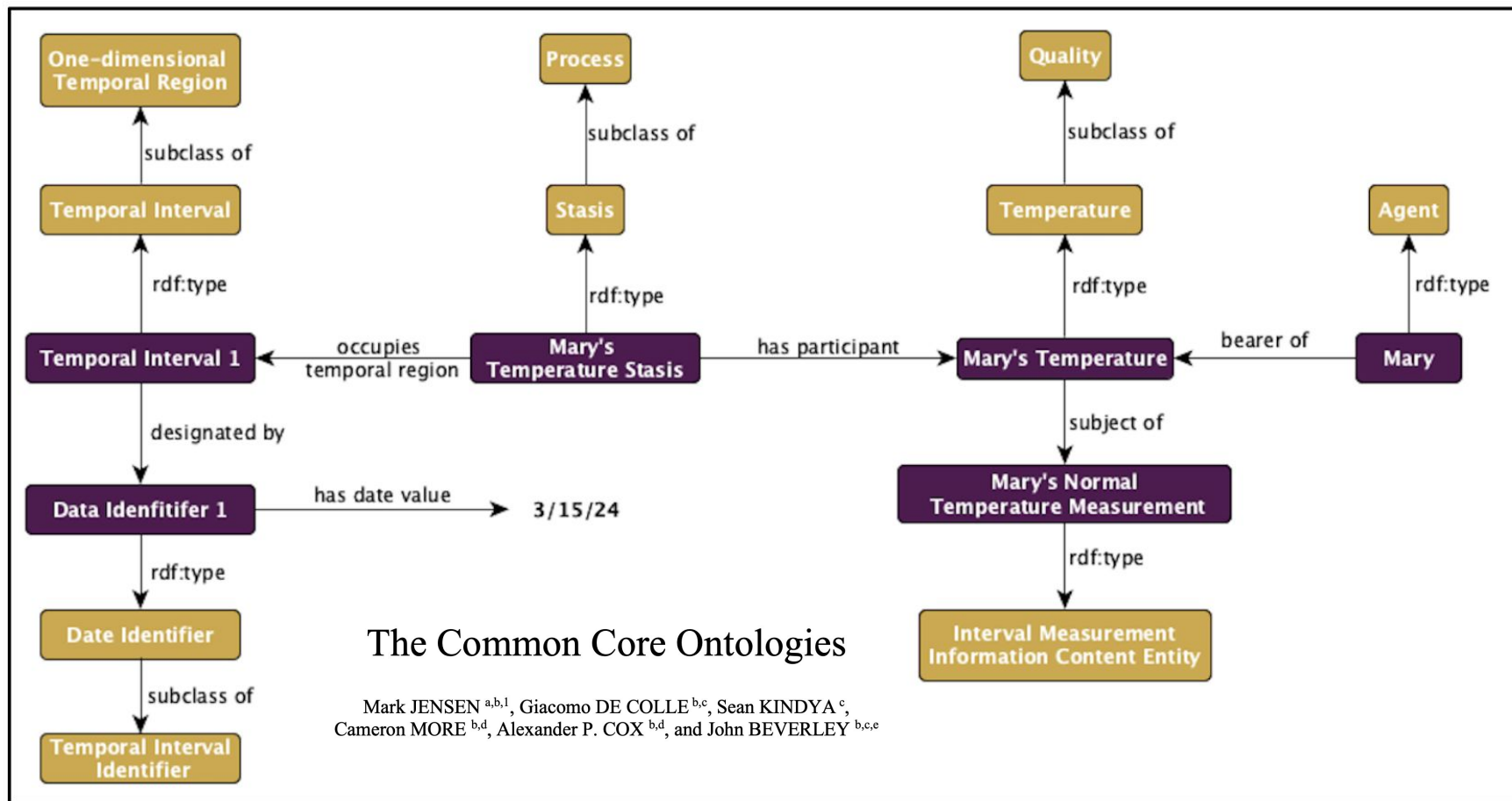
**Figure 2:** Tracking Processes across Temporal and Spatial Granularities



## The Common Core Ontologies

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*Figure 3: Measuring Outcomes of an Artifact Model Prescription*



**Figure 4: Measuring Constancy over Time**



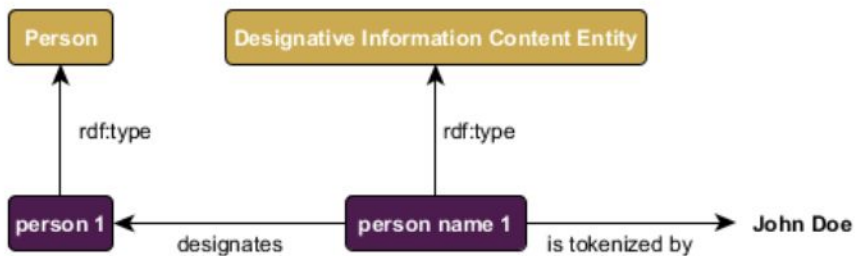
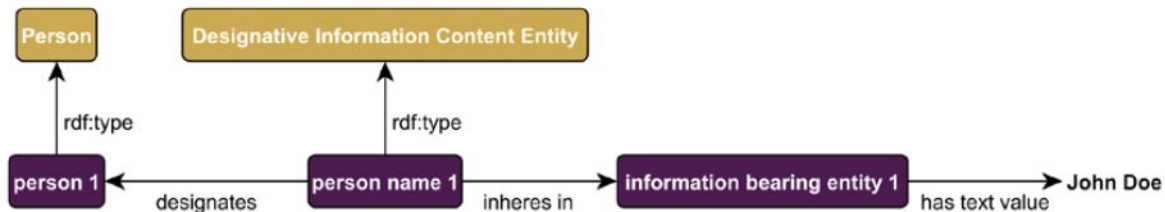


Figure 3: Tracking provenance vs. merely annotating.



**Modeling Information with  
the Common Core Ontologies**

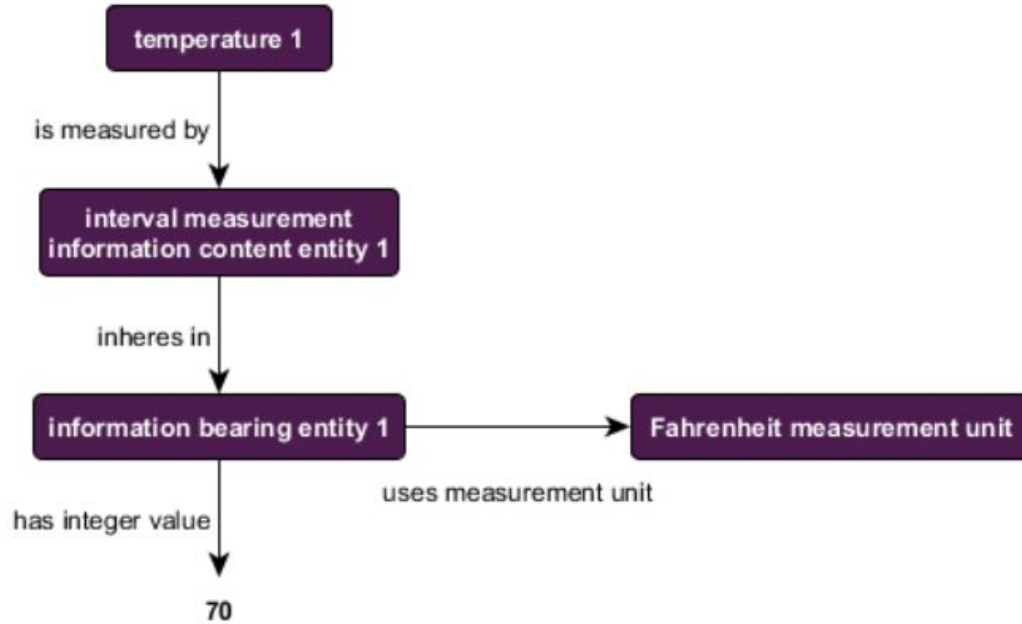
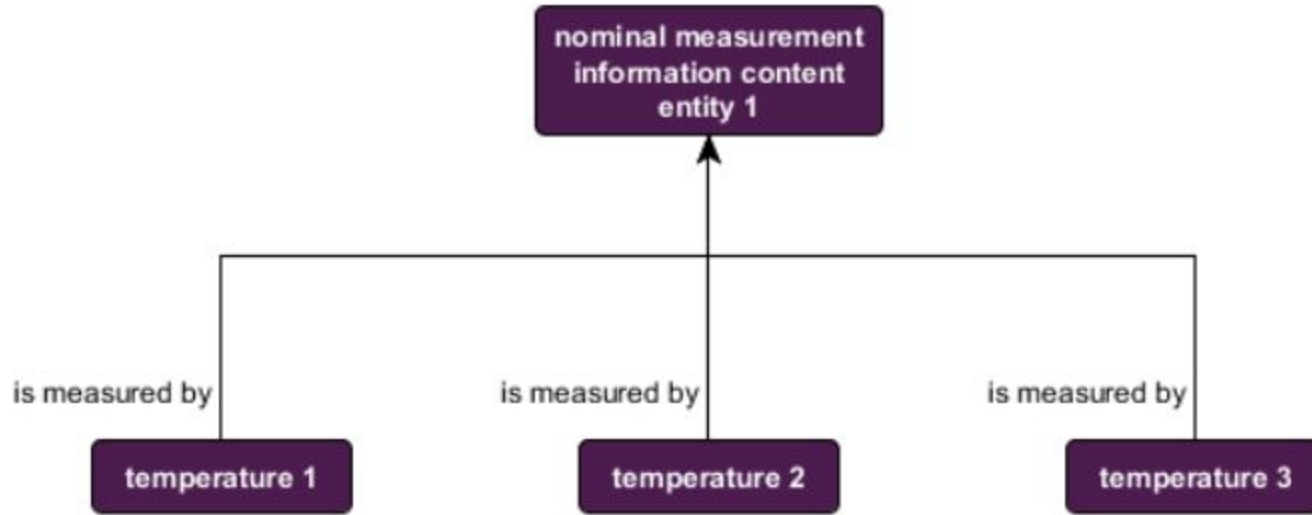
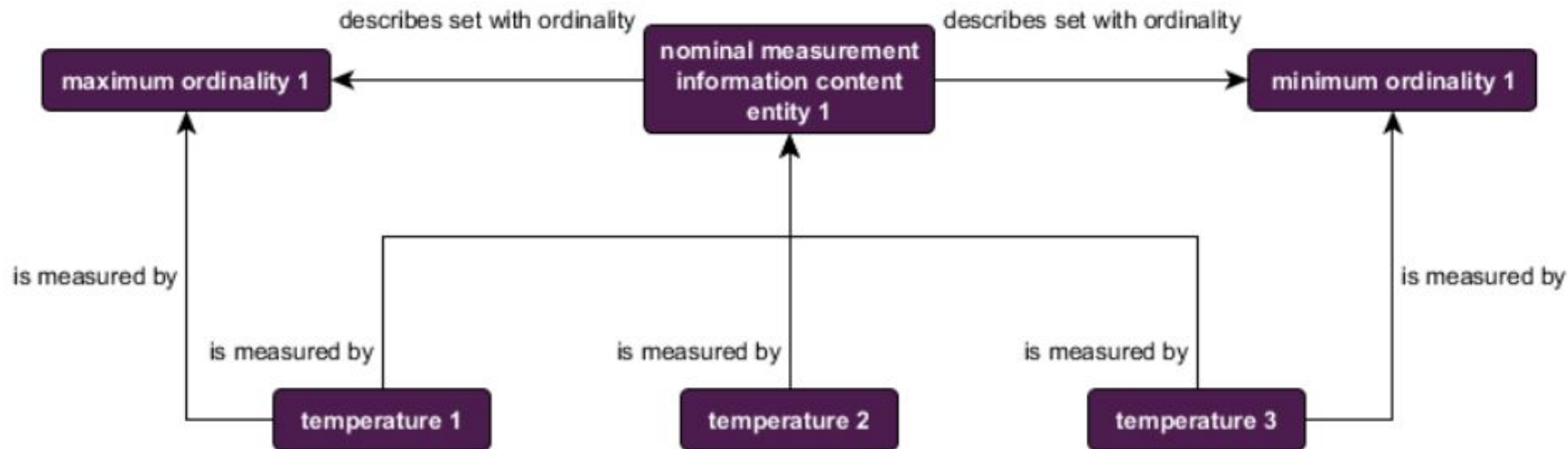


Figure 4: Relationship between measurement information and measurement unit.

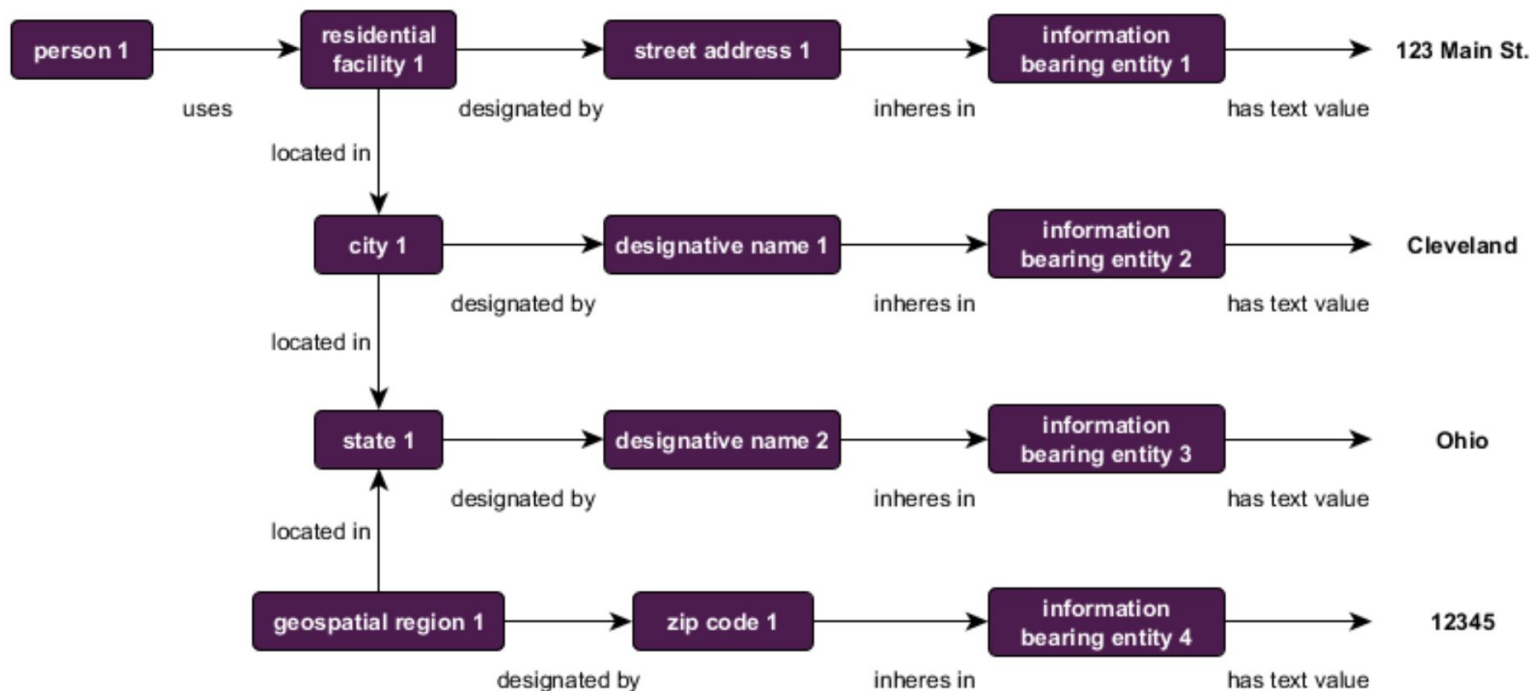




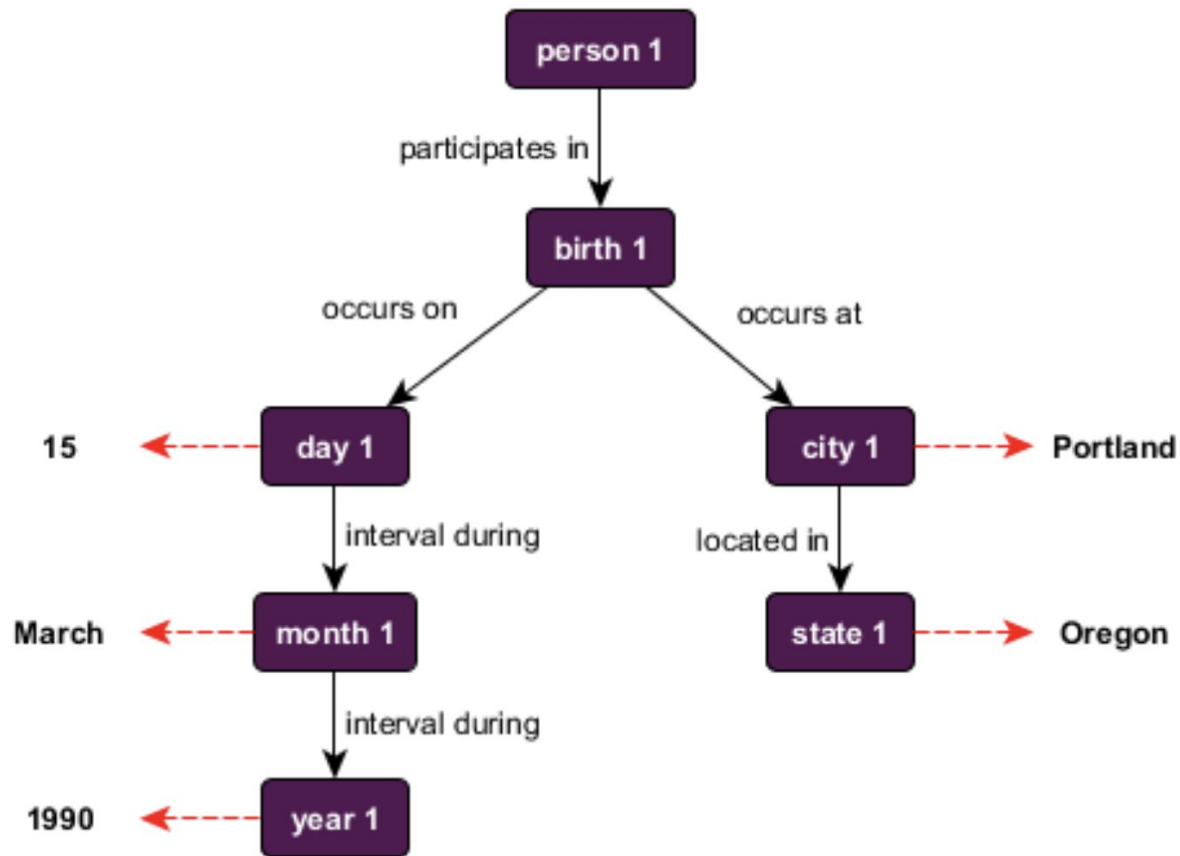
**Modeling Information with  
the Common Core Ontologies**



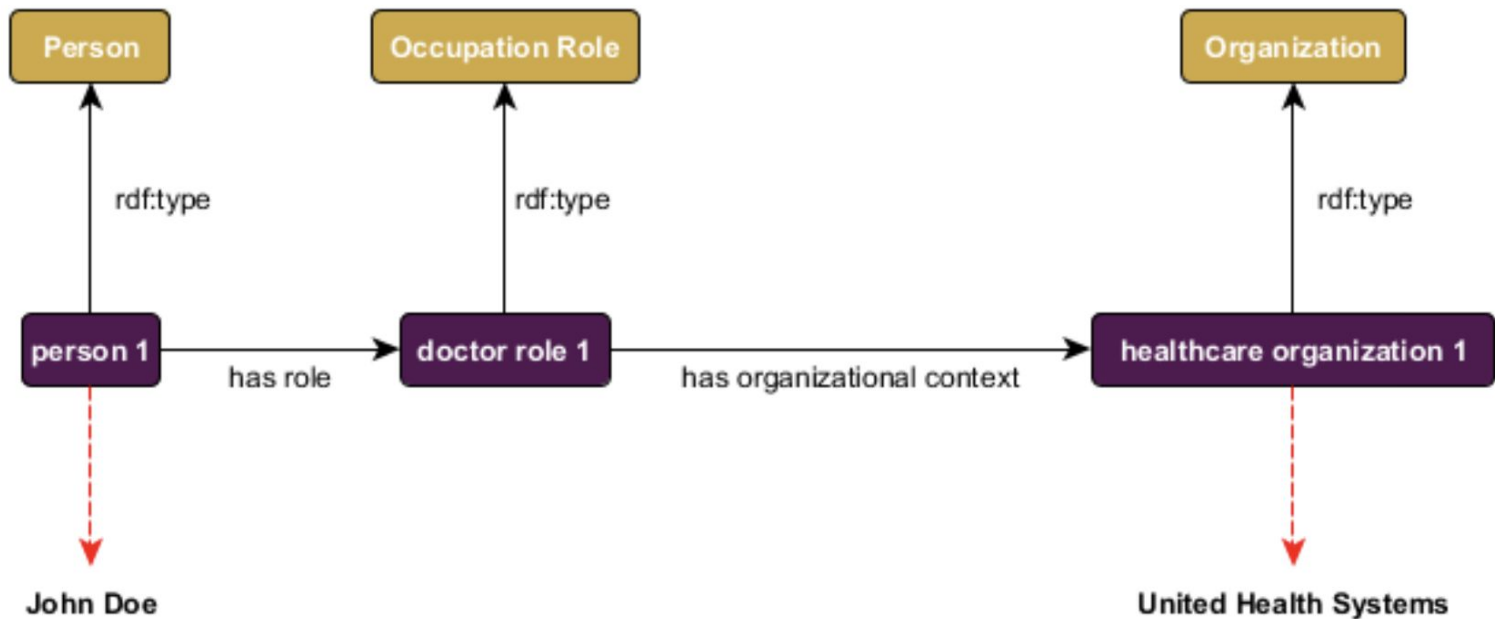
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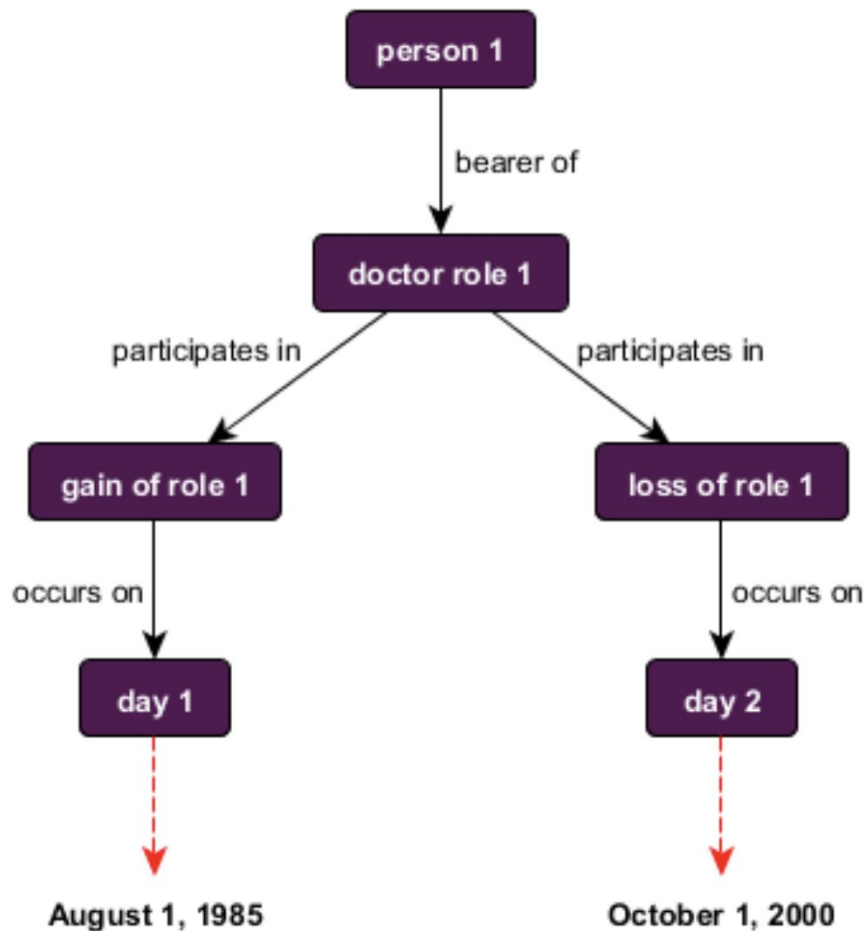
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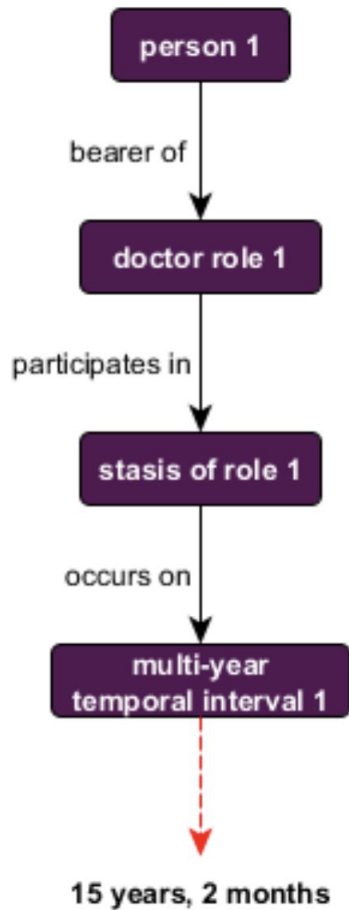


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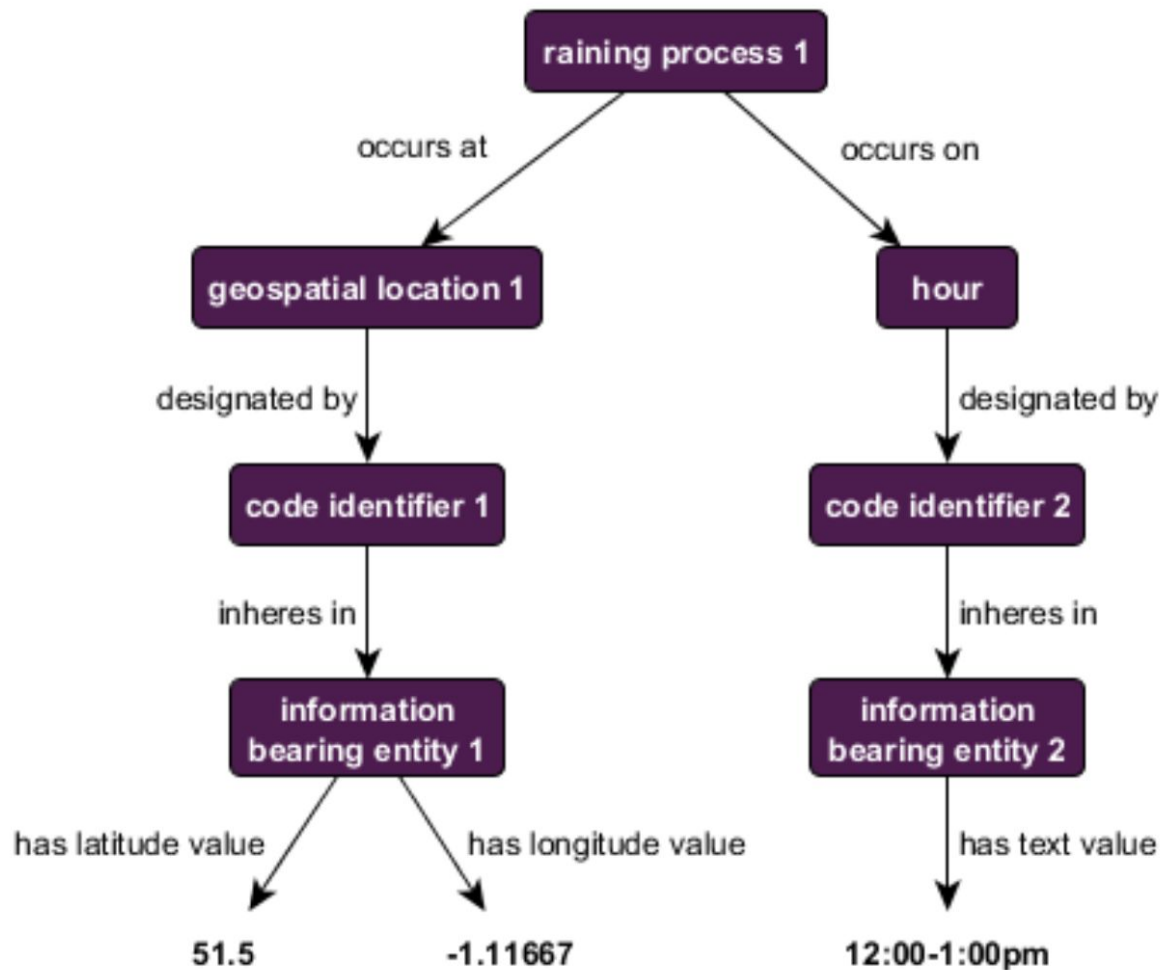


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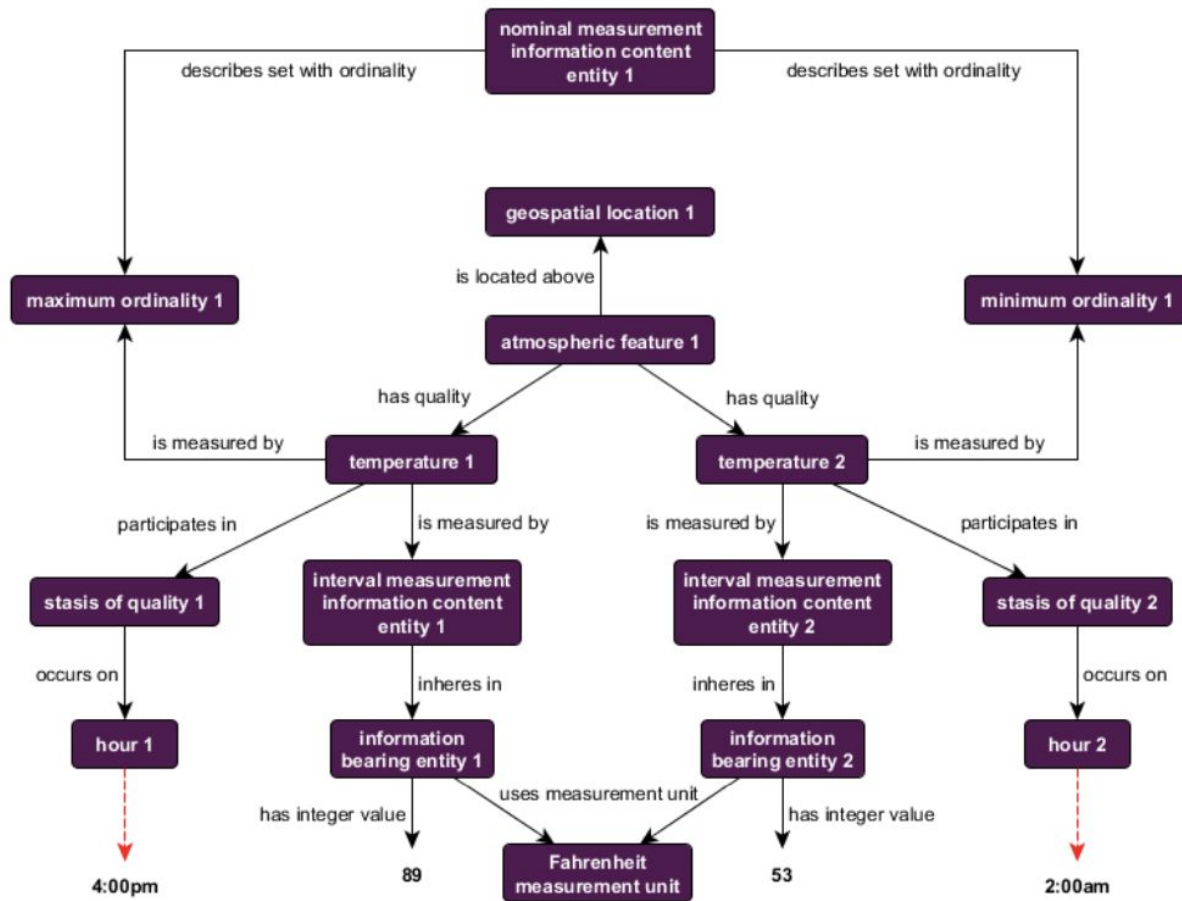




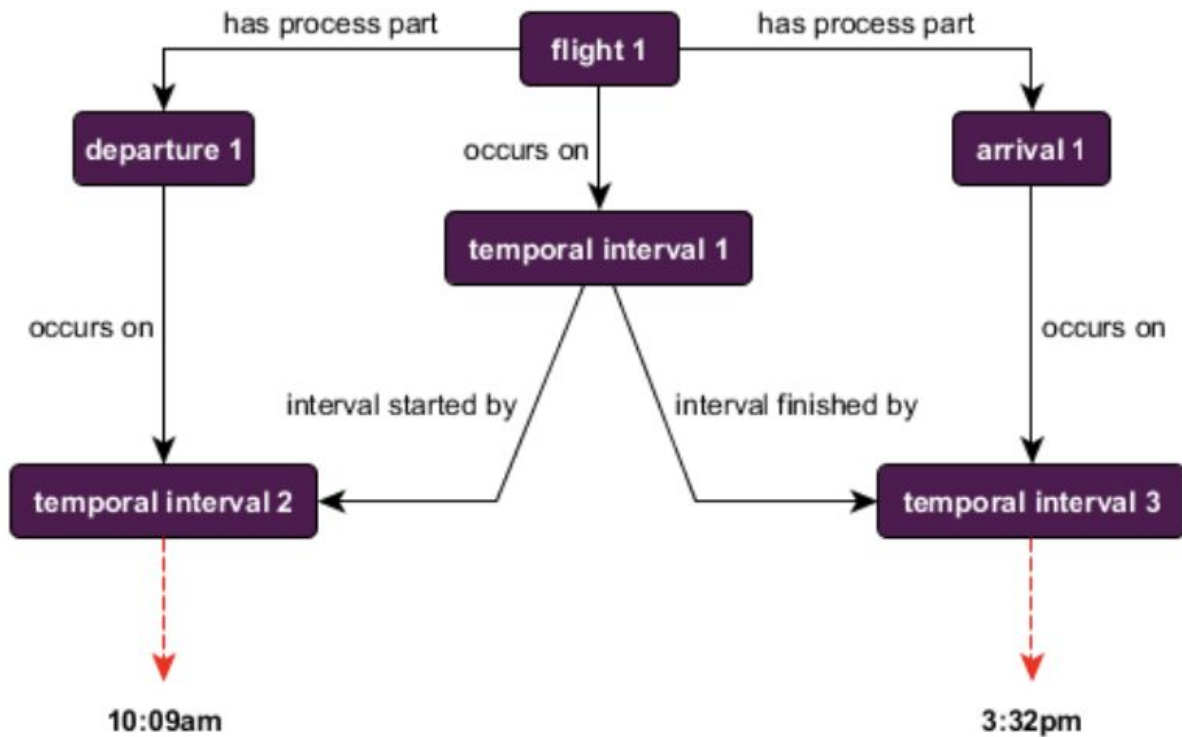
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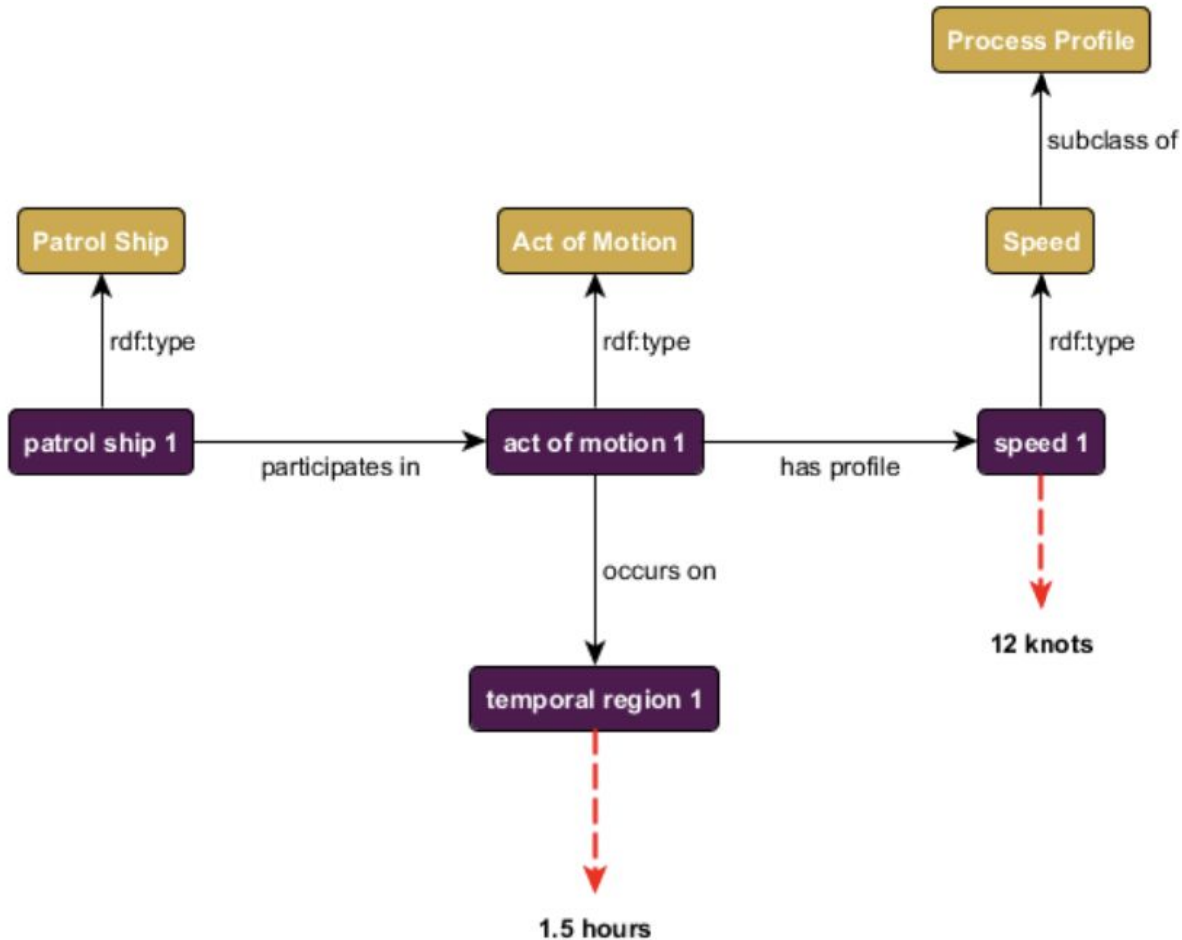
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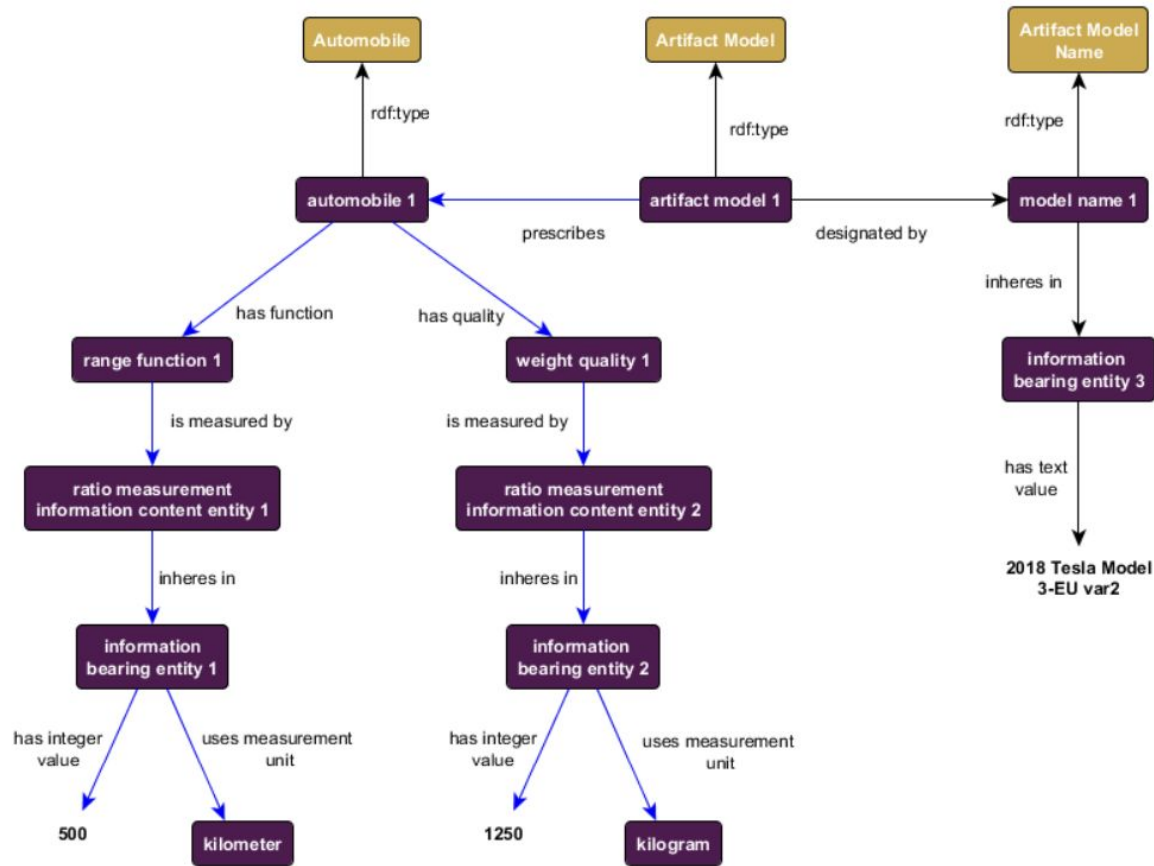
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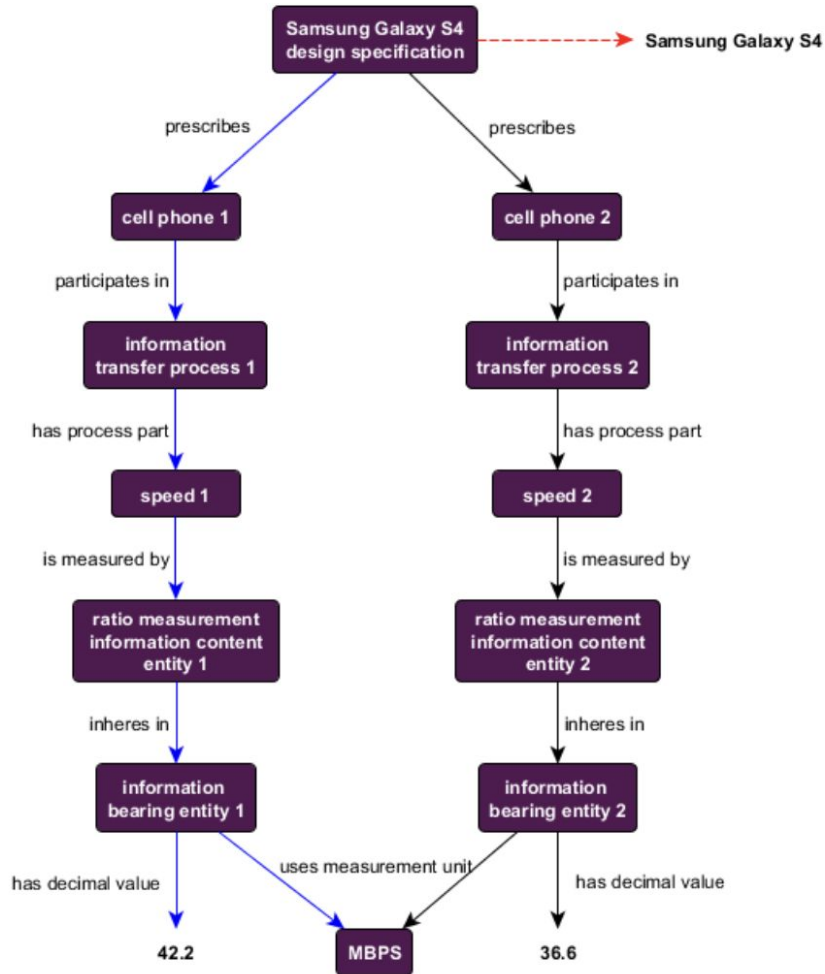
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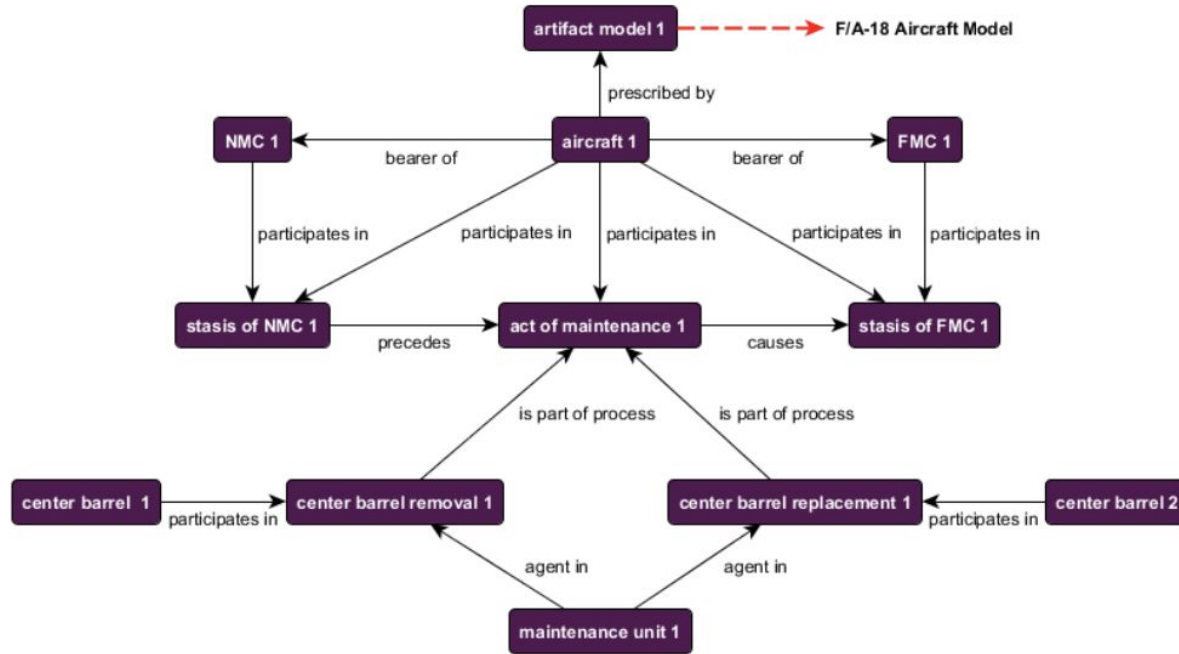
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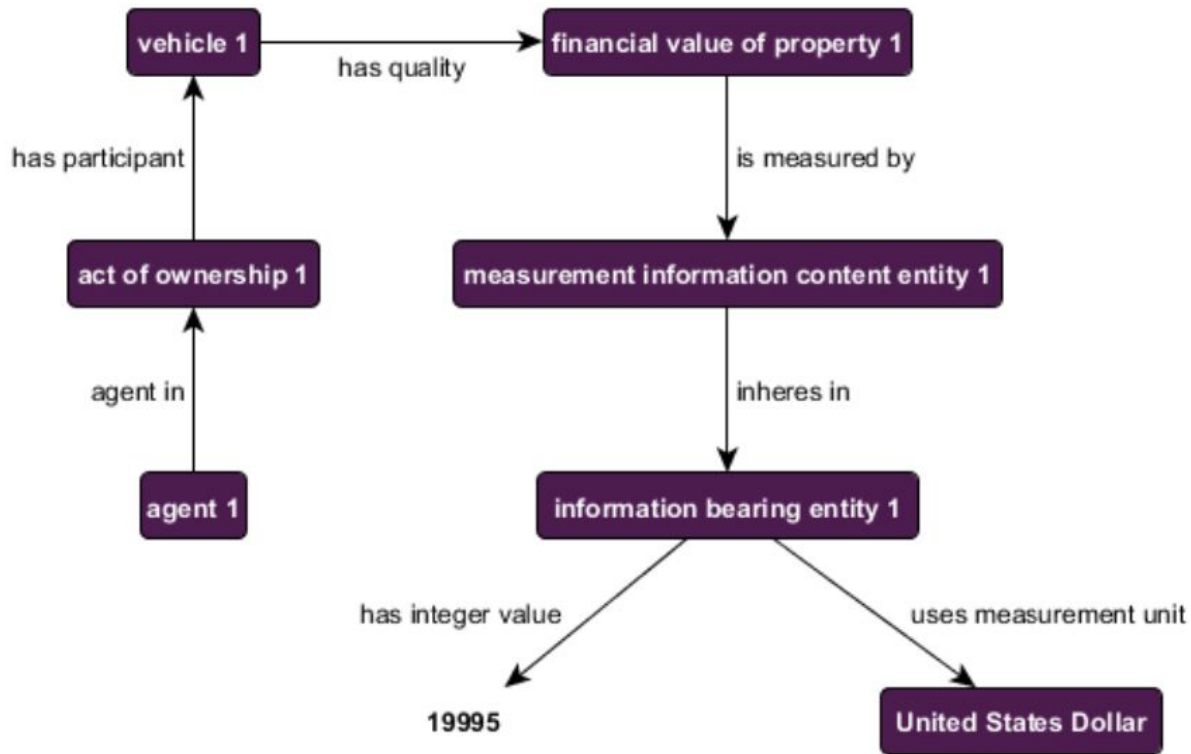


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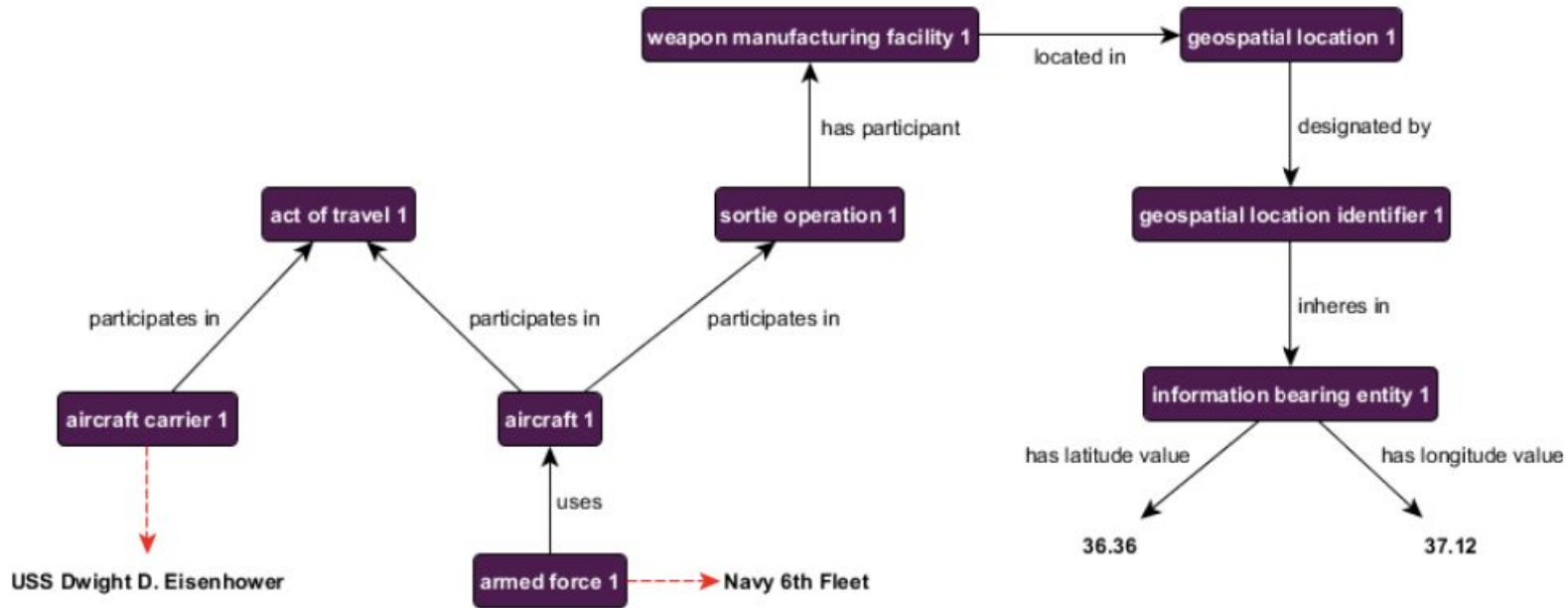


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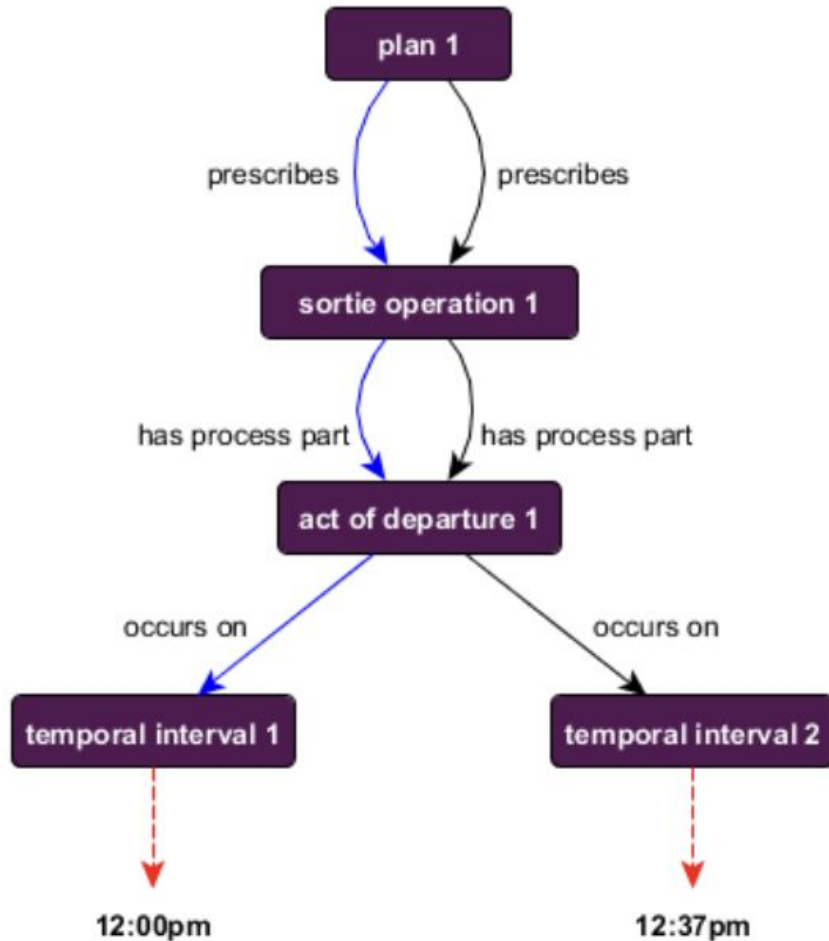




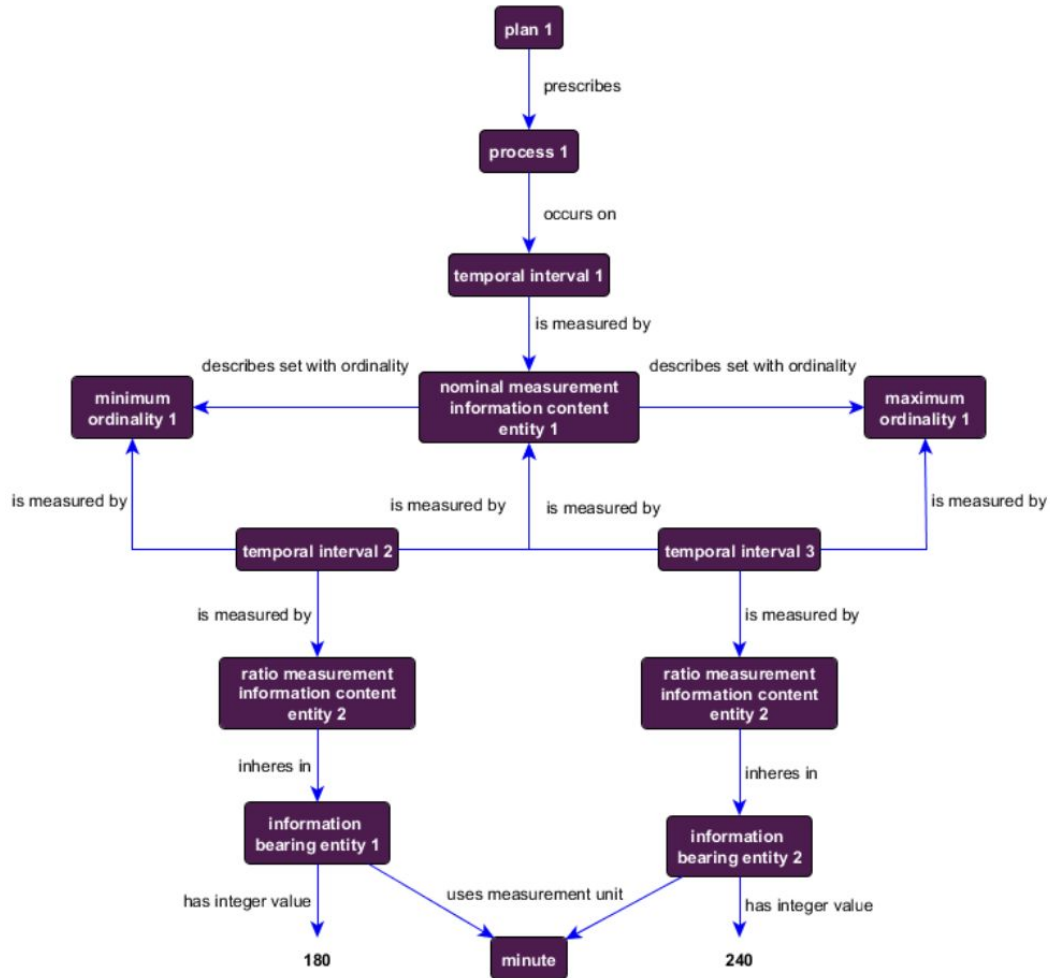
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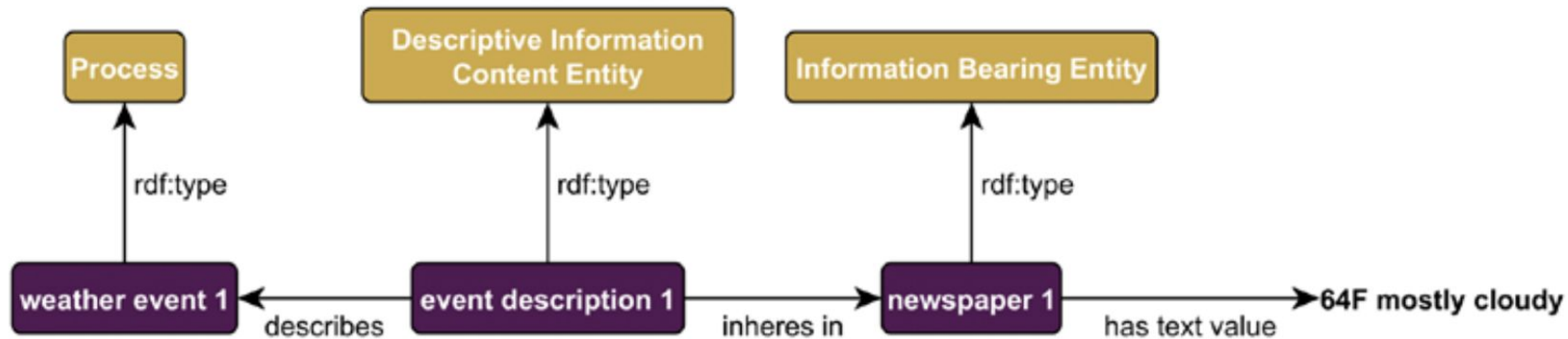


Figure 1: A *description* of an event

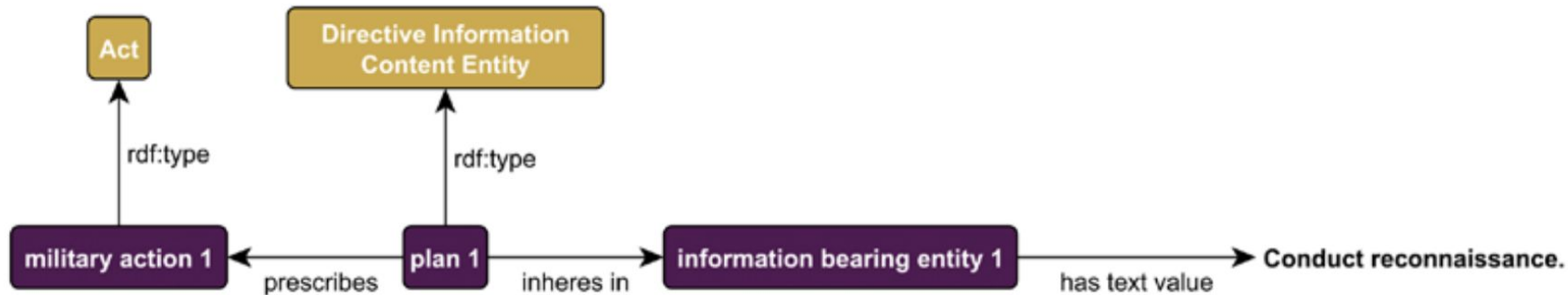


Figure 2: A *prescription* of an action



An Overview of the  
Common Core  
Ontologies

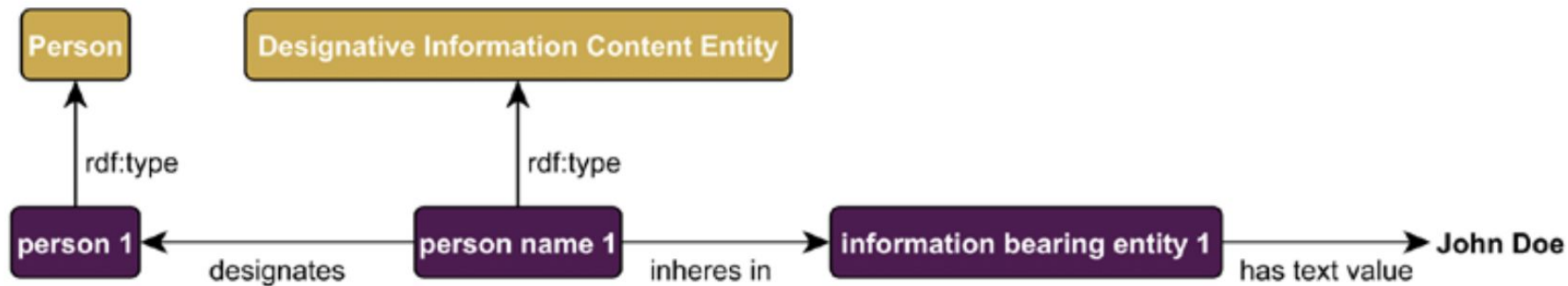


Figure 3: The *designation* of a person

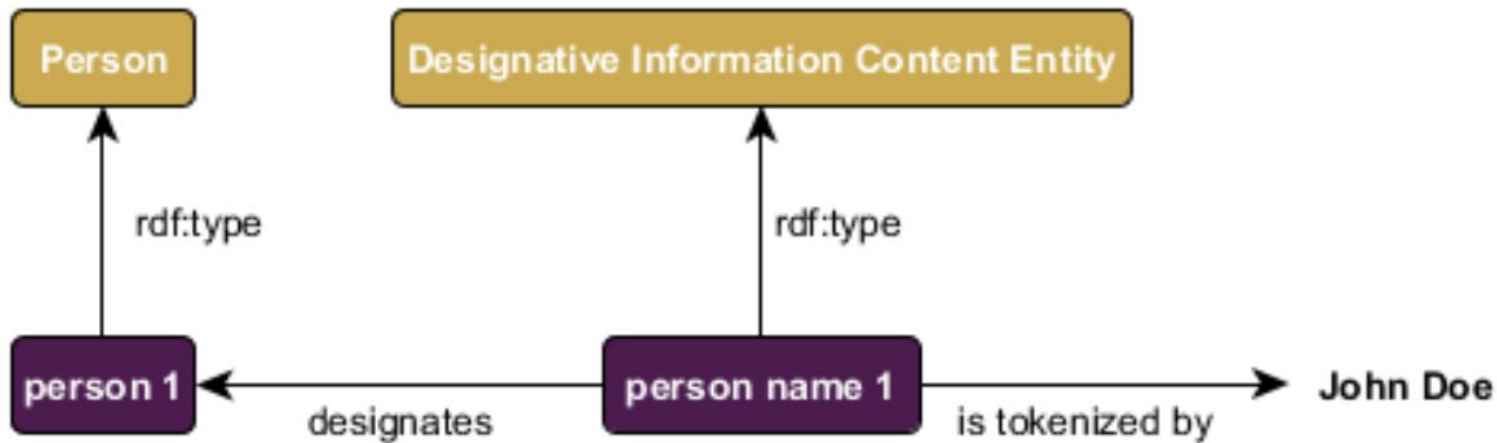


Figure 4: Annotating information with literal values.



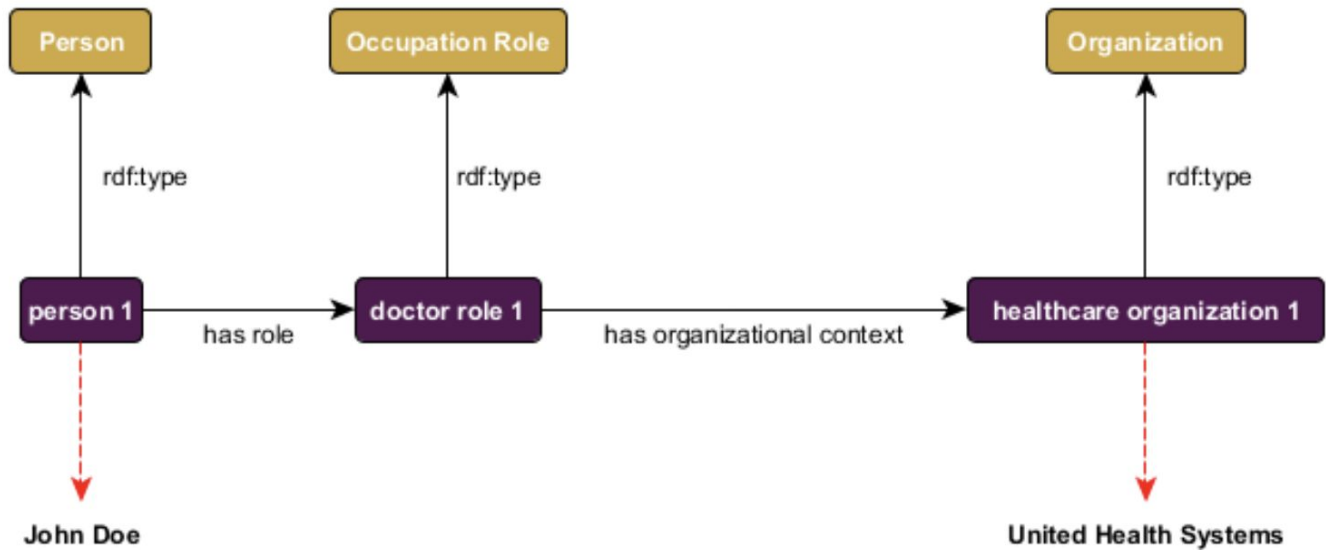


Figure 5: Persons bear roles in organizational contexts



**An Overview of the  
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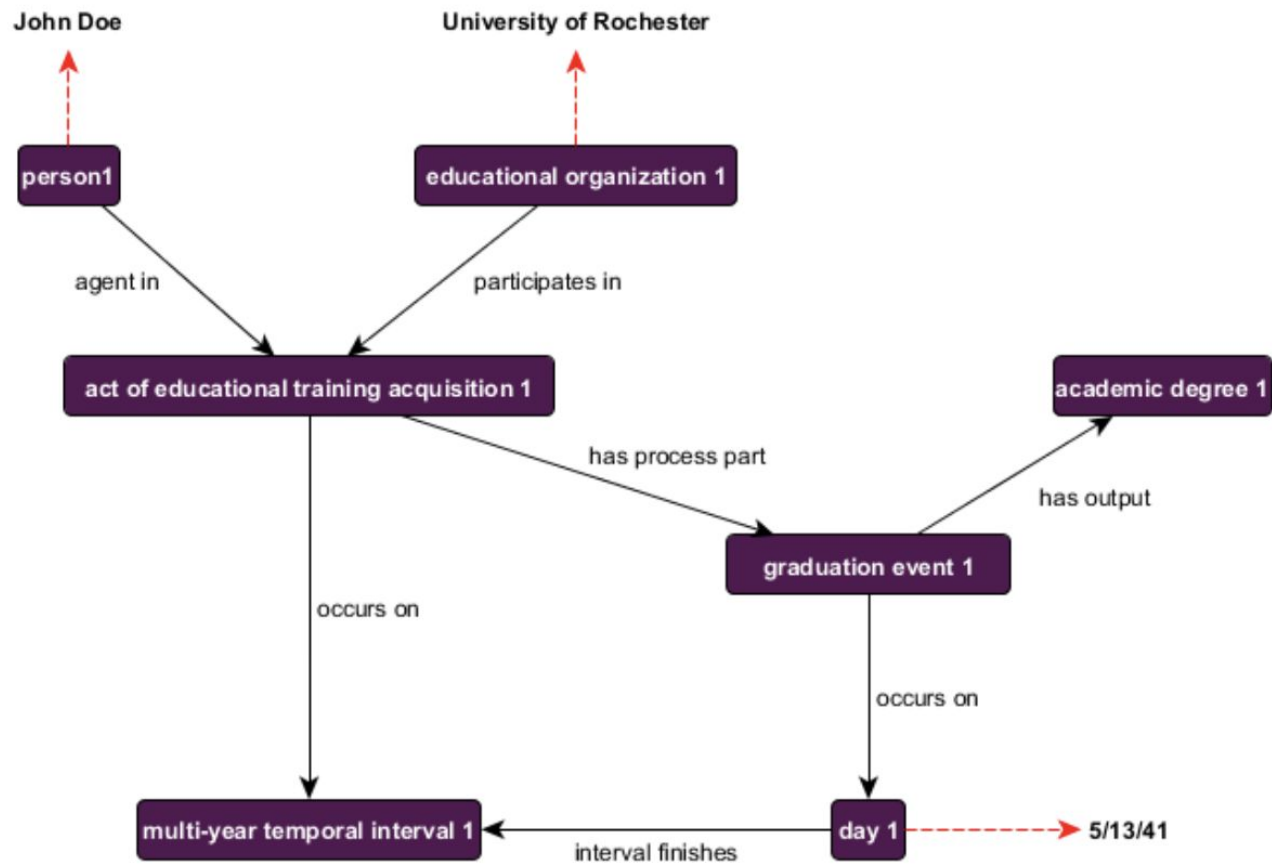


Figure 6: Persons and things participate in events, which occur at times



## An Overview of the Common Core Ontologies

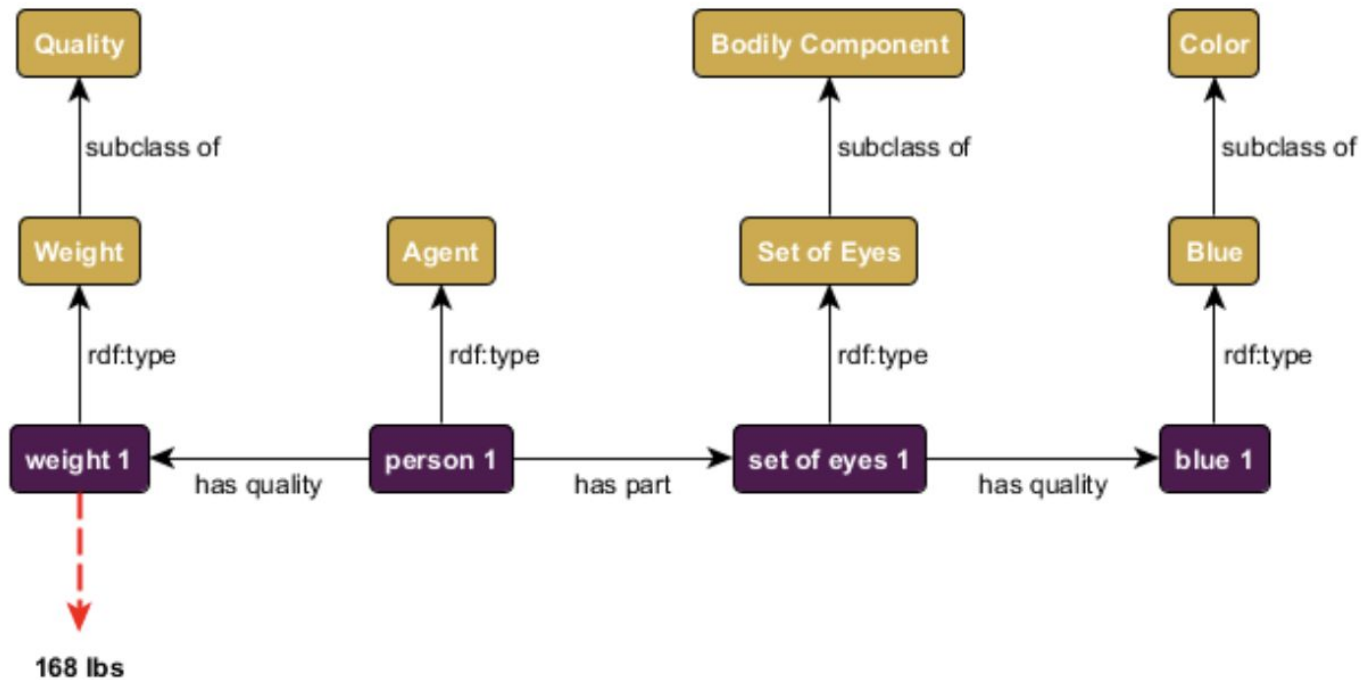


Figure 7: Attributes of a person



## An Overview of the Common Core Ontologies

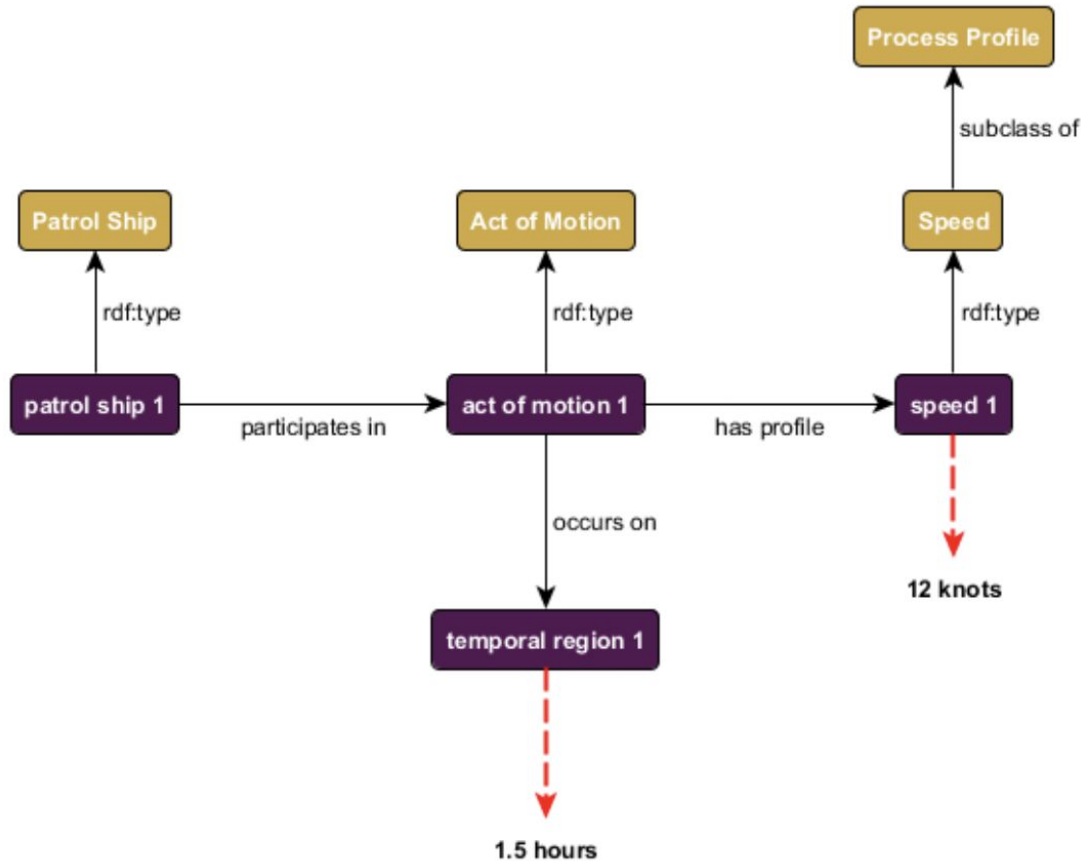


Figure 8: Attributes of a moving ship



## An Overview of the Common Core Ontologies

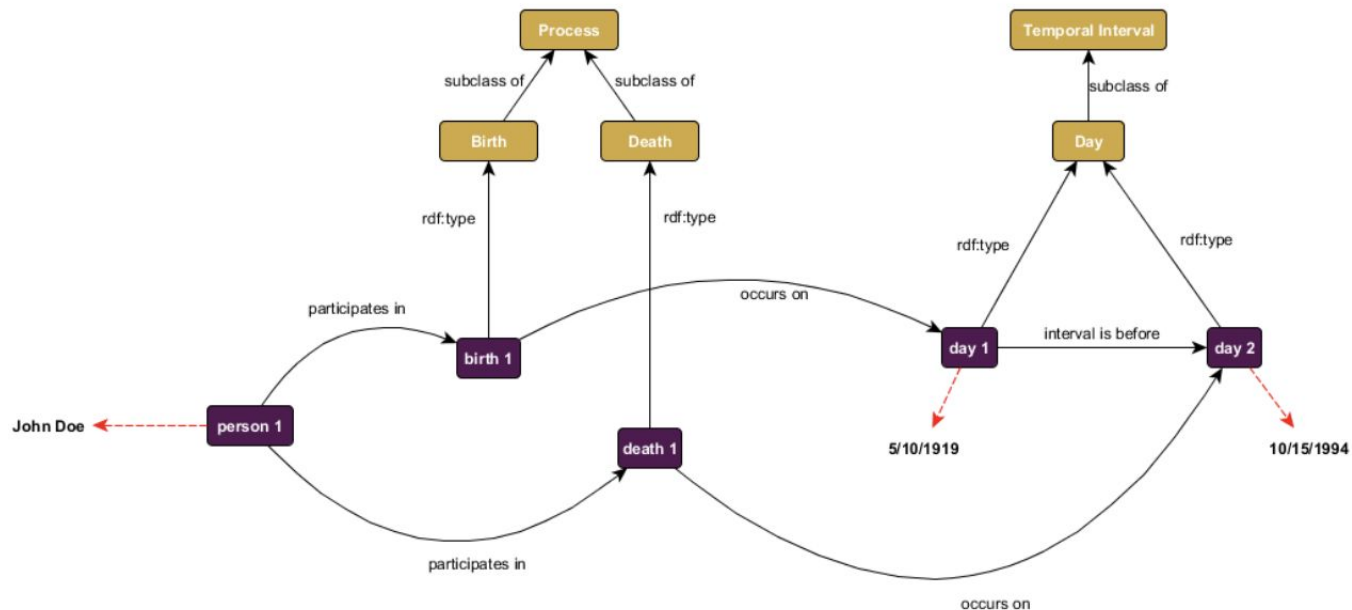


Figure 9: A person's date of birth and date of death



**An Overview of the  
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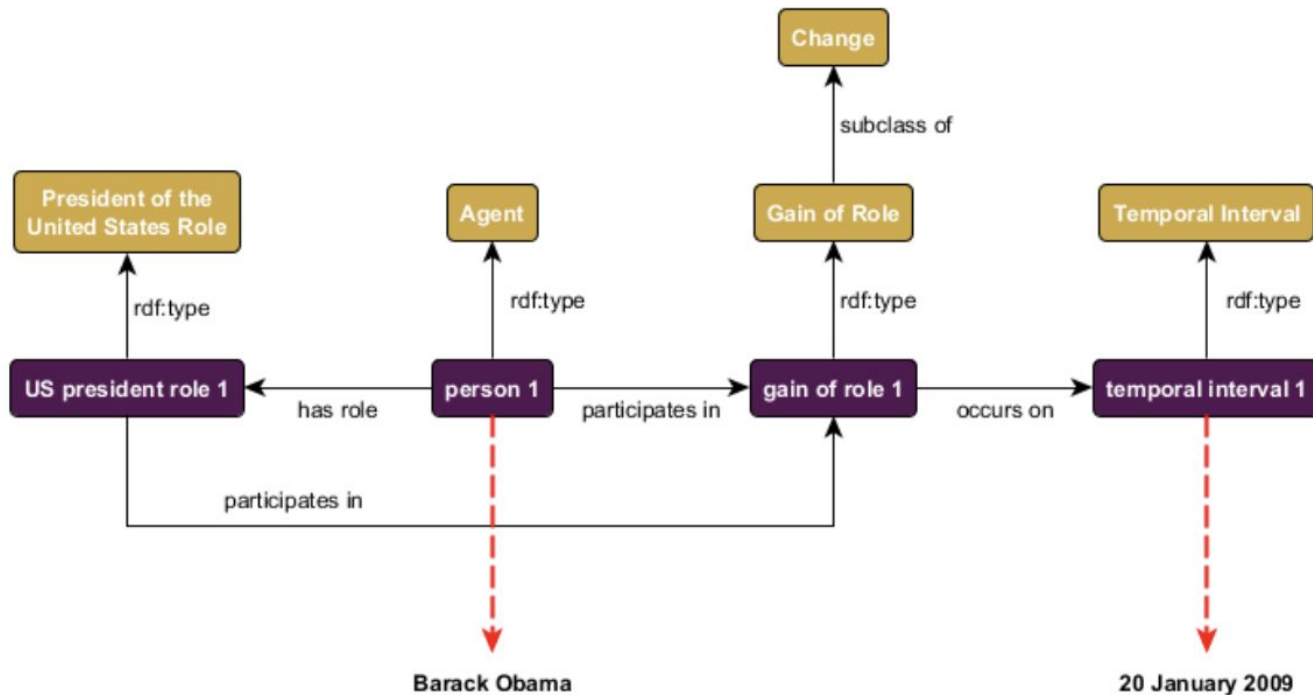


Figure 10: Obama gains the role of president

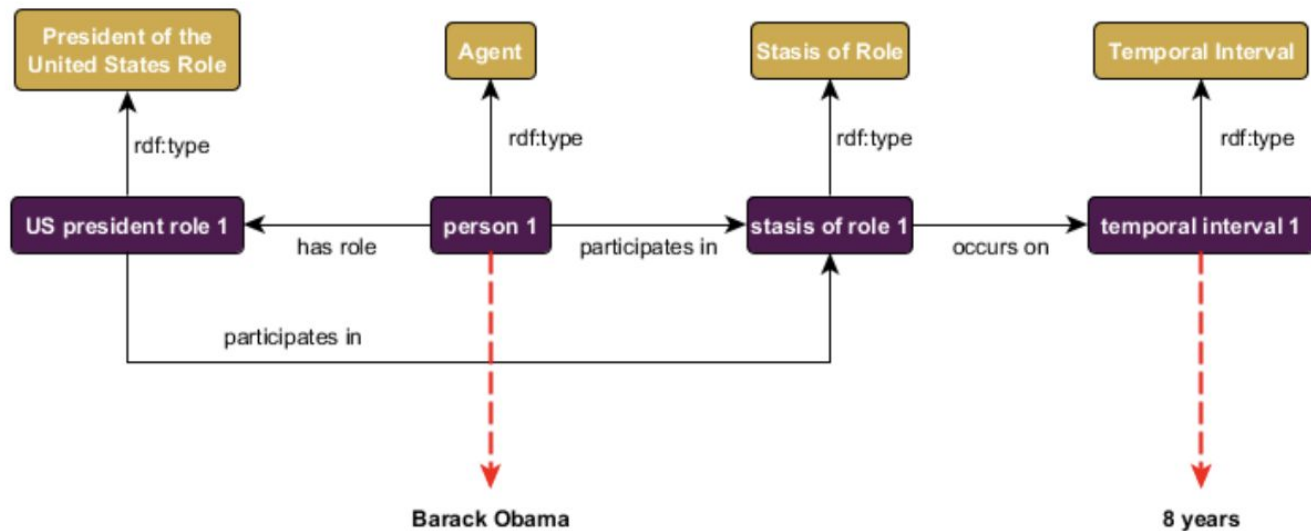


Figure 11: Obama bears the president role for 8 years



An Overview of the  
Common Core  
Ontologies

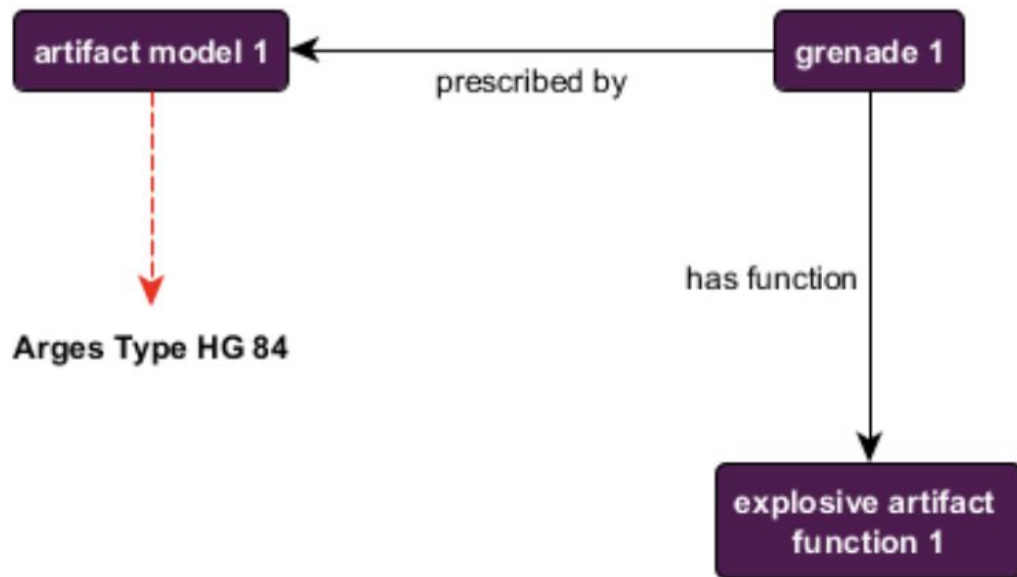


Figure 12: An artifact designed to have a function



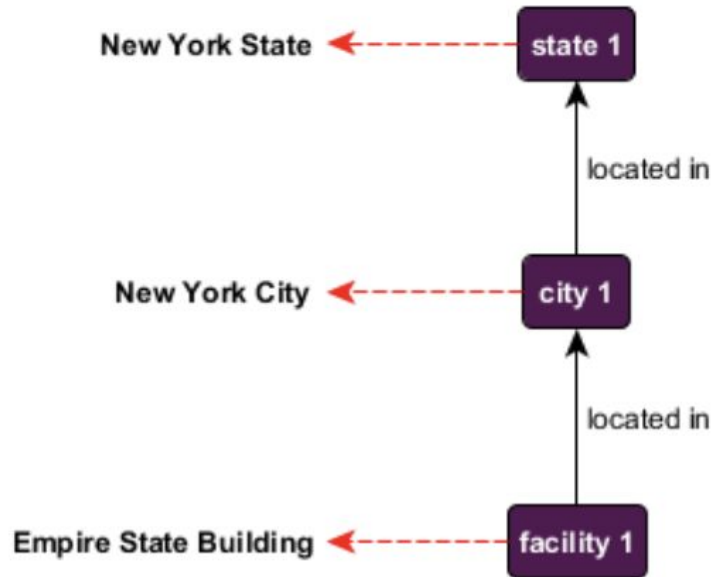


Figure 13: The location of the Empire State Building



**An Overview of the  
Common Core  
Ontologies**

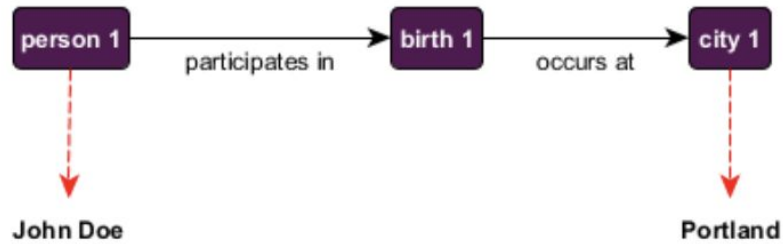


Figure 14: Where a birth event occurs



**An Overview of the  
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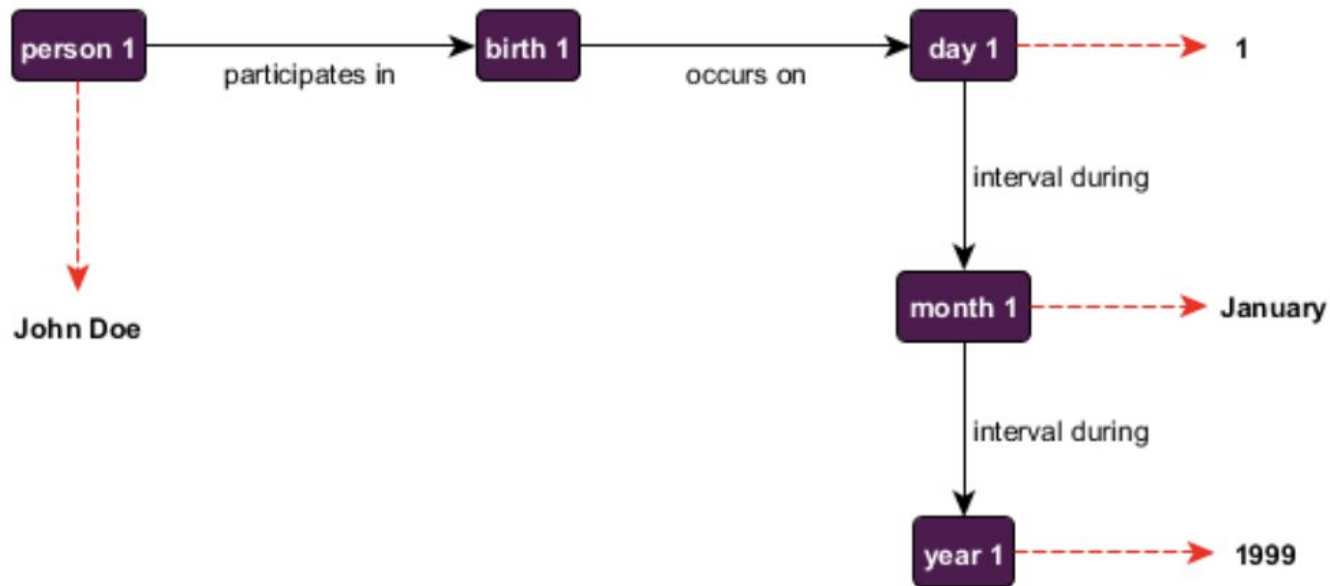


Figure 15: When a birth event occurs

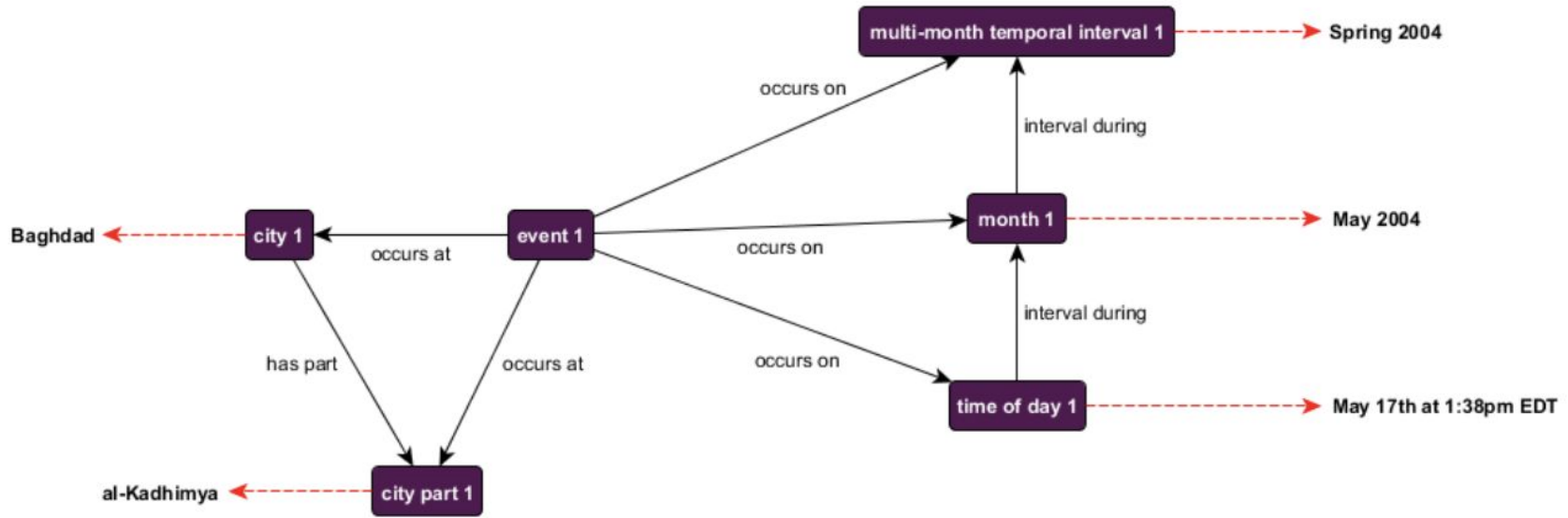


Figure 16: Imprecise times and dates for an event



**An Overview of the  
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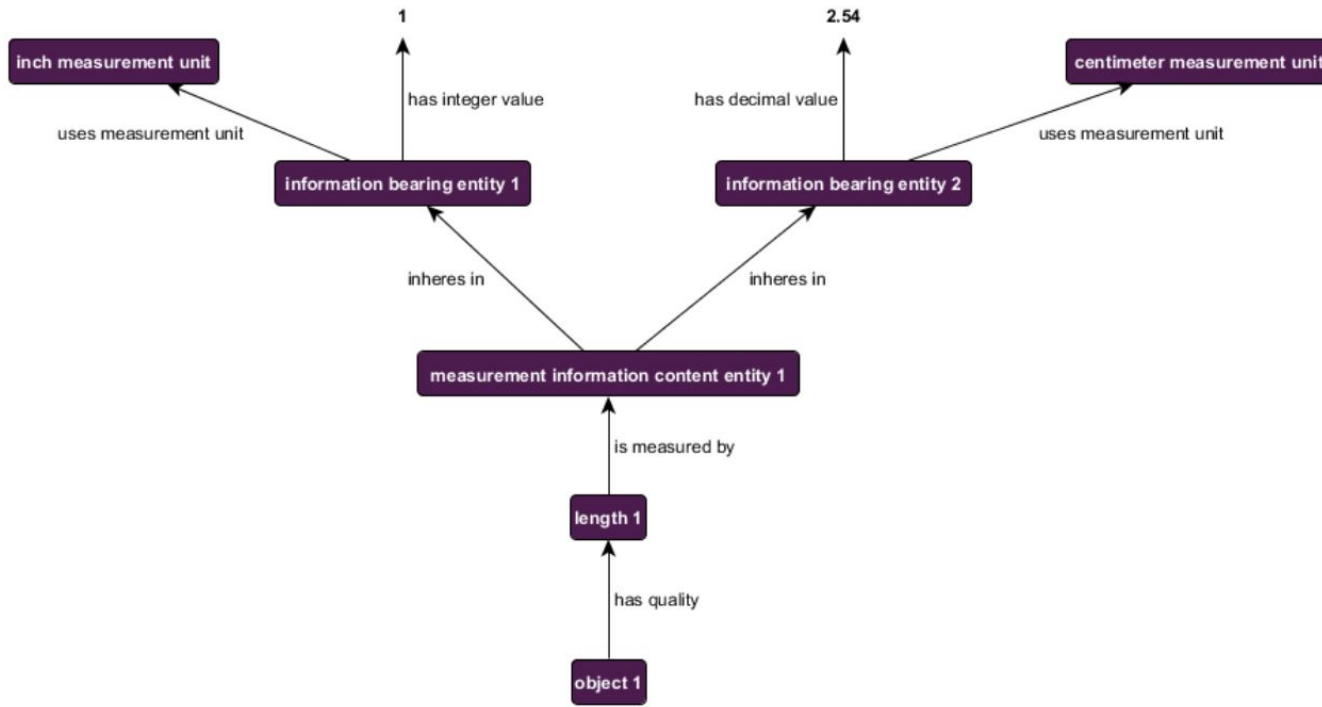
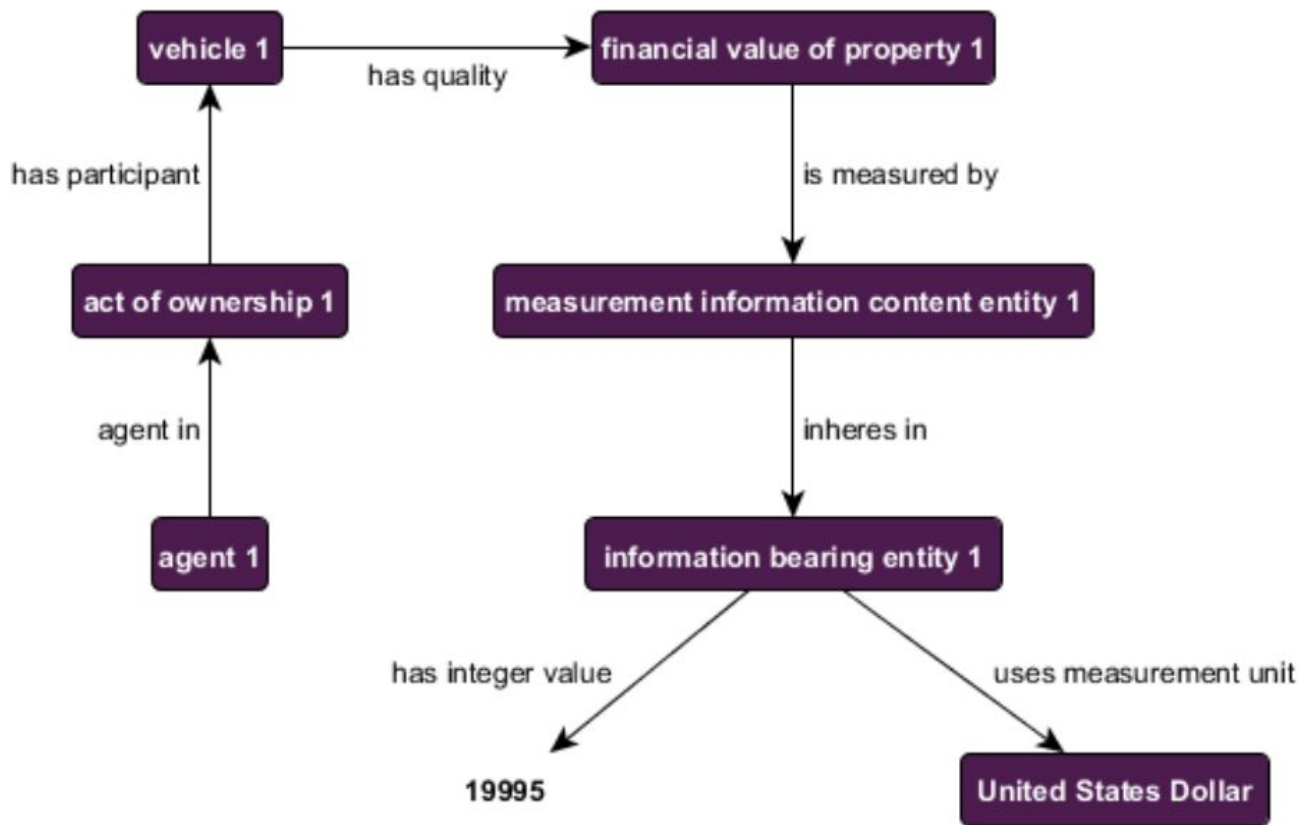


Figure 17: Using two different measuring units



## An Overview of the Common Core Ontologies



## An Overview of the Common Core Ontologies

Figure 18: Expressing financial value in numbers and currency units

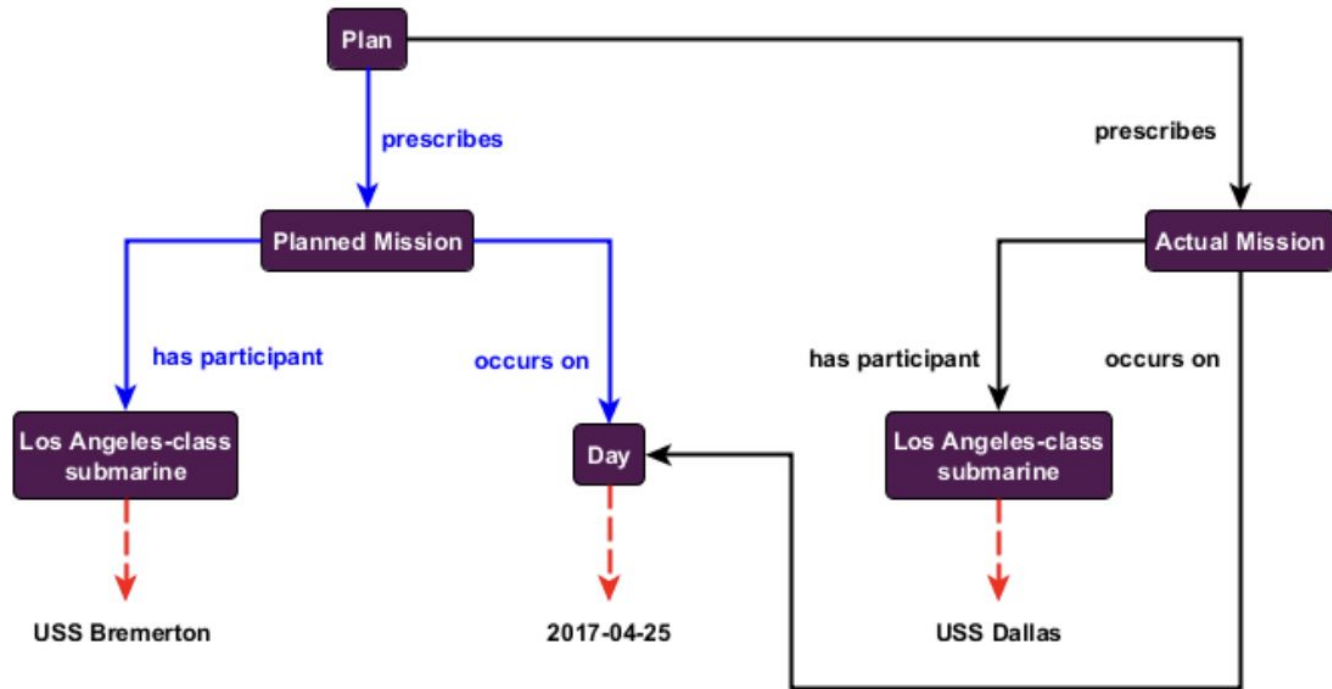


Figure 19: A planned vs. actual mission

Basic Formal Ontology: Case Studies

J. Neil Otte<sup>1</sup>, John Beverley<sup>2</sup>, and Alan Ruttenberg<sup>3</sup>

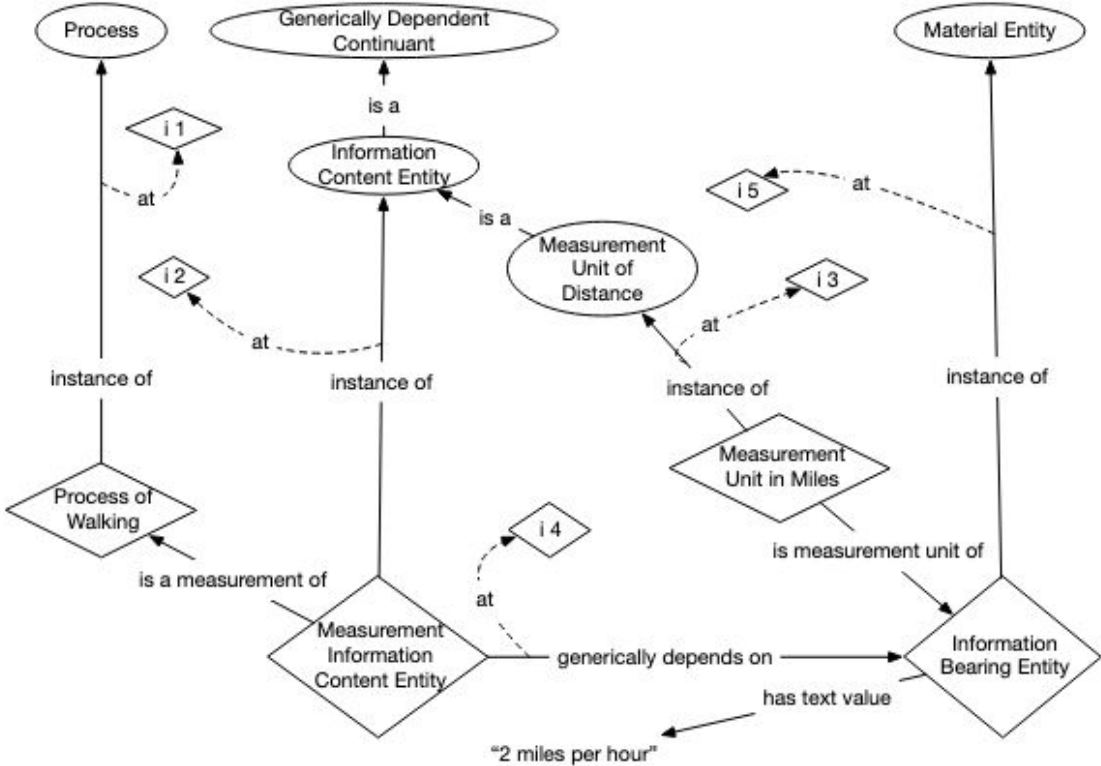


Figure 3: Relationships among Information Content Entities and Bearers



## Basic Formal Ontology: Case Studies

J. Neil Otte<sup>1</sup>, John Beverley<sup>2</sup>, and Alan Ruttenberg<sup>3</sup>

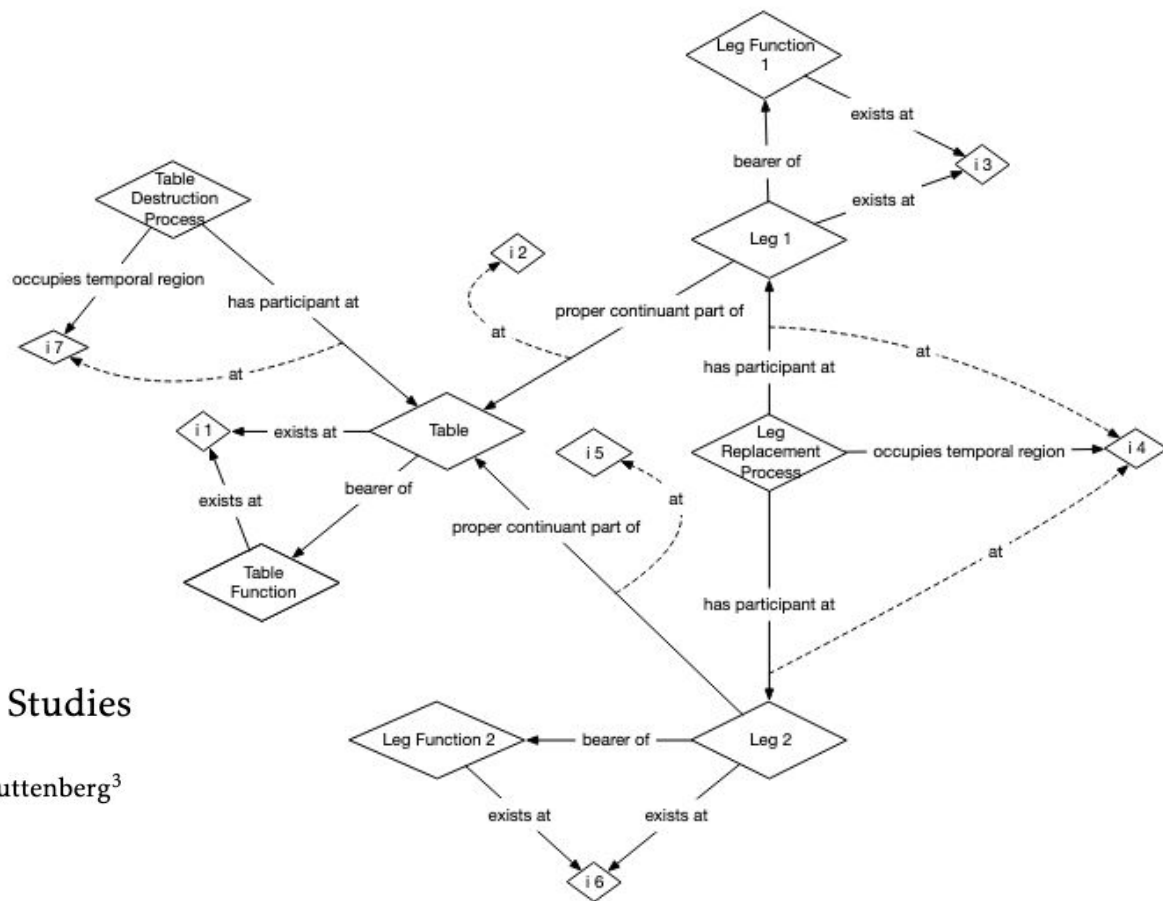


Figure 4: Table Undergoing Change in Case 1

## Basic Formal Ontology: Case Studies

J. Neil Otte<sup>1</sup>, John Beverley<sup>2</sup>, and Alan Ruttenberg<sup>3</sup>

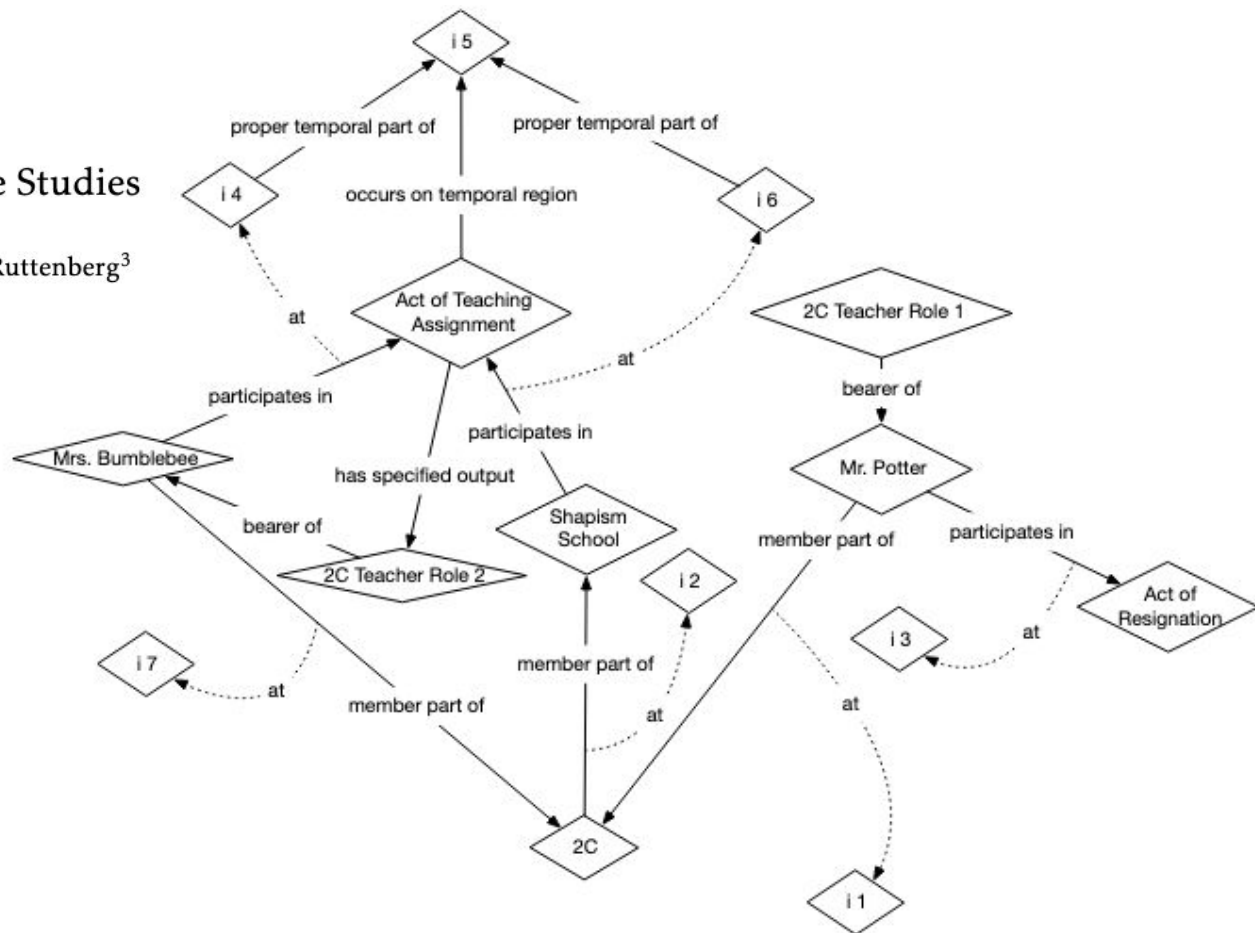


Figure 5: Resignation and Assignment of 2C Teacher Roles in Case 2

## Basic Formal Ontology: Case Studies

J. Neil Otte<sup>1</sup>, John Beverley<sup>2</sup>, and Alan Ruttenberg<sup>3</sup>

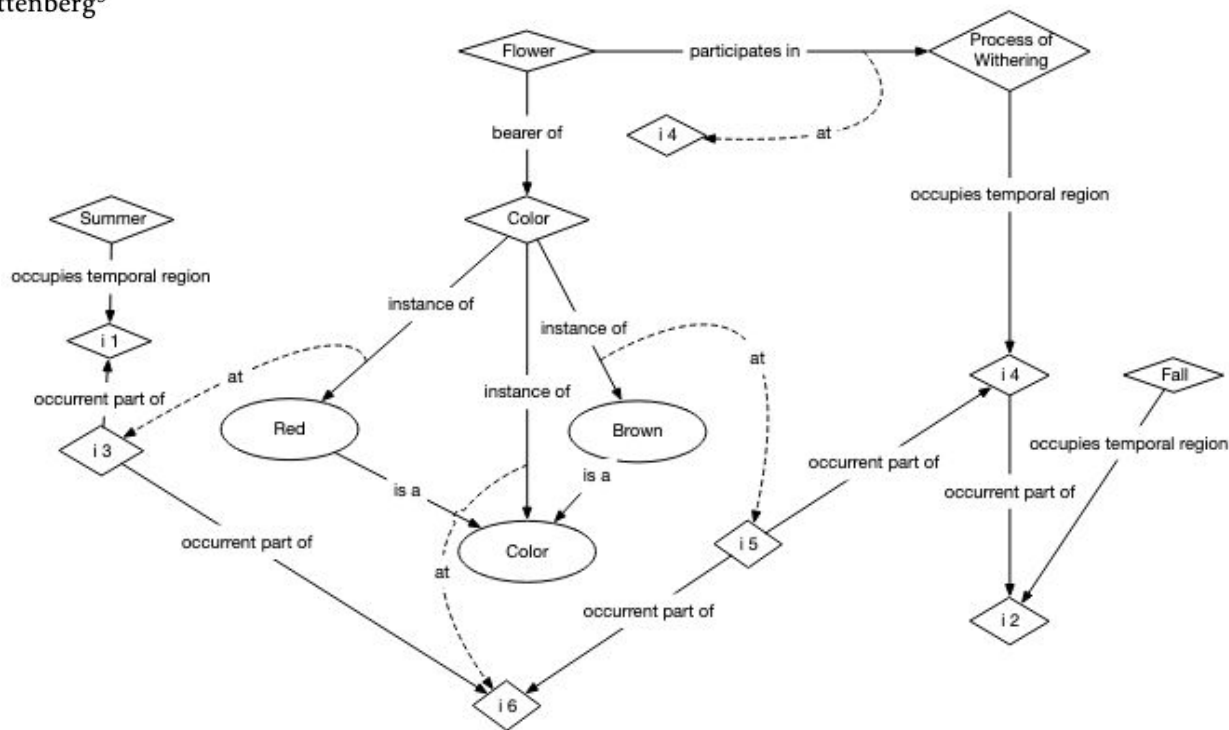


Figure 6: Petal Changing Color in Case 3

## Basic Formal Ontology: Case Studies

J. Neil Otte<sup>1</sup>, John Beverley<sup>2</sup>, and Alan Ruttenberg<sup>3</sup>

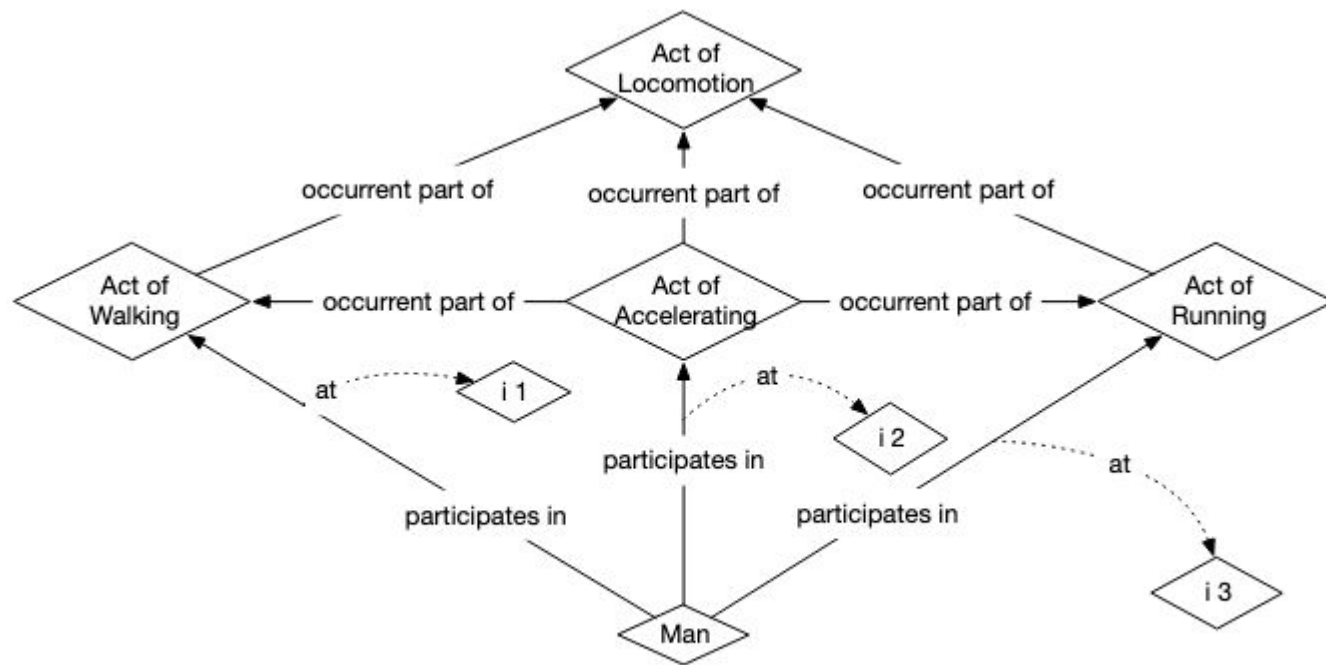
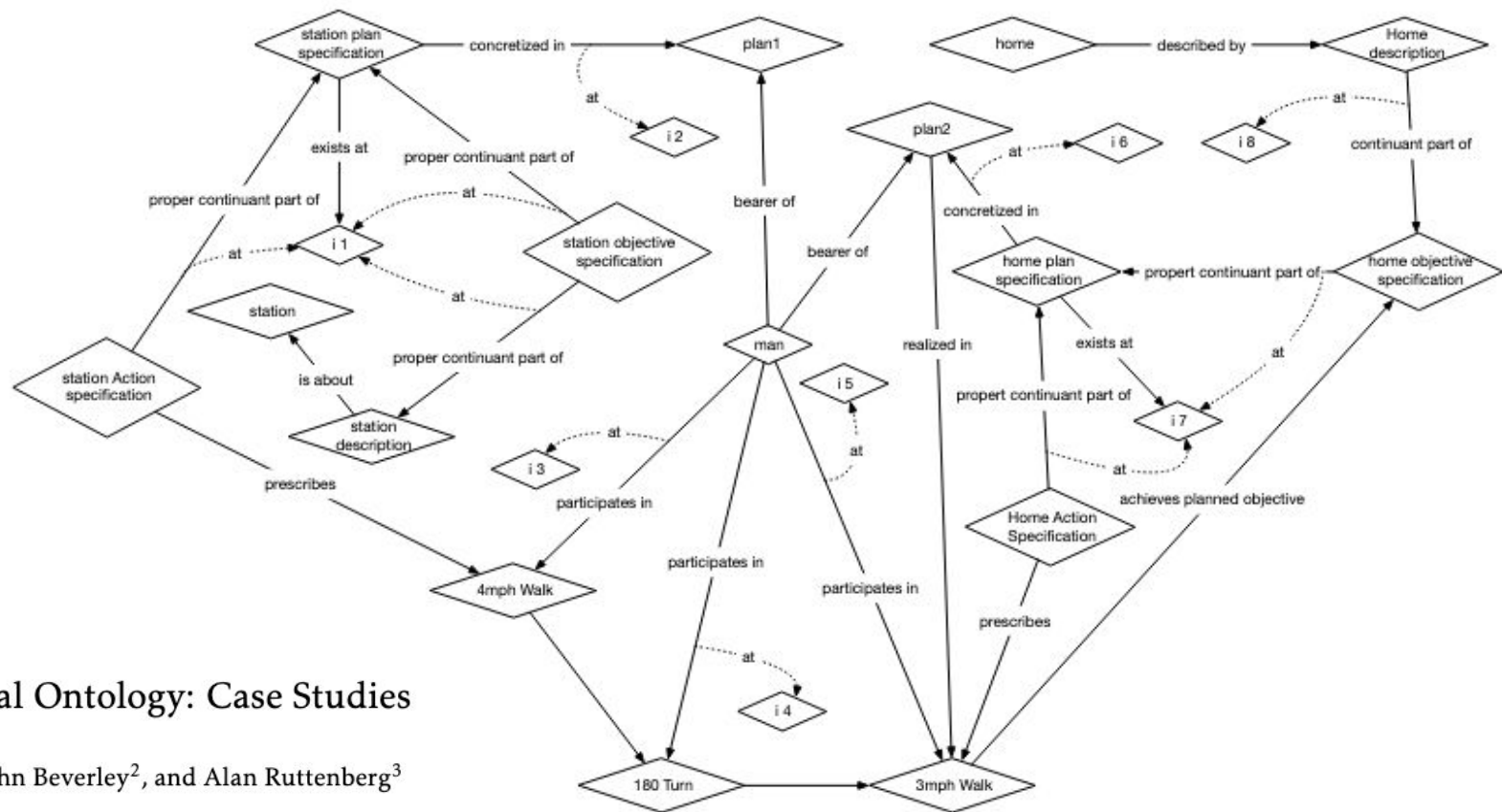


Figure 7: Man Moving with Increasing Speed in Case 4



## Basic Formal Ontology: Case Studies

J. Neil Otte<sup>1</sup>, John Beverley<sup>2</sup>, and Alan Ruttenberg<sup>3</sup>

Figure 8: Man Walking to Station, then Home in Case 5

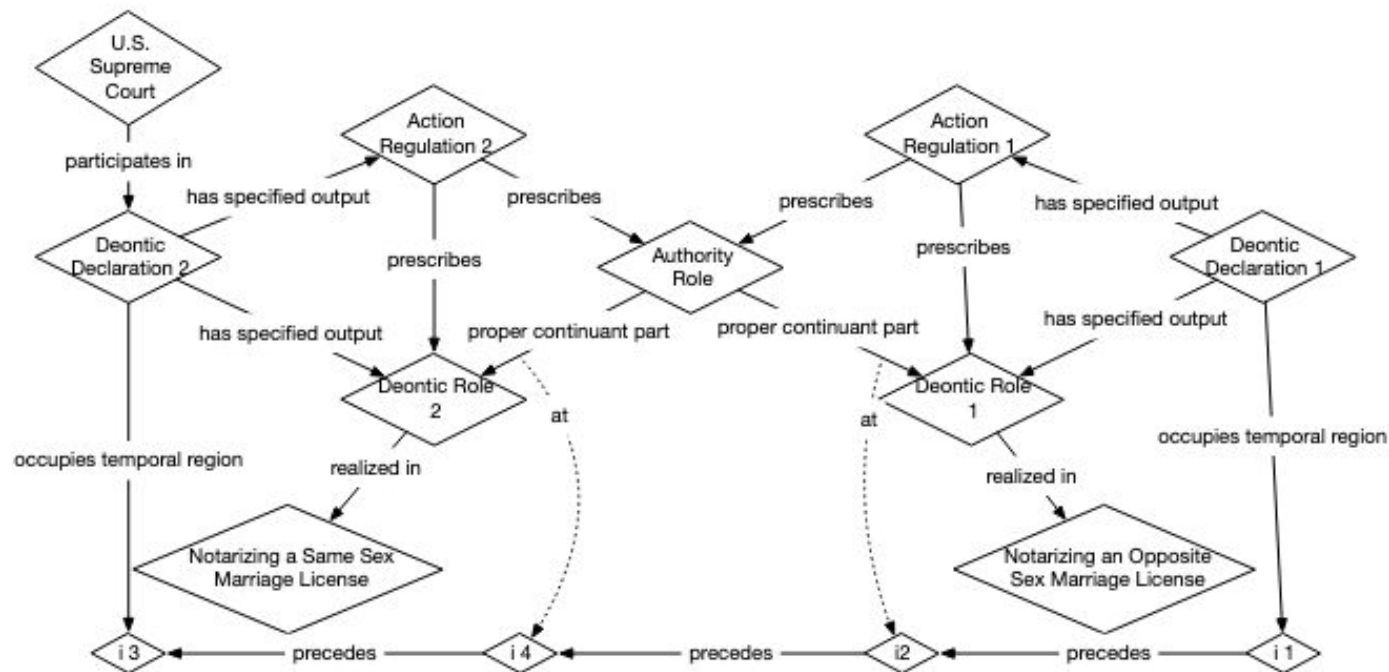
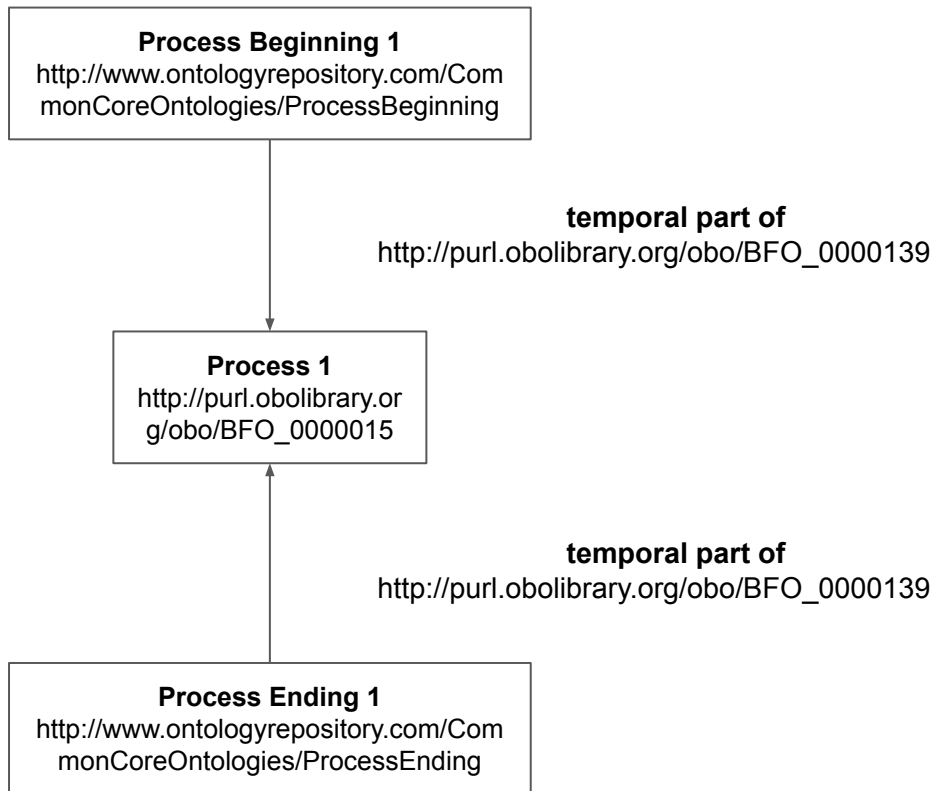


Figure 9: Changing Deontic Roles in Case 6

## Basic Formal Ontology: Case Studies

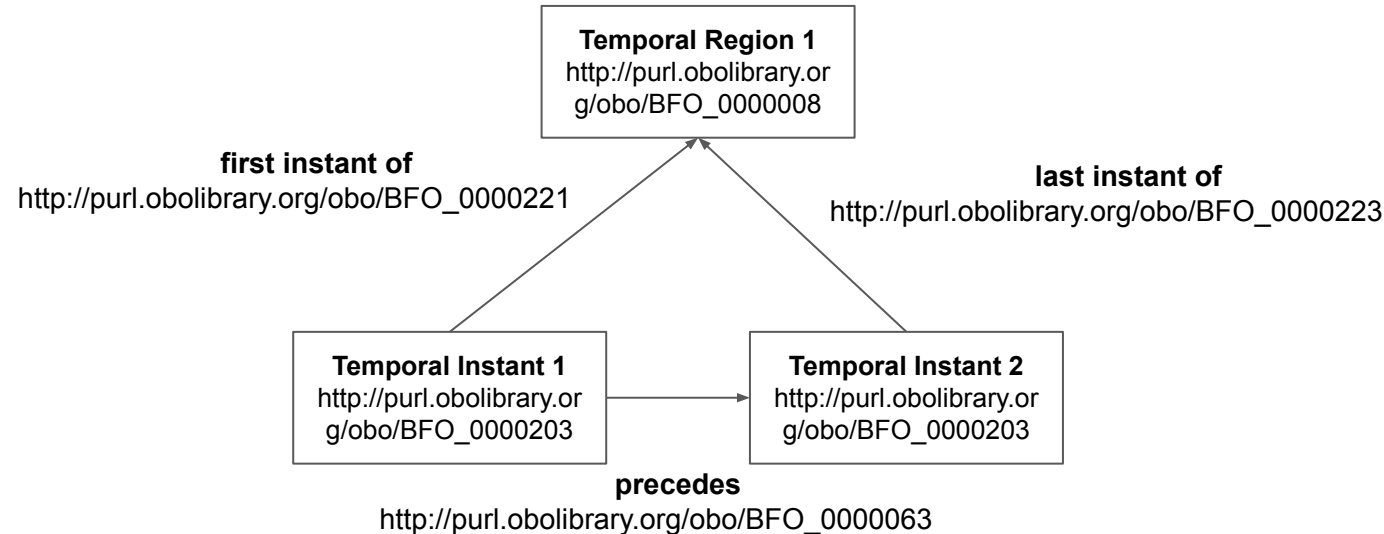
J. Neil Otte<sup>1</sup>, John Beverley<sup>2</sup>, and Alan Ruttenberg<sup>3</sup>

# Starting and ending a process



The boxes depict instances of classes with the corresponding IRI. Arrows are relations of the corresponding IRI.

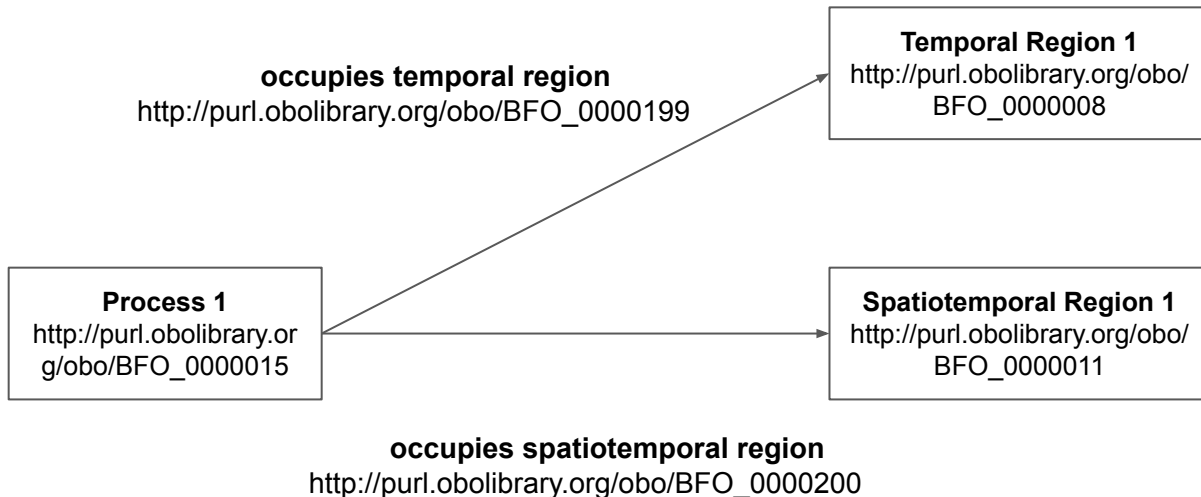
# First and Last Moments of Temporal Regions



The boxes depict instances of classes with the corresponding IRI. Arrows are relations of the corresponding IRI.



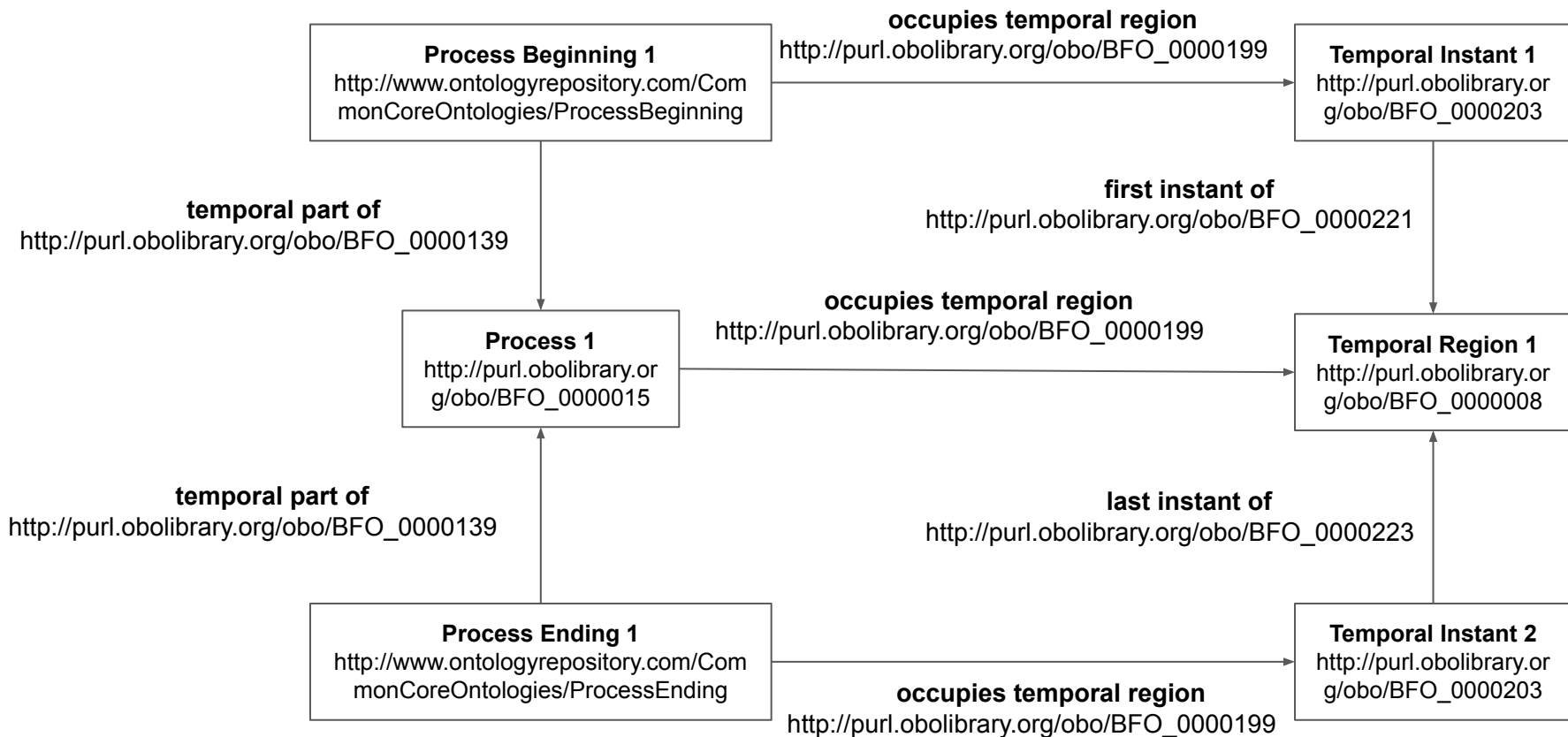
# Tracking spatiotemporal and temporal information for processes



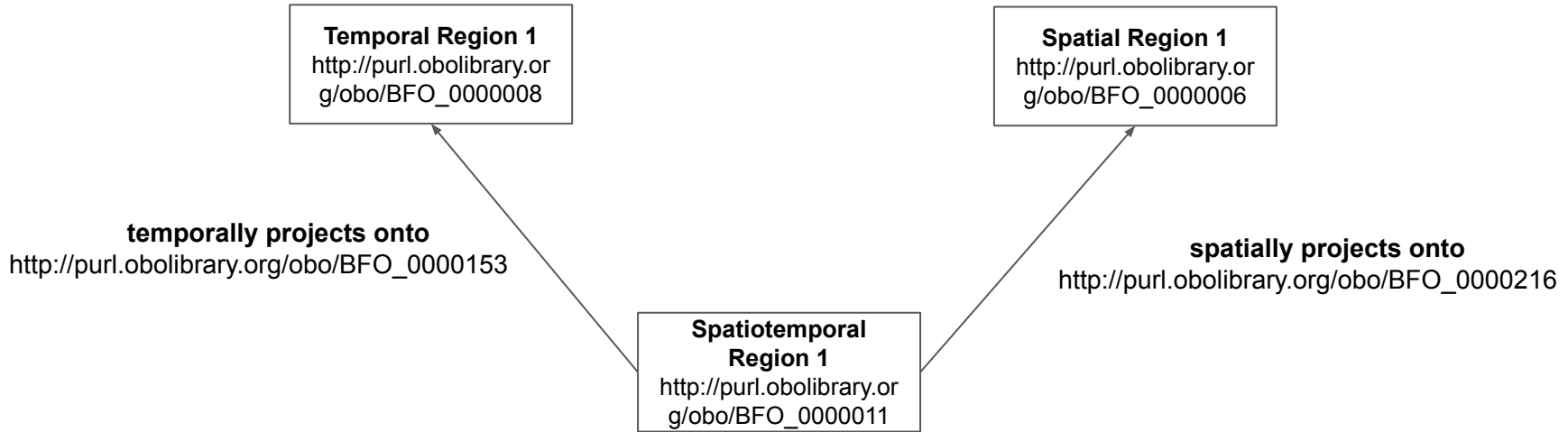
The boxes depict instances of classes with the corresponding IRI. Arrows are relations of the corresponding IRI.

# Starting and ending processes in time

The boxes depict instances of classes with the corresponding IRI. Arrows are relations of the corresponding IRI.

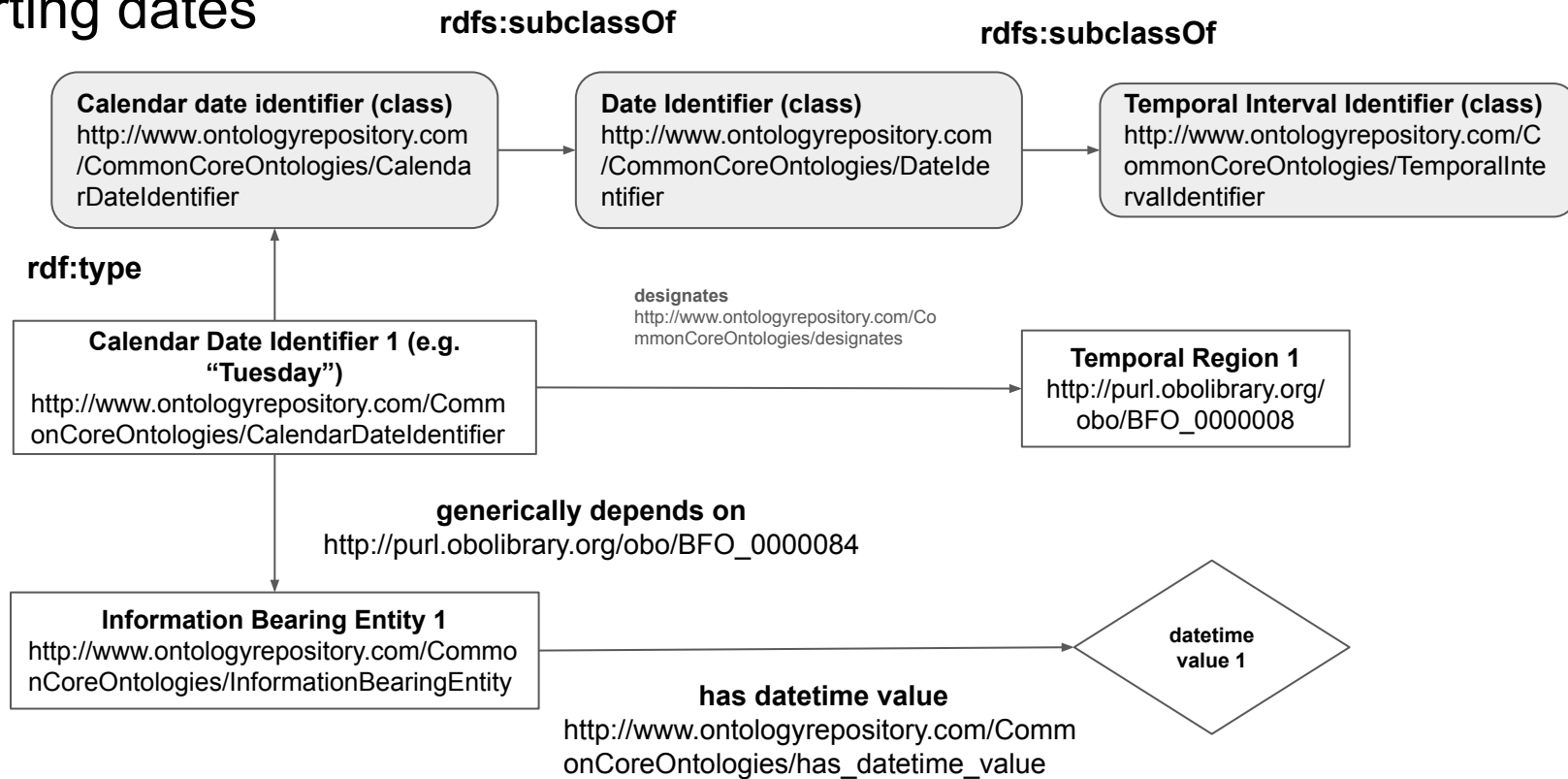


# Separating space and time information from spacetime information



The boxes depict instances of classes with the corresponding IRI. Arrows are relations of the corresponding IRI.

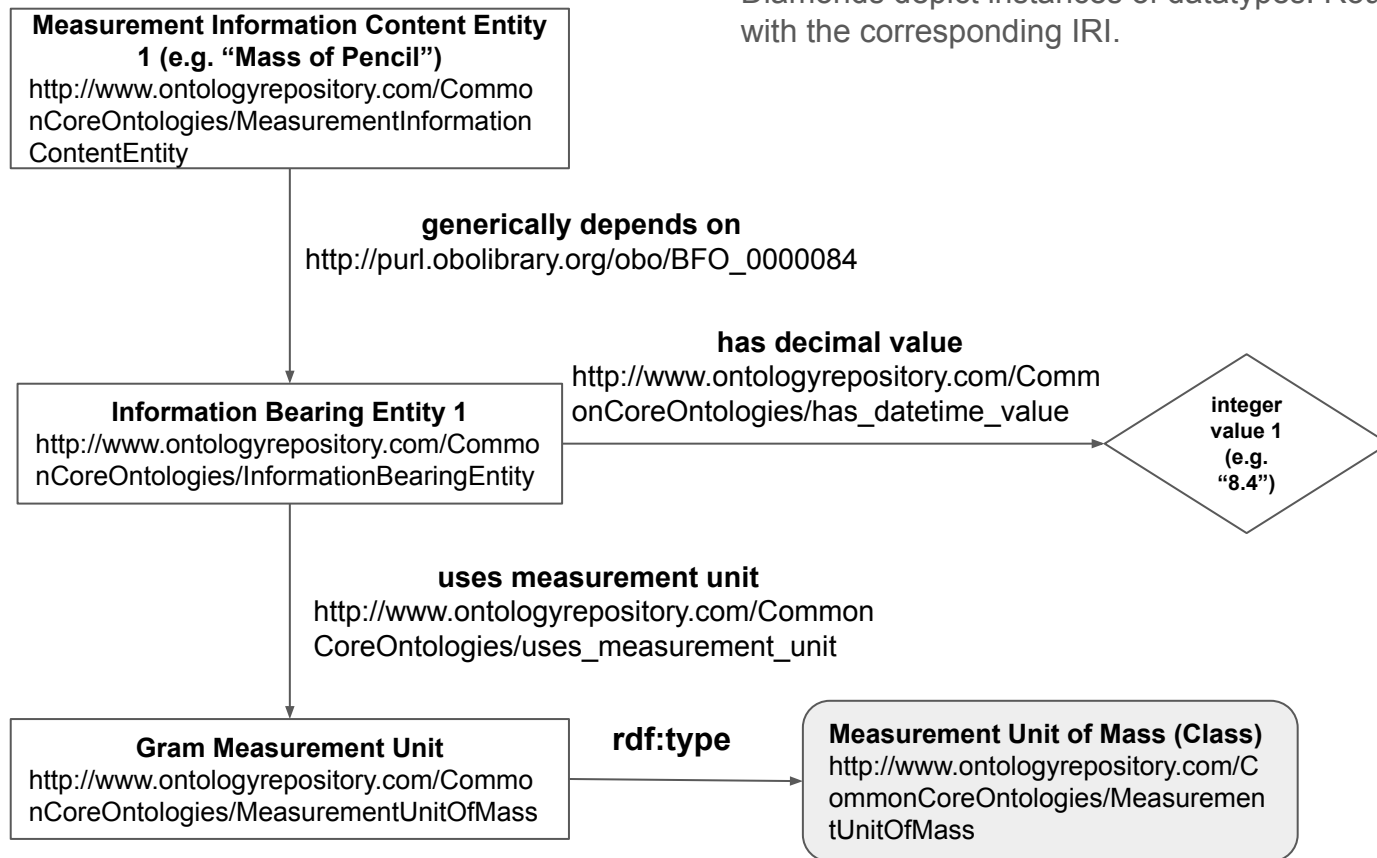
# Inserting dates



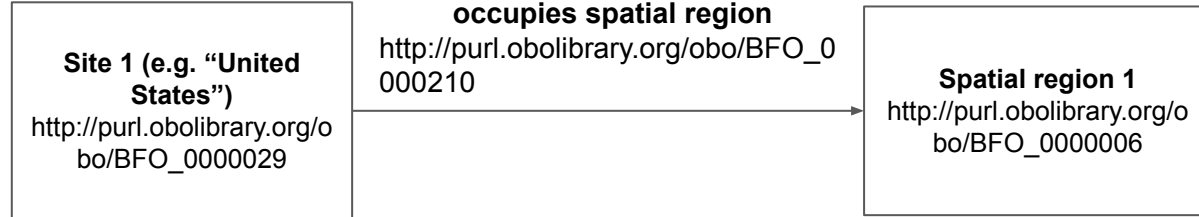
The white boxes depict instances of classes with the corresponding IRI. Arrows are relations of the corresponding IRI. Gray boxes depict classes with the corresponding IRI. Diamonds depict instances of datatypes. Rounded boxes are classes with the corresponding IRI.

# Measurement Data

The white boxes depict instances of classes with the corresponding IRI. Arrows are relations of the corresponding IRI. Gray boxes depict classes with the corresponding IRI..  
Diamonds depict instances of datatypes. Rounded boxes are classes with the corresponding IRI.

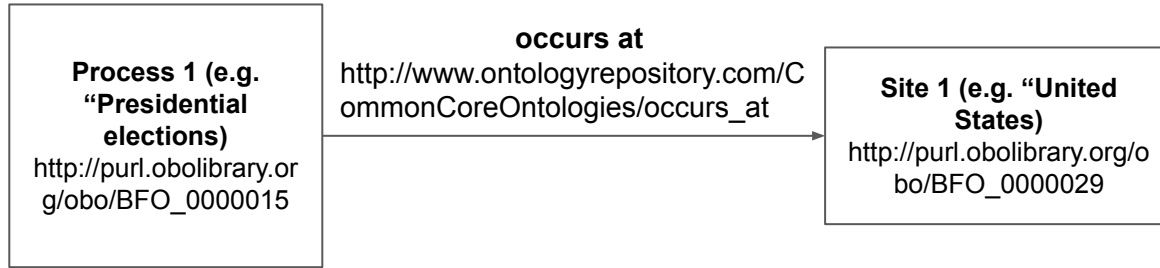


# Sites and spatial regions



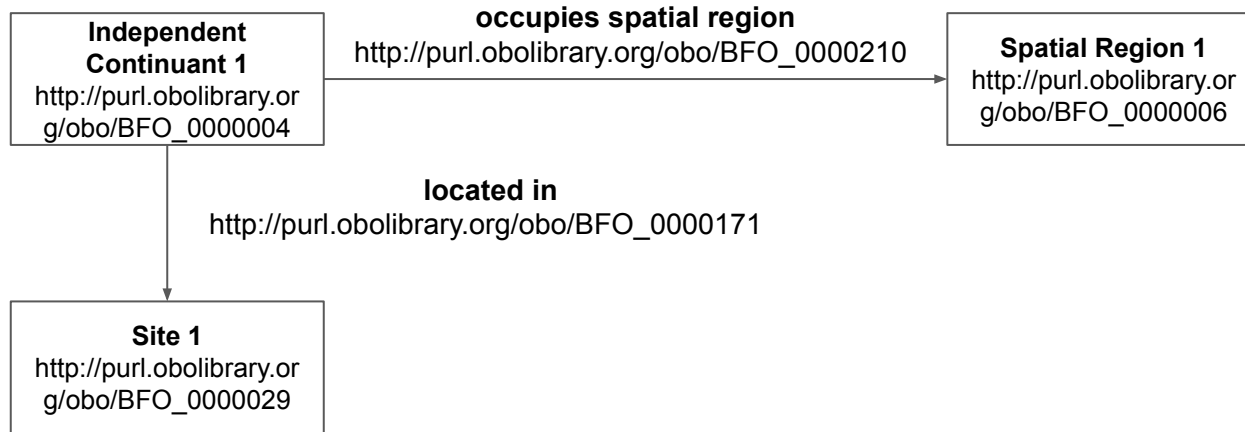
The boxes depict instances of classes with the corresponding IRI. Arrows are relations of the corresponding IRI.

# Site of a Process



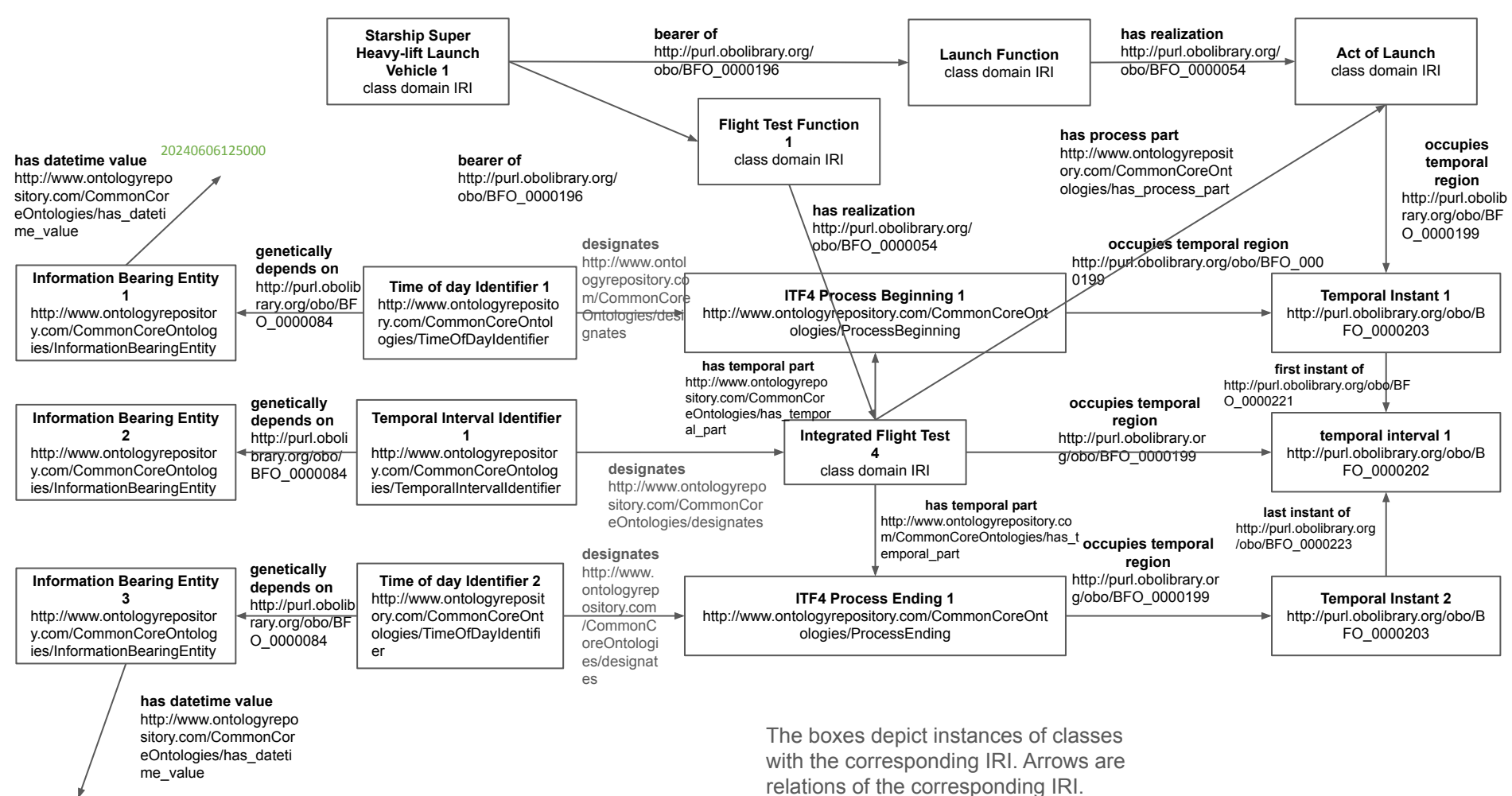
The boxes depict instances of classes with the corresponding IRI. Arrows are relations of the corresponding IRI.

# Location of Independent Continuants



The boxes depict instances of classes with the corresponding IRI. Arrows are relations of the corresponding IRI.





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