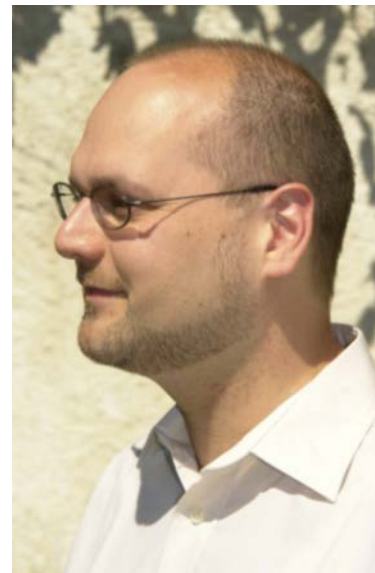


Ontology Design Patterns: Some key ideas

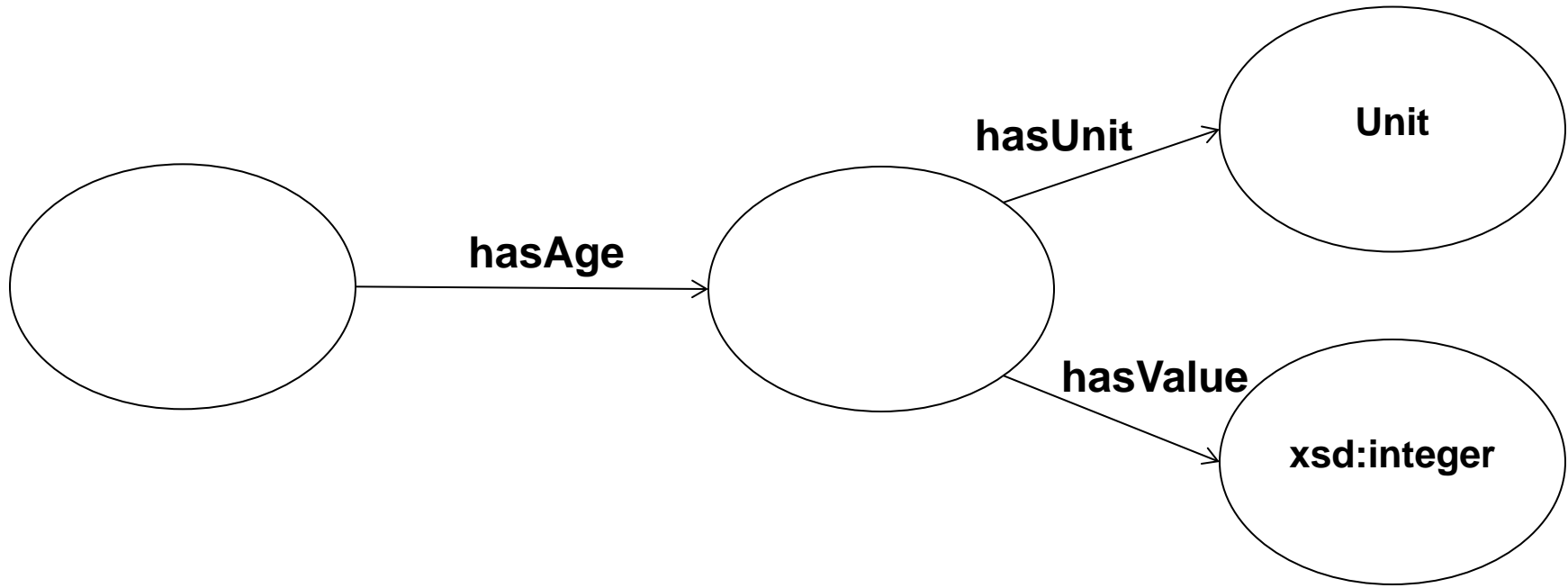


Pascal Hitzler

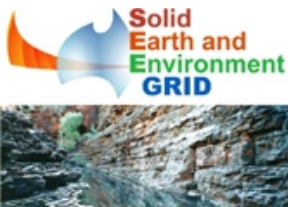
DaSe Lab for Data Semantics
Wright State University
<http://www.pascal-hitzler.de>



Specific, straightforward data modeling is very restrictive regarding data integration and reuse.



Specific, straightforward data modeling is very restrictive regarding data integration and reuse.



SEE GRID community website



Jump

Solid Earth and Environment GRID

CGIModel

You are here: SEEGrid > CGIModel Web > GeologicTime (21 May 2014, SimonCox)

Log In or Register

Geological Time Systems - a UML model, with encodings in XML and RDF/OWL

- CGIModel Web
- Create New Topic
- Index
- Search
- Changes
- Notifications
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- Statistics
- Preferences

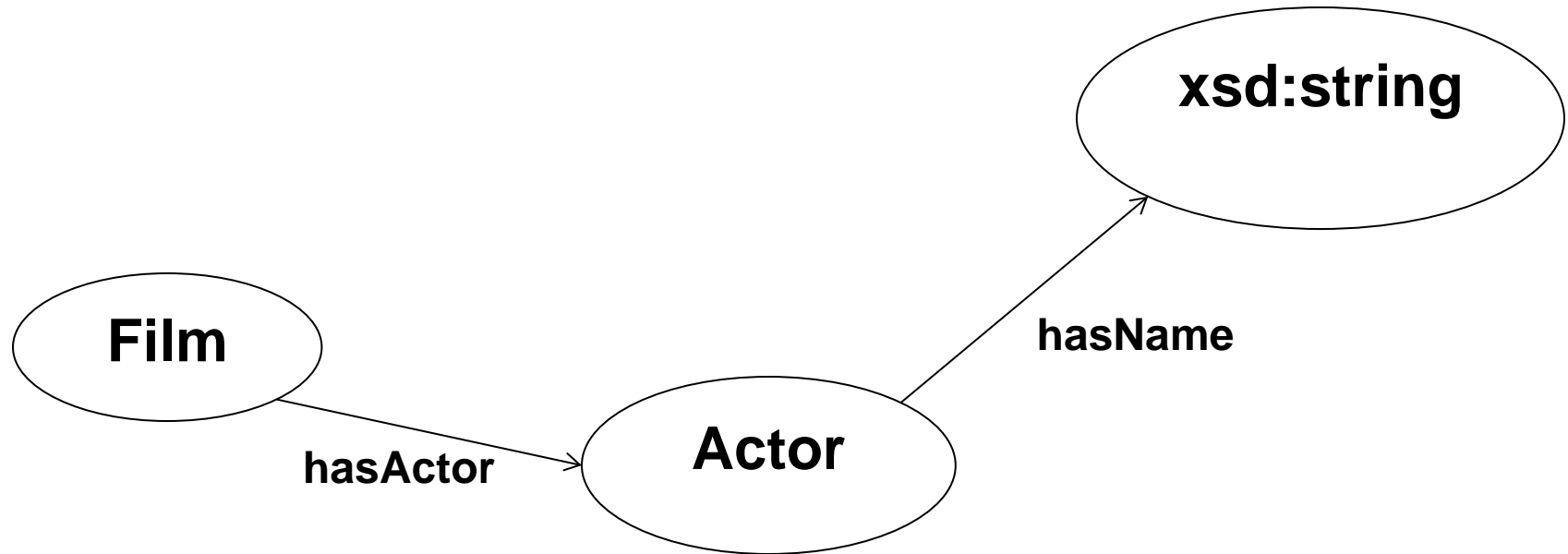
Webs

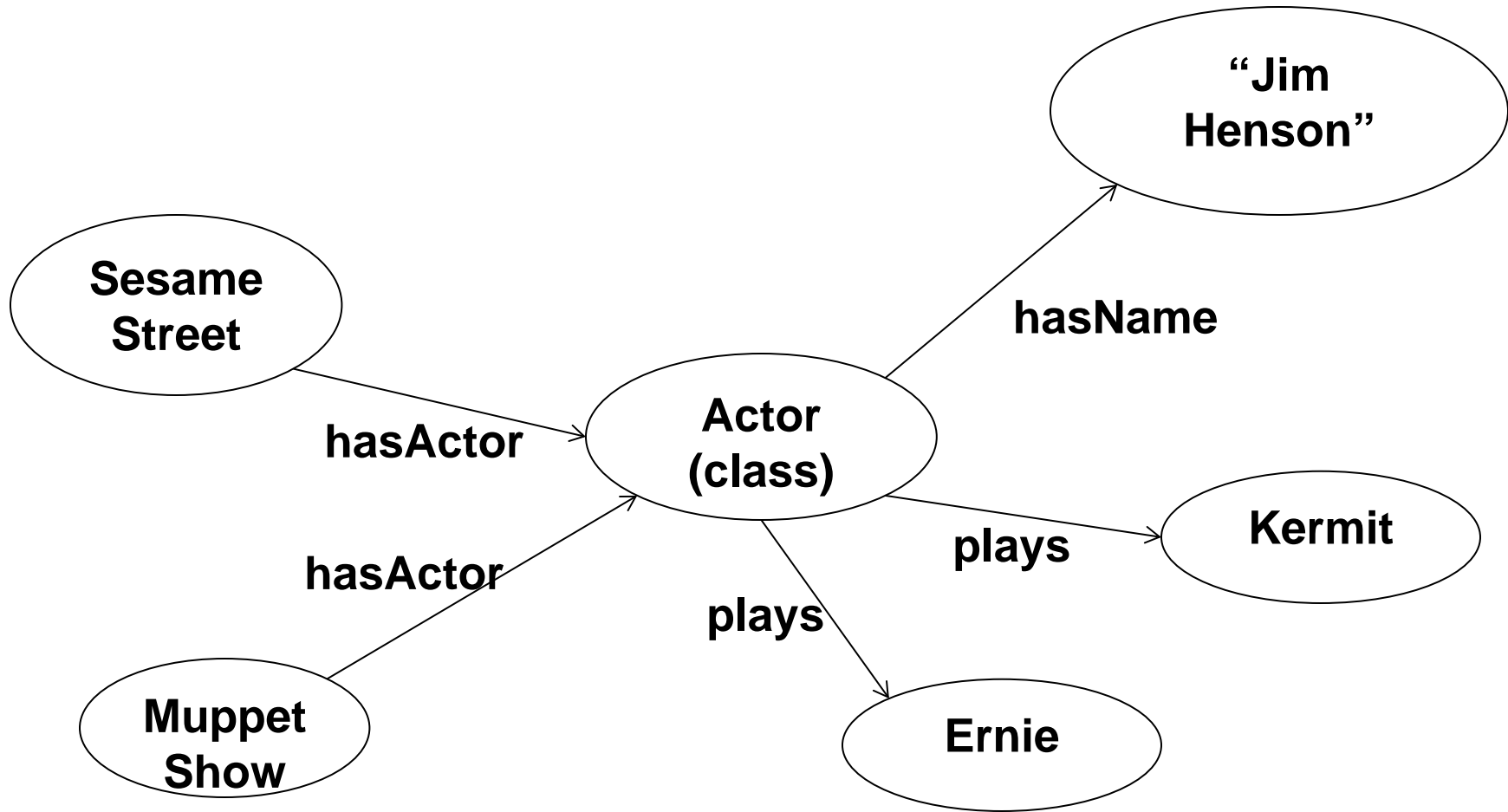
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- ASRDC
- AUKEGGS
- AnalyticalGeoscience
- AppSchemas
- CGIModel
- Compsvices
- GPML
- Gazetteer
- Geohazards
- GeothermalData
- Infosvices

- ↓ Introduction
- ↓ ICS Stratigraphic Chart
- ↓ GeologicTime XML
 - ↓ Schema documents
 - ↓ Example Instance
- ↓ Alternative formalizations
 - ↓ RDF/OWL
- ↓ Geological Timescale service
- ↓ Theory
 - ↓ Temporal Reference System
 - ↓ ISO model for temporal reference systems
 - ↓ Modification required for the geological timescale
 - ↓ GeologicalTimeScale
 - ↓ Correlations and evidence in the geological record
 - ↓ Calibration of the timescale using observations
 - ↓ Components for the GSSP
- ↓ Notes
 - ↓ Theory: Ordinal Reference Systems vs. general Tempological Complexes

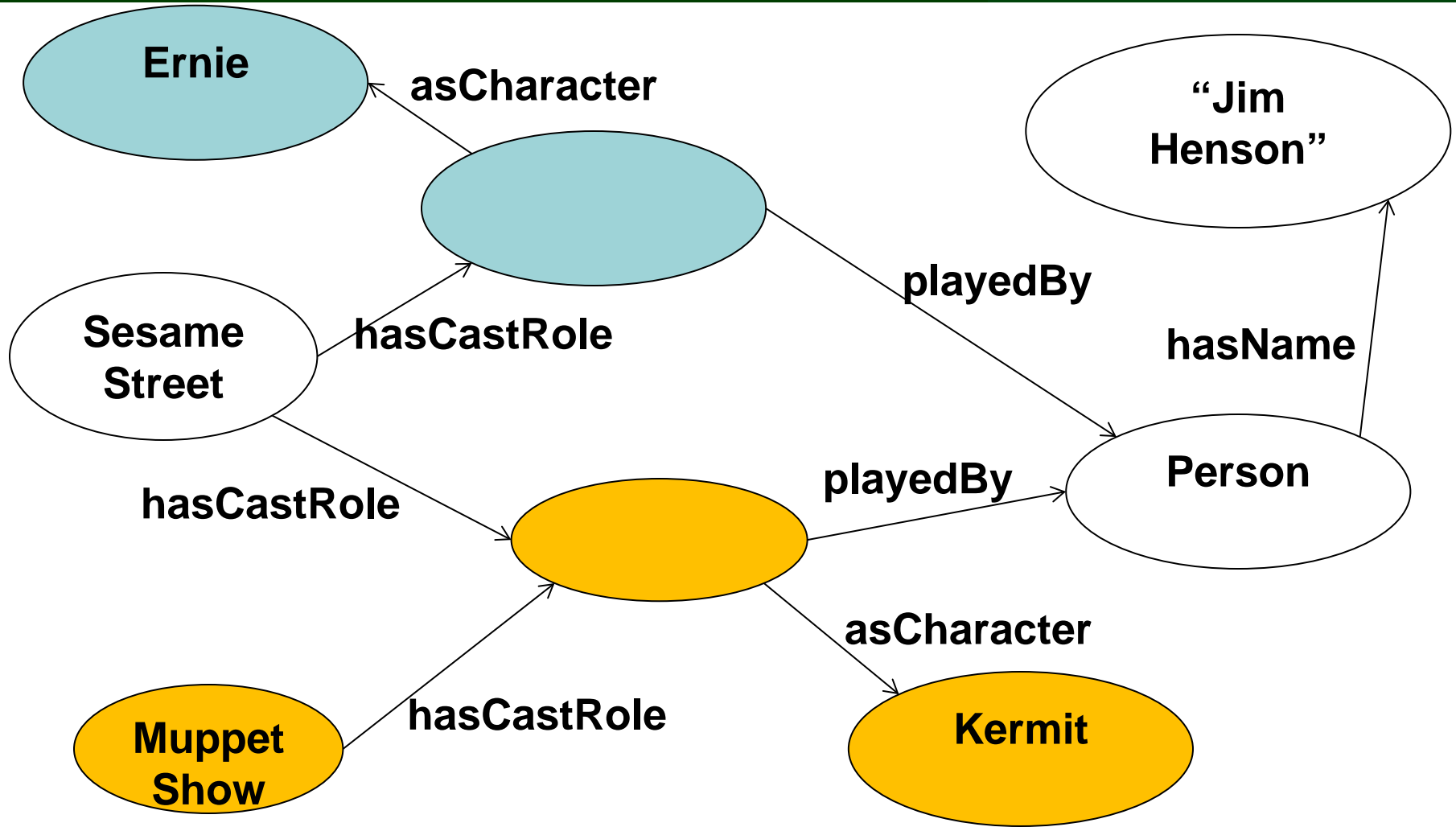
See also

- Mailing List
 - GeoSciML design
- Commission for Geoscience Interoperability Working Group
 - GeoSciML Design
 - EarthResourceML
- Previous IWG task groups
 - Geoscience Concepts
 - Test Bed Implementation
 - Use-cases and Requirements
 - Service Architecture
 - Technical Assistance
- OneGeology
 - OneGeology technology

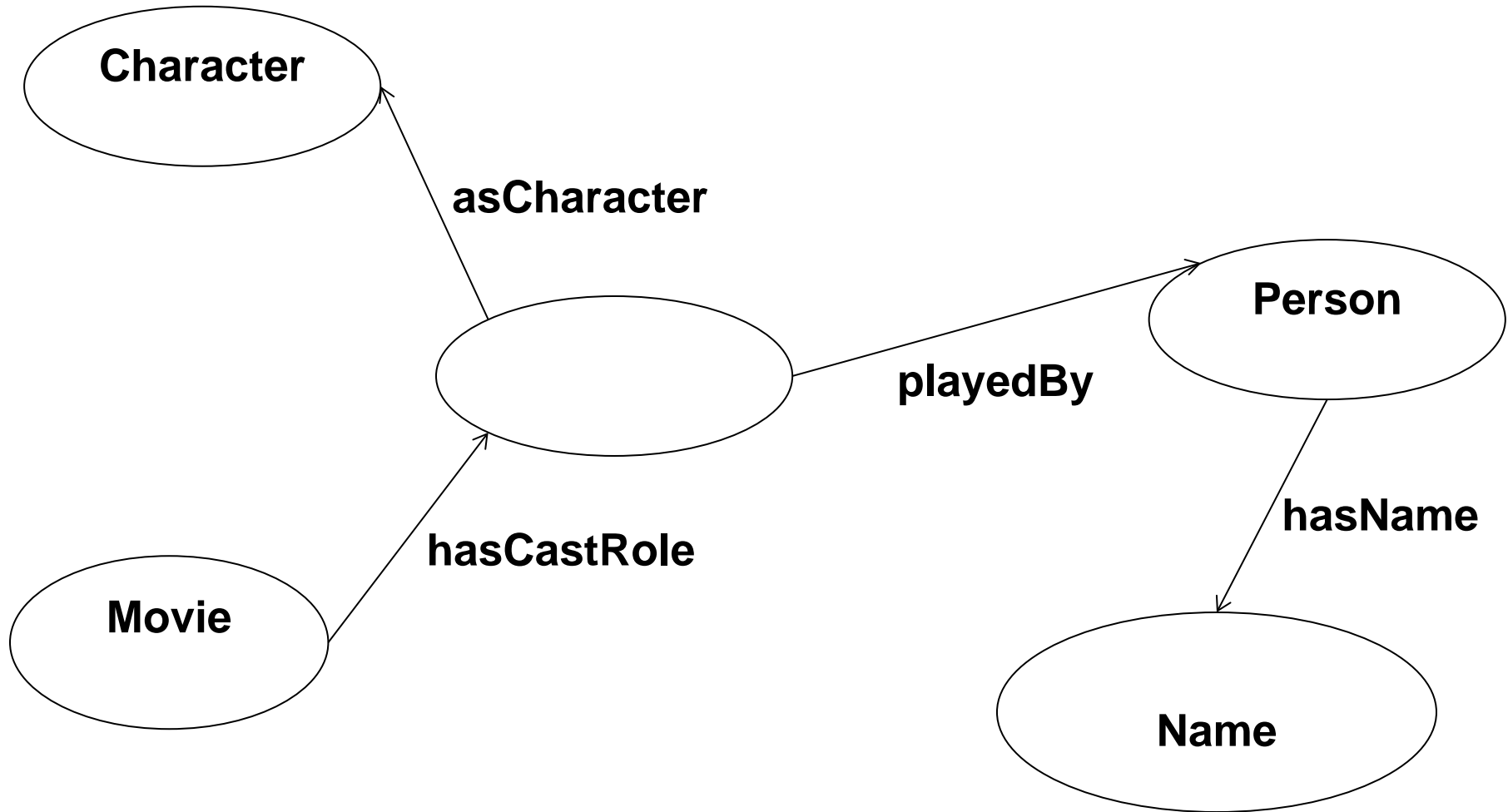




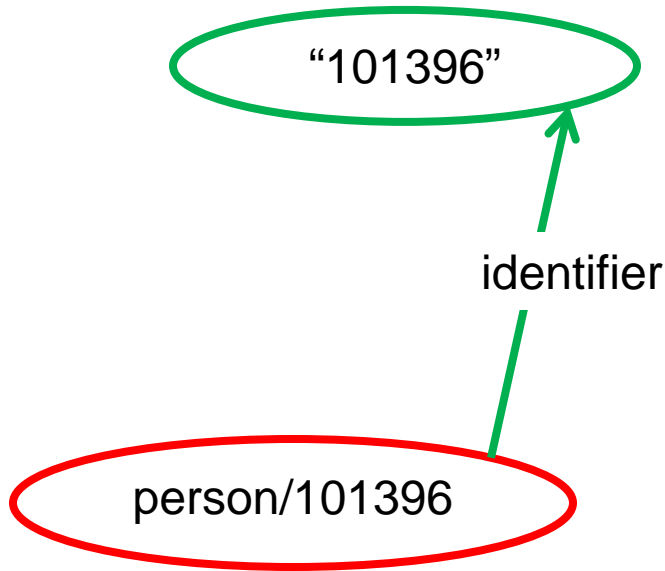
Better!



Better!



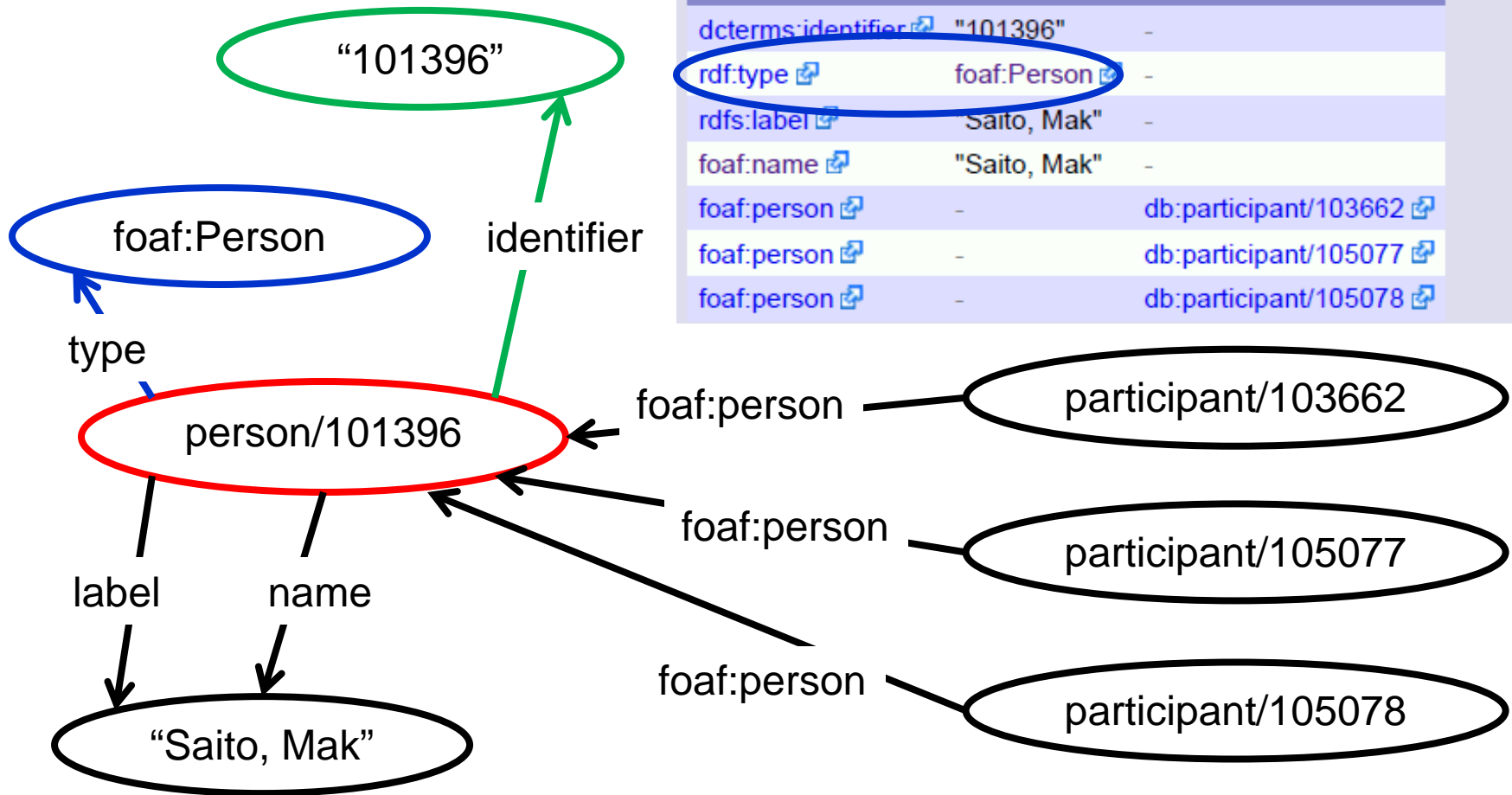
From R2R:



Description of `http://linked.rvdata.us/resource/person/101396:`

property	hasValue	isValueOf
<code>dcterms:identifier</code>	<code>"101396"</code>	-
<code>rdf:type</code>	<code>foaf:Person</code>	-
<code>rdfs:label</code>	<code>"Saito, Mak"</code>	-
<code>foaf:name</code>	<code>"Saito, Mak"</code>	-
<code>foaf:person</code>	-	<code>db:participant/103662</code>
<code>foaf:person</code>	-	<code>db:participant/105077</code>
<code>foaf:person</code>	-	<code>db:participant/105078</code>

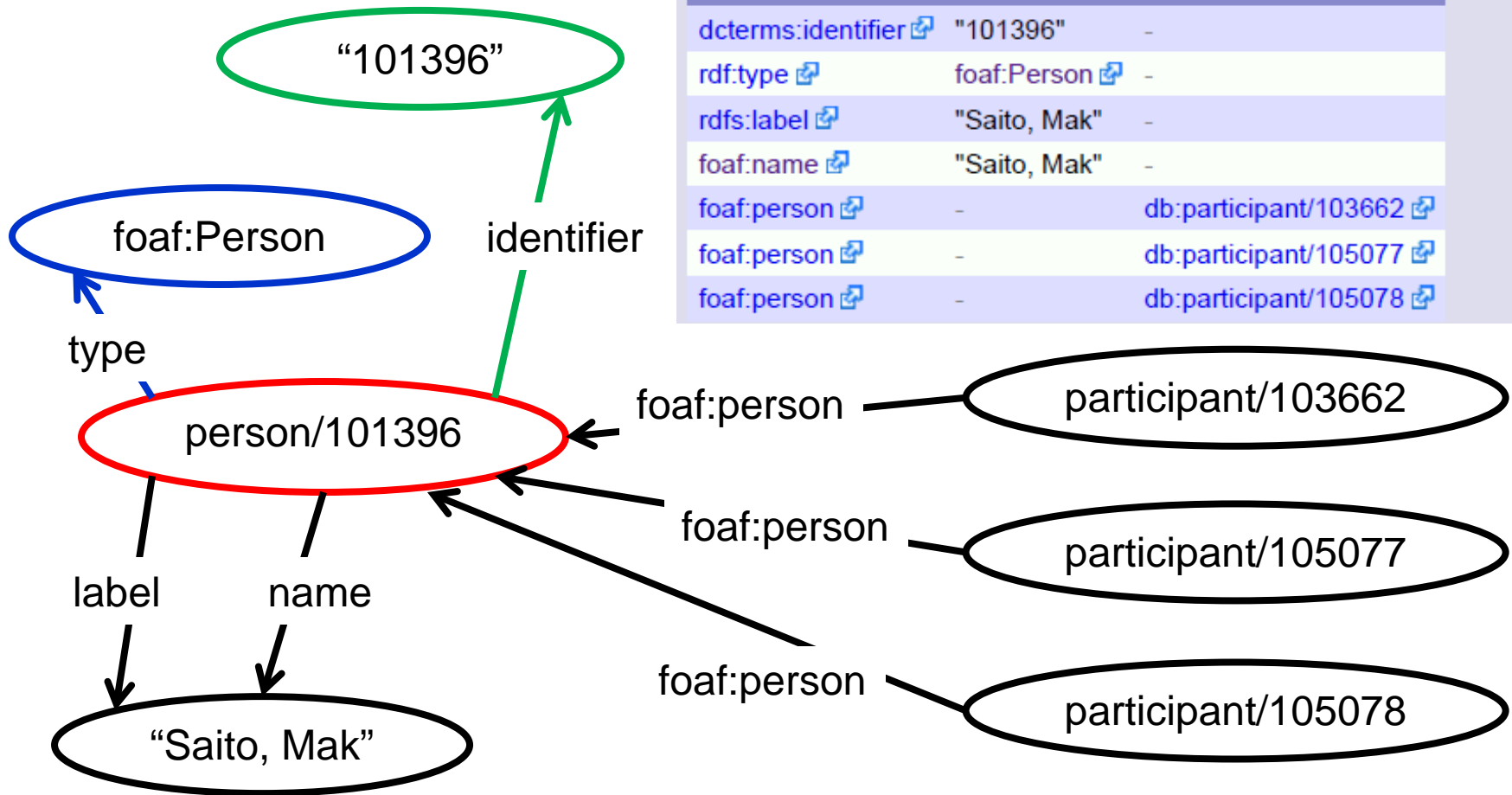
From R2R:



Description of <http://linked.rvdata.us/resource/person/101396>:

property	hasValue	isValueOf
dcterms:identifier	"101396"	-
rdf:type	foaf:Person	-
rdfs:label	"Saito, Mak"	-
foaf:name	"Saito, Mak"	-
foaf:person	-	db:participant/103662
foaf:person	-	db:participant/105077
foaf:person	-	db:participant/105078

From R2R:

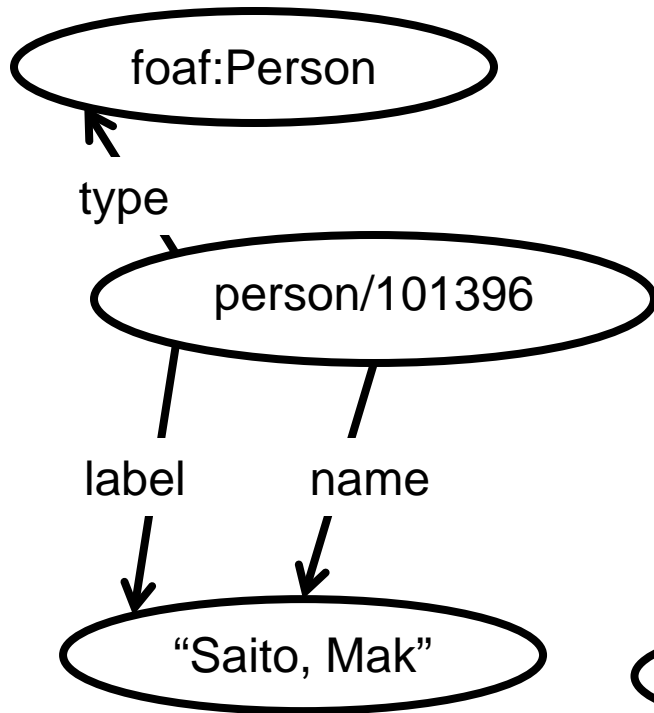


Description of <http://linked.rvdata.us/resource/person/101396>:

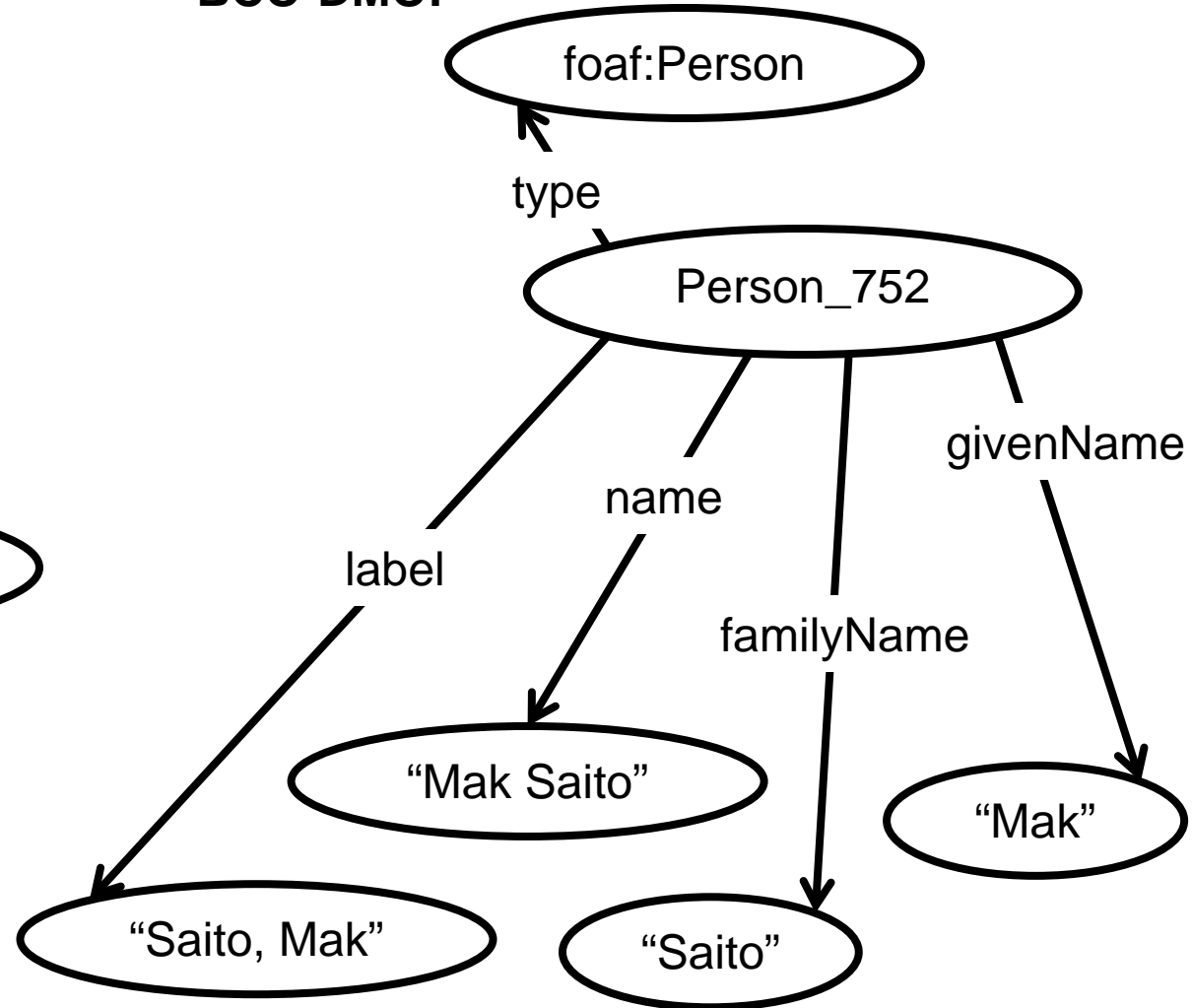
property	hasValue	isValueOf
dcterms:identifier	"101396"	-
rdf:type	foaf:Person	-
rdfs:label	"Saito, Mak"	-
foaf:name	"Saito, Mak"	-
foaf:person	-	db:participant/103662
foaf:person	-	db:participant/105077
foaf:person	-	db:participant/105078

Information representation choices

R2R:

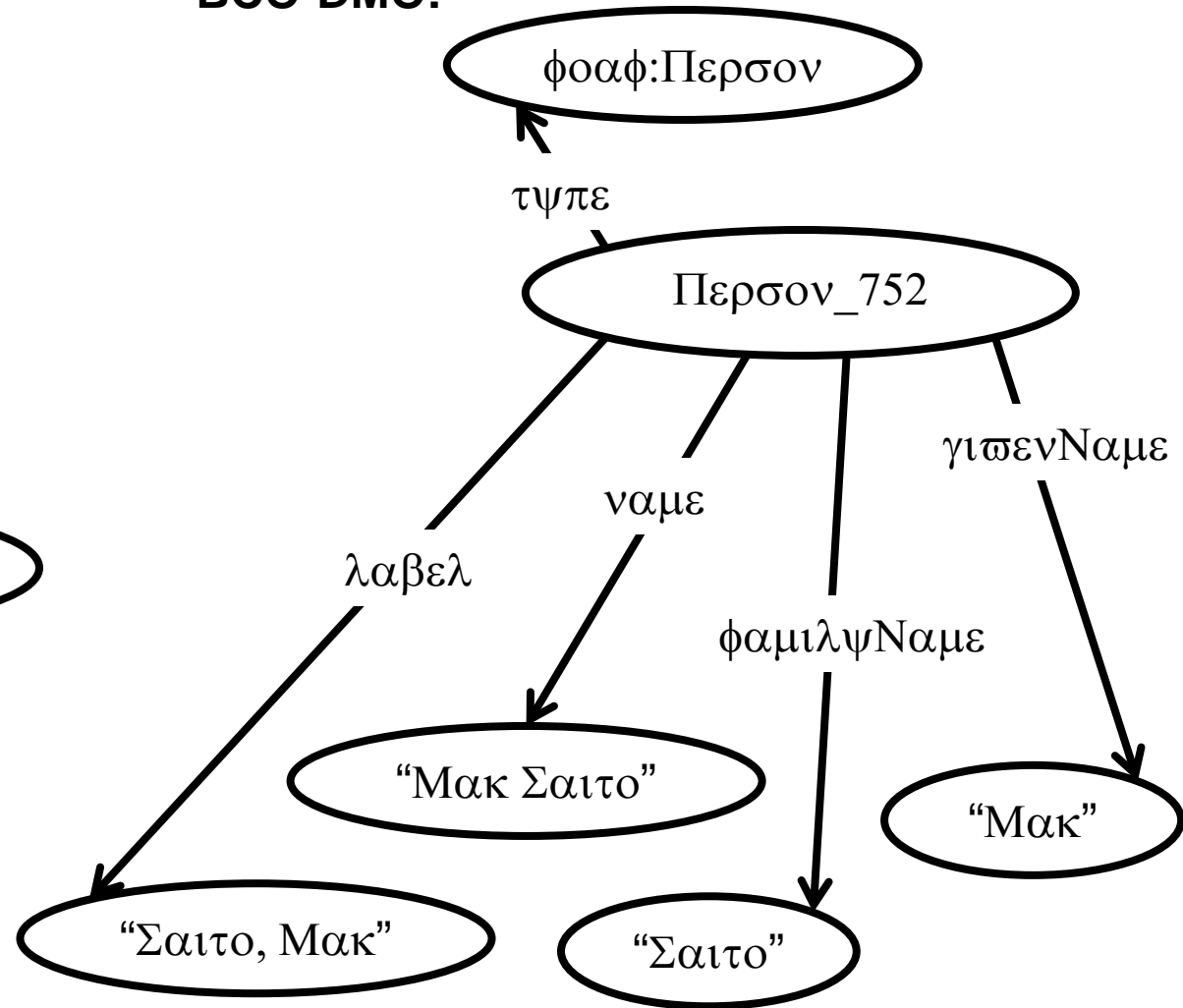


BCO-DMO:

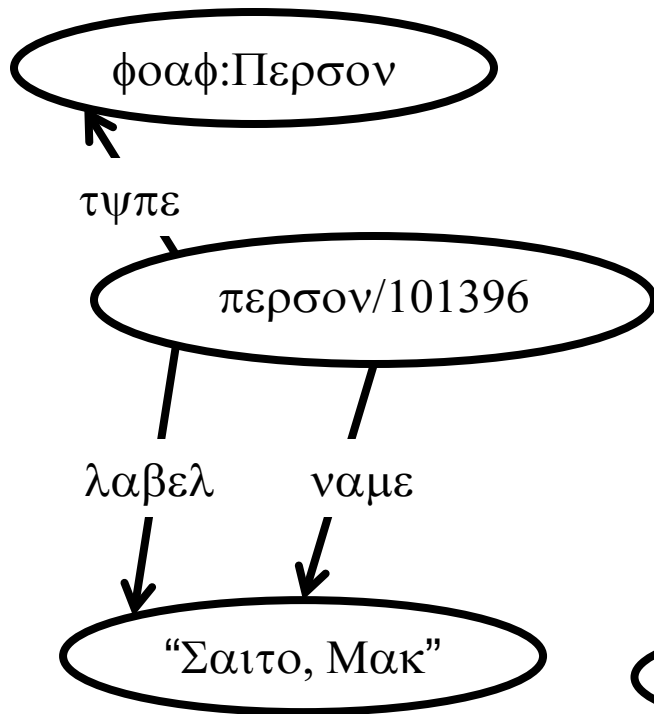


Information representation choices

BCO-DMO:

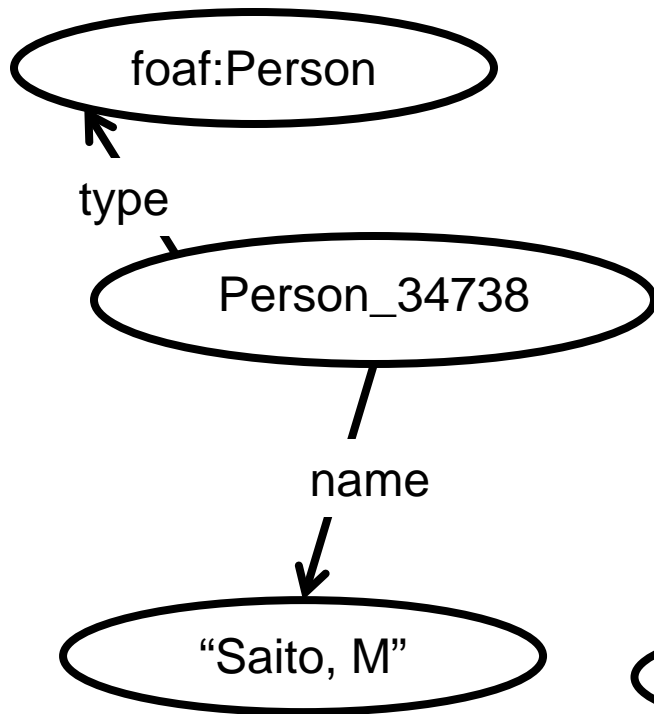


R2R:

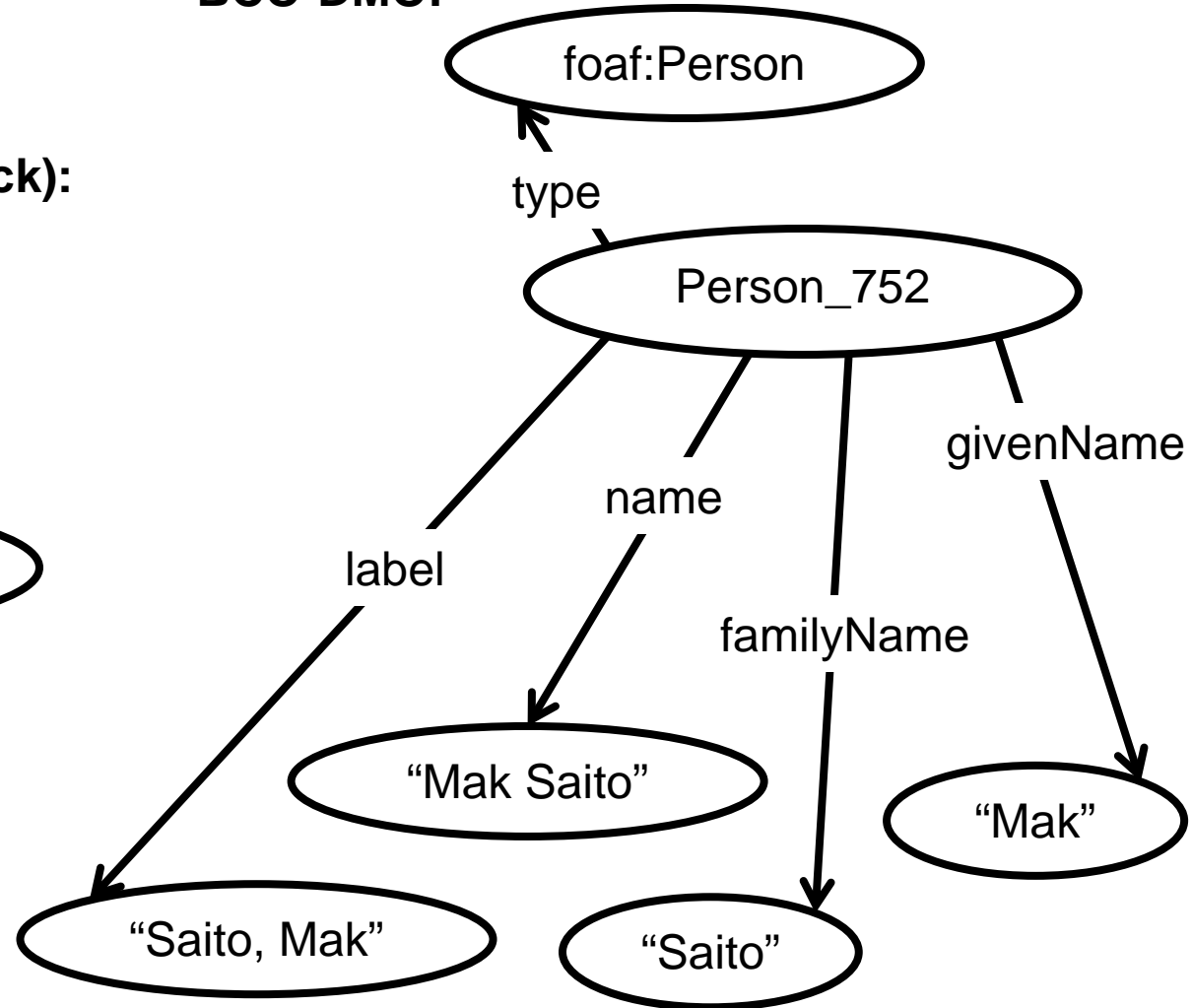


Information representation choices

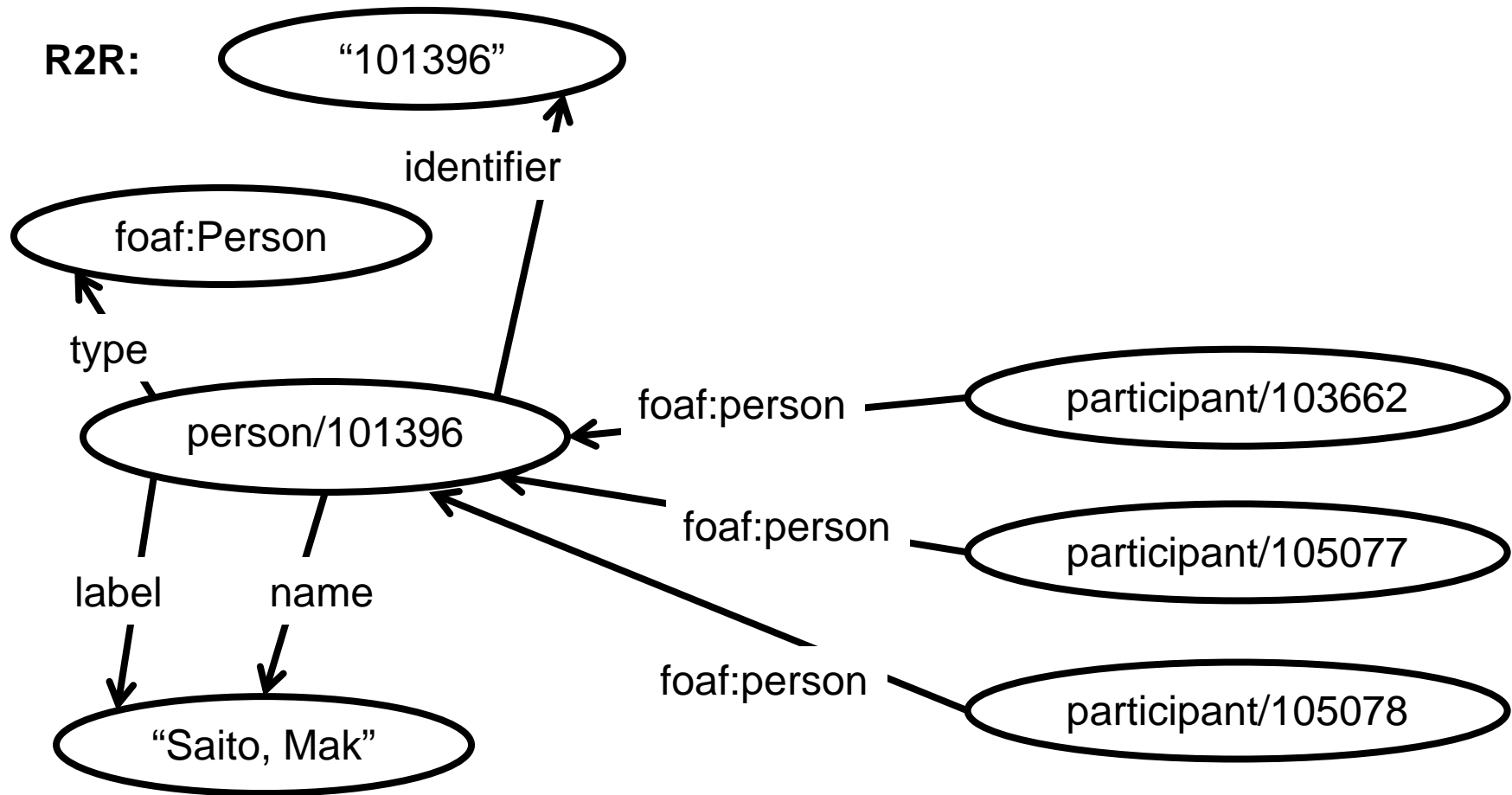
AGU Abstracts (Tom Narock):



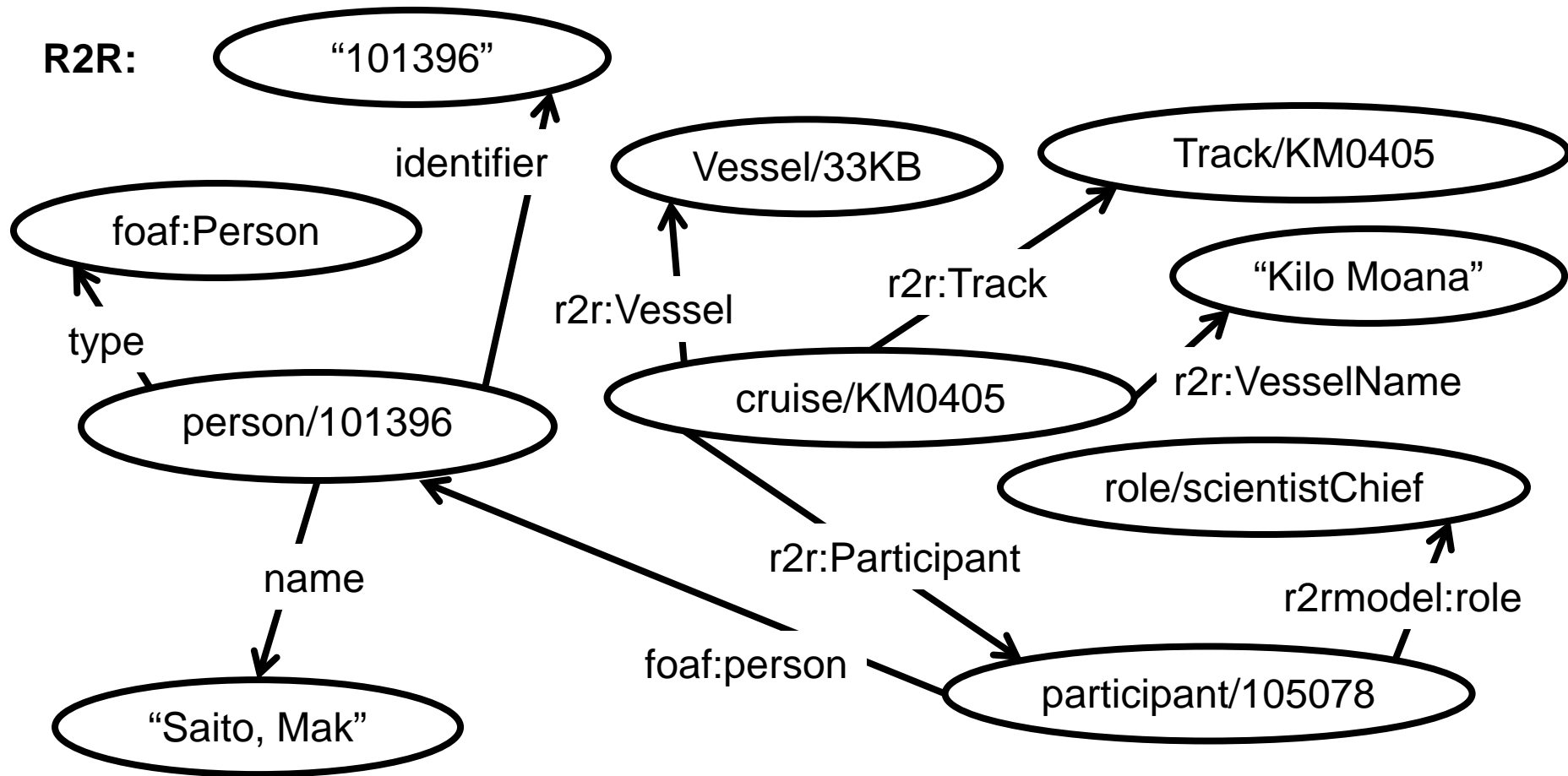
BCO-DMO:



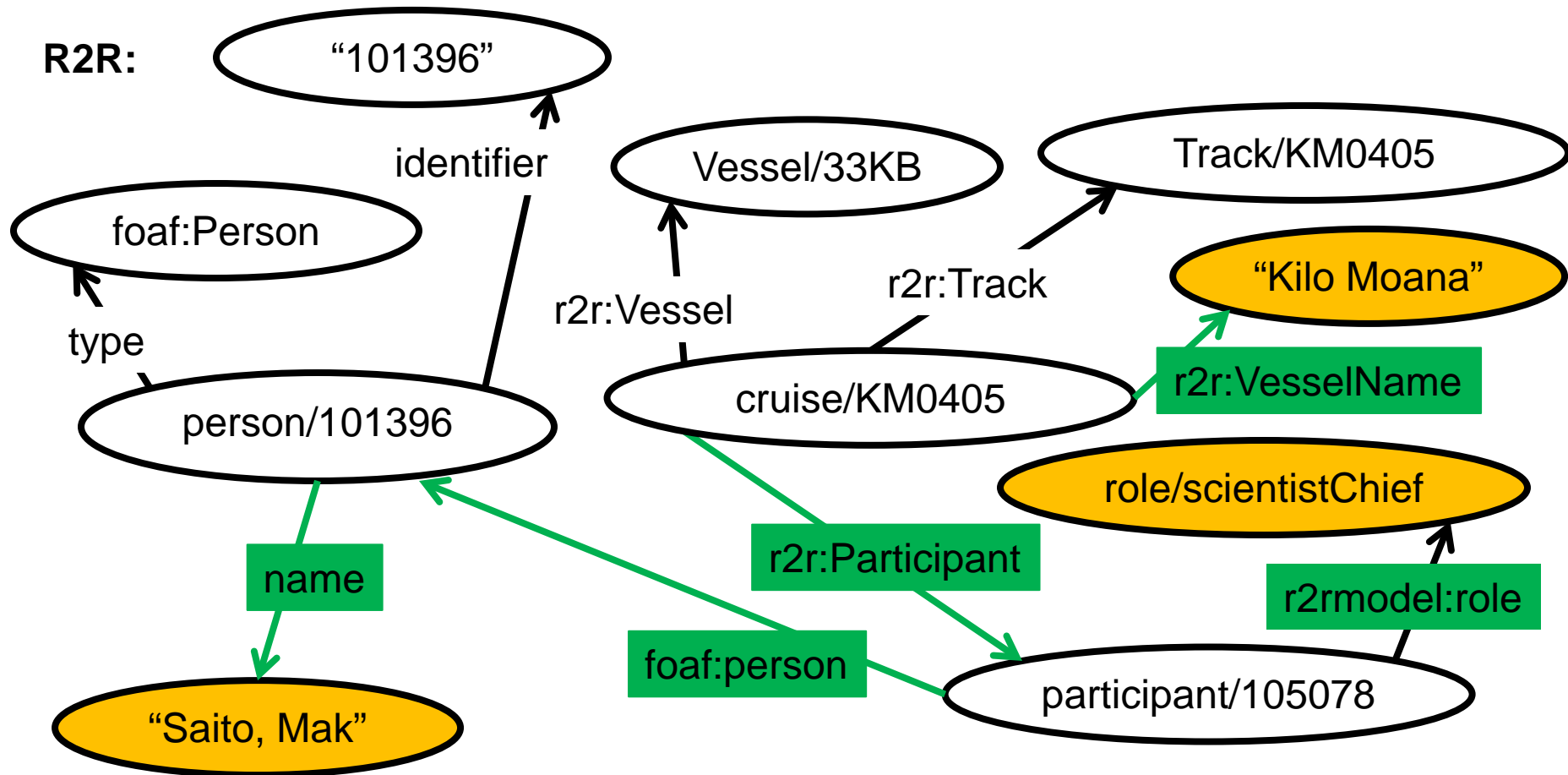
Information representation choices



Information representation choices



Information representation choices



“An ontology design pattern is a reusable successful solution to a recurrent modeling problem.”

So-called *content patterns* usually encode specific abstract notions, such as process, event, agent, etc.

Patterns provide modular, reusable, replaceable, pieces.

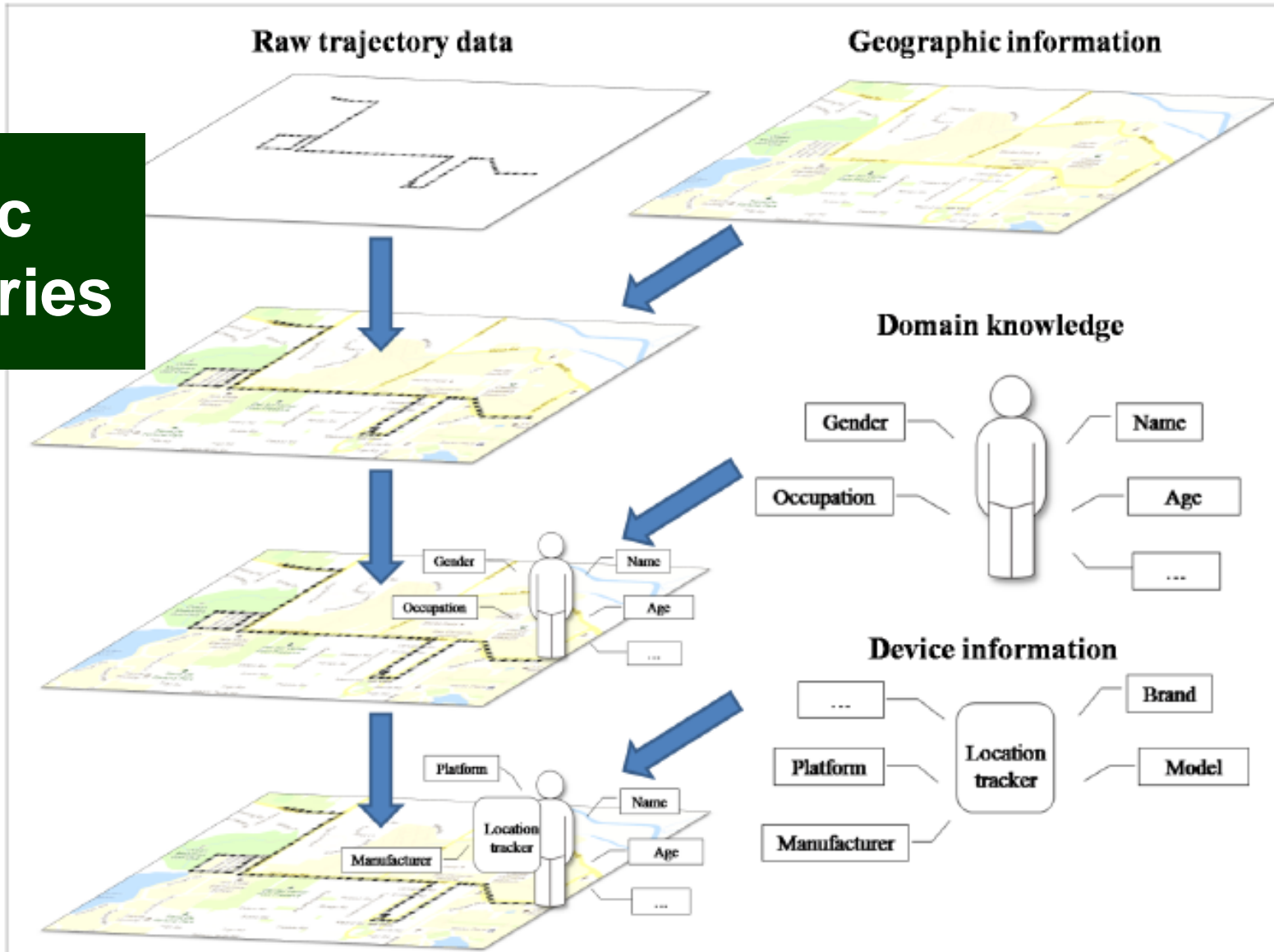
By agreeing on **reuse of generic patterns** (but **leaving the relationships** between the patterns to a specific assembly **for a special purpose**), we can have **reuse while preserving heterogeneity**.

Some central patterns:

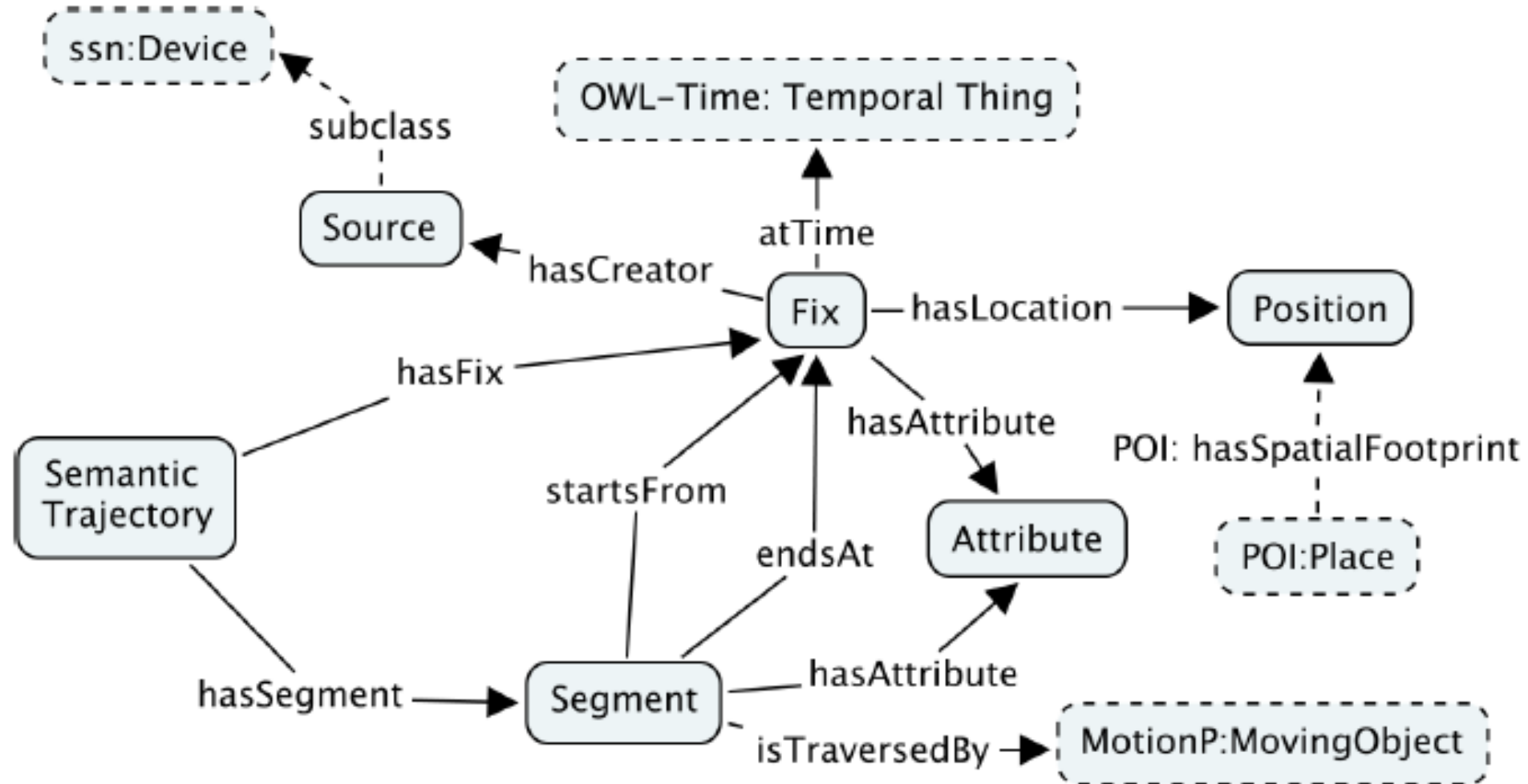
- **Cruise**
- **Trajectory**
- **Person**
- **Organization**
- **Roles of Agents**
- **Repository Object**
- **Data Set**
- **Document**

We're not starting from zero of course.

Semantic Trajectories



[Hu, Janowicz, Carral, Scheider, Kuhn, Berg-Cross, Hitzler, Dean, COSIT2013]



$$\begin{aligned} \text{Fix} \sqsubseteq & \exists \text{atTime.OWL-Time:Temporal Thing} \sqcap \exists \text{hasLocation.Position} \\ & \sqcap \exists \text{hasFix}^- .\text{SemanticTrajectory} \end{aligned} \quad (1)$$

$$\text{Segment} \sqsubseteq \exists \text{startsFrom.Fix} \sqcap \exists \text{endsAt.Fix} \quad (2)$$

$$\top \sqsubseteq \leq 1 \text{startsFrom.}\top \quad (3)$$

$$\top \sqsubseteq \leq 1 \text{endsAt.}\top \quad (4)$$

$$\text{Segment} \sqsubseteq \exists \text{hasSegment}^- .\text{SemanticTrajectory} \quad (5)$$

$$\text{startsFrom}^- \circ \text{endsAt} \sqsubseteq \text{hasNext} \quad (6)$$

$$\text{hasNext} \sqsubseteq \text{hasSuccessor} \quad (7)$$

$$\text{hasSuccessor} \circ \text{hasSuccessor} \sqsubseteq \text{hasSuccessor} \quad (8)$$

$$\text{hasNext}^- \sqsubseteq \text{hasPrevious} \quad (9)$$

$$\text{hasSuccessor}^- \sqsubseteq \text{hasPredecessor} \quad (10)$$

$$Fix \sqcap \neg \exists endsAt.Segment \sqsubseteq StartingFix \quad (11)$$

$$Fix \sqcap \neg \exists startsFrom.Segment \sqsubseteq EndingFix \quad (12)$$

$$Segment \sqcap \exists startsFrom.StartingFix \sqsubseteq StartingSegment \quad (13)$$

$$Segment \sqcap \exists endsAt.EndingFix \sqsubseteq EndingSegment \quad (14)$$

$$SemanticTrajectory \sqsubseteq \exists hasSegment.Segment \quad (15)$$

$$hasSegment \circ startsFrom \sqsubseteq hasFix \quad (16)$$

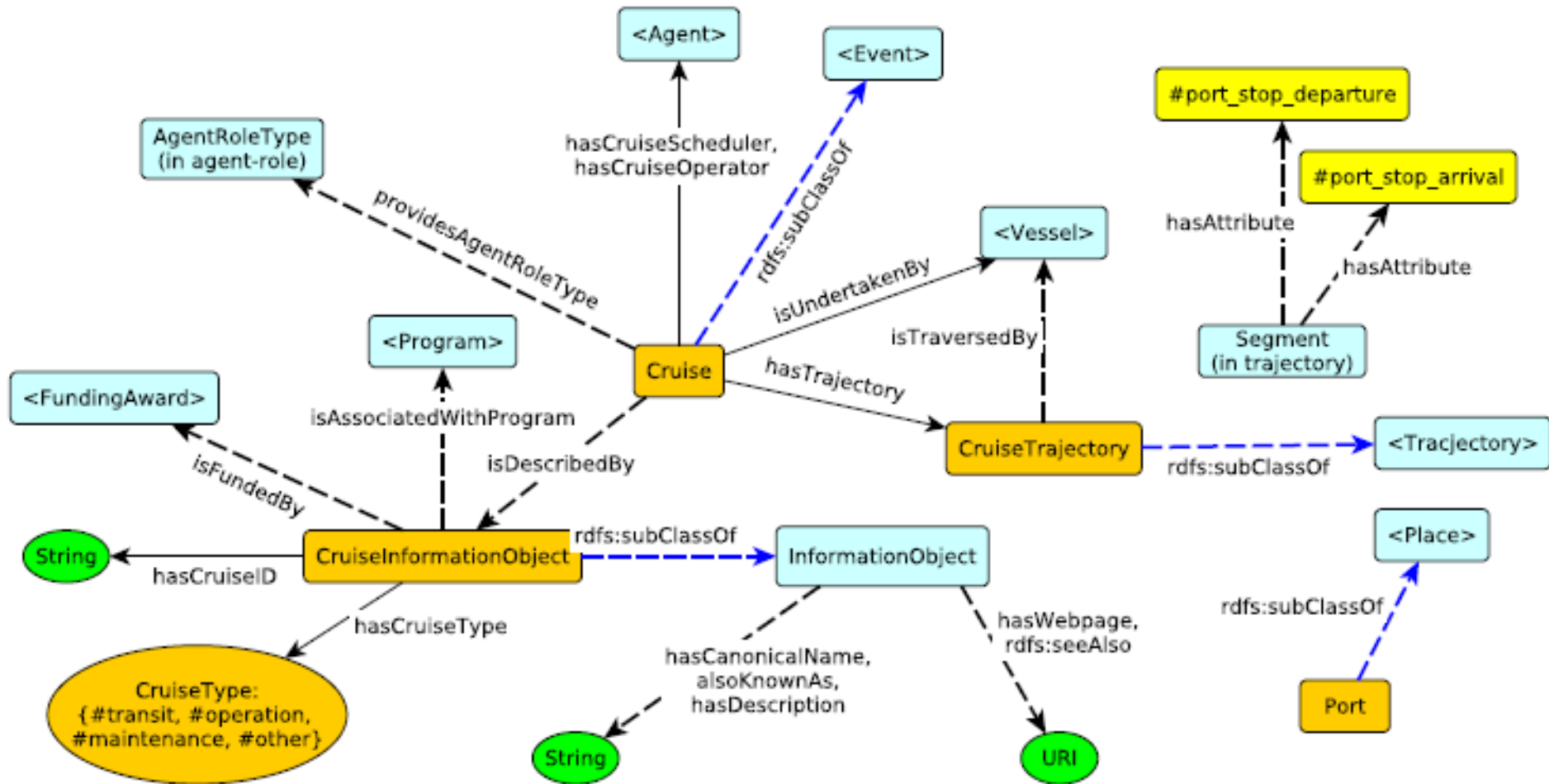
$$hasSegment \circ endsAt \sqsubseteq hasFix \quad (17)$$

$$\exists hasSegment.Segment \sqsubseteq SemanticTrajectory \quad (18)$$

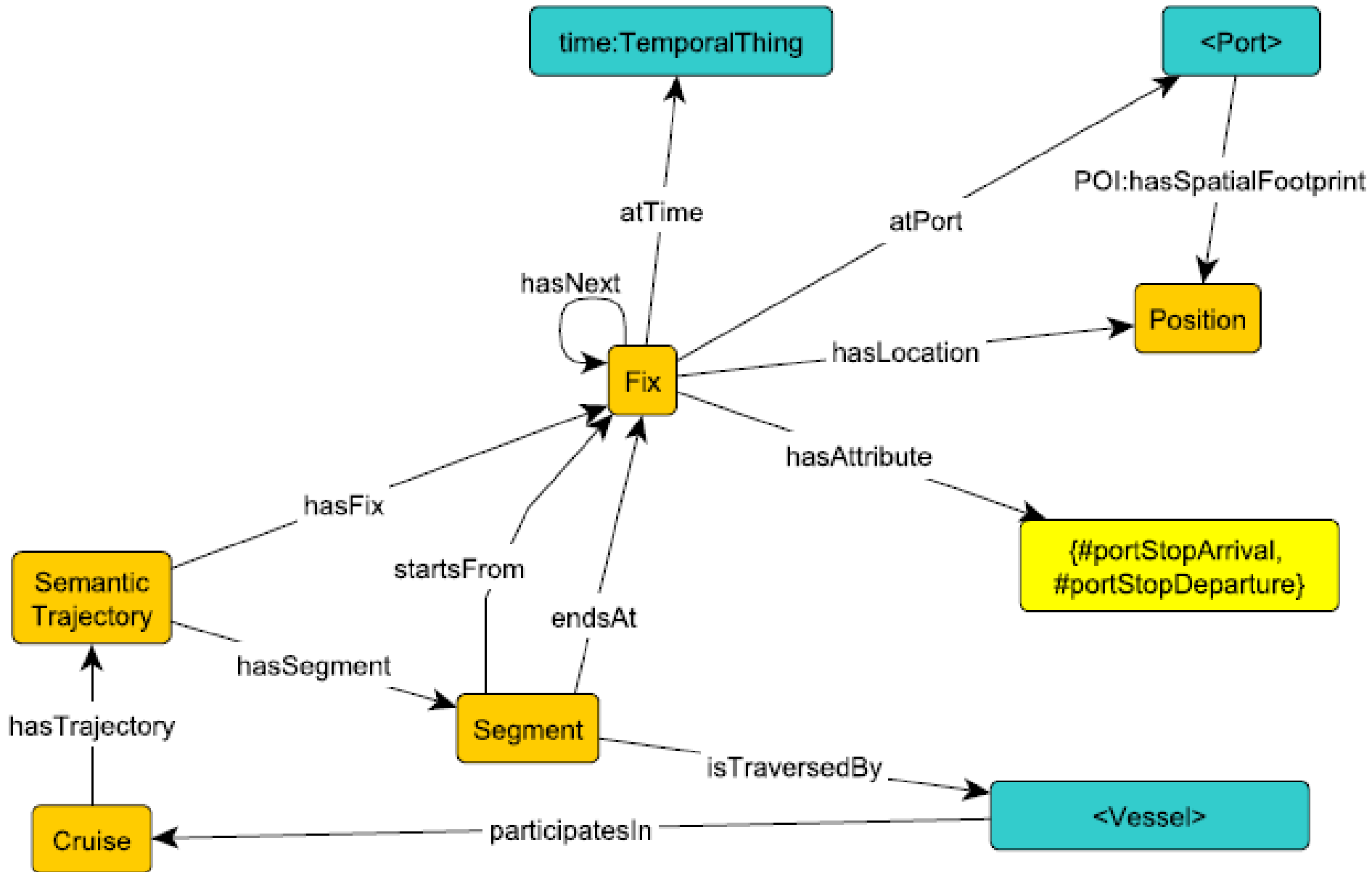
$$\exists hasSegment^- .SemanticTrajectory \sqsubseteq Segment \quad (19)$$

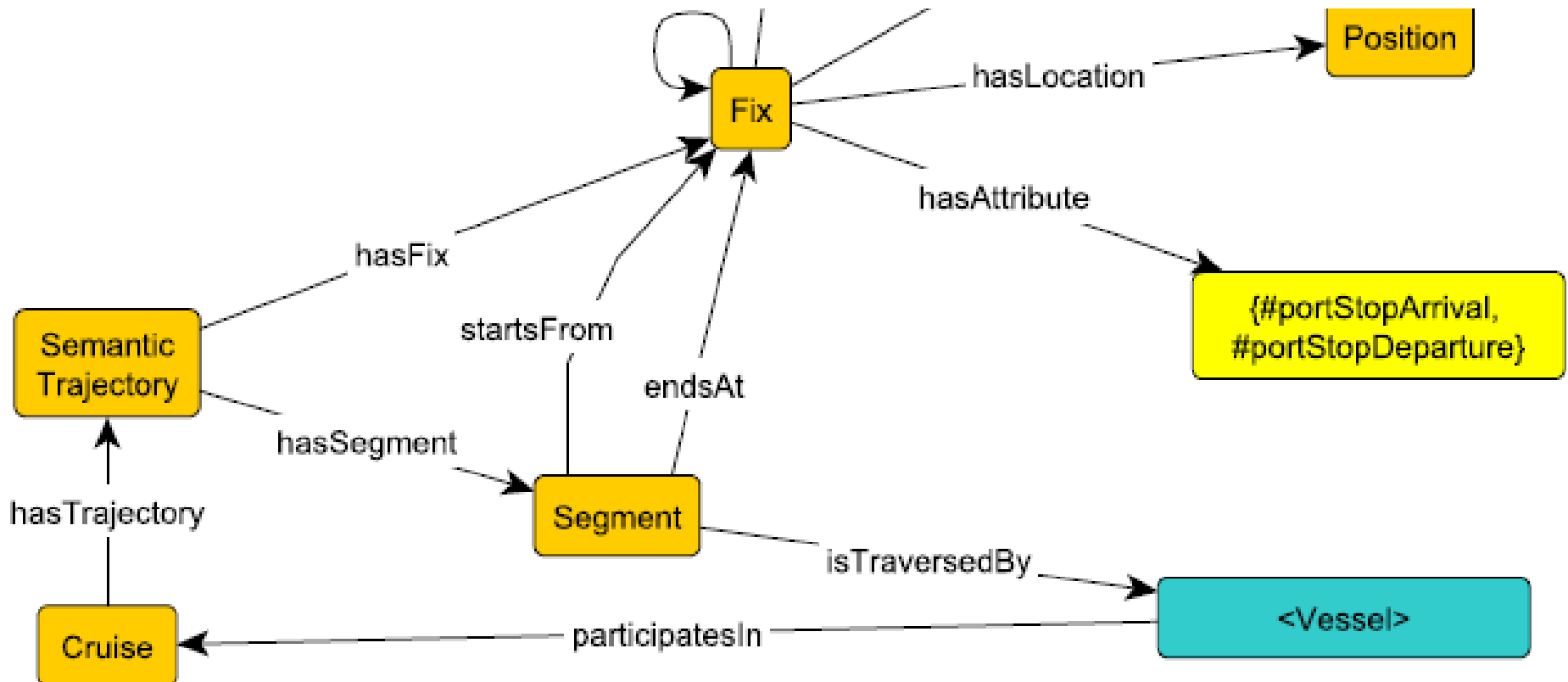
$$\exists hasFix.Segment \sqsubseteq SemanticTrajectory \quad (20)$$

$$\exists hasFix^- .SemanticTrajectory \sqsubseteq Fix \quad (21)$$



Cruise trajectory (draft)



$$\begin{aligned} & \text{Cruise}(x) \wedge \text{hasTrajectory}(x, y) \\ & \quad \wedge \text{hasSegment}(y, z) \wedge \text{isTraversedBy}(z, v) \\ & \quad \rightarrow \text{participatesIn}(v, z) \end{aligned}$$


$$\begin{aligned} & \text{Cruise}(x) \wedge \text{hasTrajectory}(x, y) \\ & \quad \wedge \text{hasSegment}(y, z) \wedge \text{isTraversedBy}(z, v) \\ & \quad \rightarrow \text{participatesIn}(v, z) \end{aligned}$$
$$\text{Cruise} \equiv \exists \text{cruise}.\text{Self}$$
$$\begin{aligned} & \text{cruise} \circ \text{hasTrajectory} \circ \text{hasSegment} \circ \text{isTraversedBy} \\ & \quad \sqsubseteq \text{hasParticipant} \end{aligned}$$
$$\text{hasParticipant} \equiv \text{participatesIn}^-$$

$$\begin{aligned} & \text{Fix}(x) \wedge \text{hasAttribute}(x, \#\text{portStopArrival}) \\ & \wedge \text{atPort}(x, y) \wedge \text{hasSpatialFootprint}(y, z) \\ & \wedge \text{hasLocation}(x, w) \rightarrow \text{locatedIn}(w, z) \end{aligned}$$
$$\begin{aligned} \text{Fix} \wedge \exists \text{hasTrajectory}.\{\#\text{portStopArrival}\} & \equiv \exists \text{fixps}.\text{Self} \\ & \text{hasLocation}^- \circ \text{fixps} \circ \text{atPort} \circ \text{hasSpatialFootprint} \\ & \sqsubseteq \text{locatedIn} \end{aligned}$$

Robert Arko, Columbia University

Suzanne Carbotte, Columbia University

Cynthia Chandler, Woods Hole Oceanographic Institution

Michelle Cheatham, Wright State University

Timothy Finin, University of Maryland, Baltimore County

Pascal Hitzler, Wright State University

Krzysztof Janowicz, University of California, Santa Barbara

Adila Krisnadhi, Wright State University

Thomas Narock, Marymount University

Lisa Raymond, Woods Hole Oceanographic Institution

Adam Shepherd, Woods Hole Oceanographic Institution

Peter Wiebe, Woods Hole Oceanographic Institution

**The presented work is part of the NSF *OceanLink* project:
EarthCube Building Blocks, Leveraging Semantics and Linked Data
for Geoscience Data Sharing and Discovery**

Thanks!



Semantic Web - Interoperability, Usability, Applicability *an IOS Press Journal*

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Tracking Number

Special Call for Ontology Design Pattern descriptions

Submitted by [Pascal Hitzler](#) on 03/20/2014 - 13:25

Semantic Web journal:
Special Call for
Ontology Design Pattern descriptions

An ontology design pattern is a reusable solution to a recurring ontology modeling problem. Different kinds of ontology design patterns have been identified, and they are used for different purposes ranging from their use as building blocks and strategies for ontology creation to their utilization for heterogeneity preservation in information integration.

The Semantic Web journal calls for papers containing concise descriptions of an Ontology Design Pattern. Papers are typically expected to include discussions of at least the following aspects.

- A general introduction concerning the rationale of making the pattern.
- A graphical depiction of the pattern accompanied by an explanation, in intuitive terms, of the design choices made.
- A detailed axiomatization, e.g. using OWL, for the relationships between the vocabulary terms used in the patterns.
- A detailed discussion of related patterns or ontology modeling practices and their relationships with the presented pattern.
- A convincing discussion of use cases.
- Examples for existing datasets which can be used with the pattern.

Papers will be evaluated along the following dimensions: Quality of the pattern, usefulness (or potential usefulness) of the pattern, clarity and completeness of the descriptions.

Prospective authors must take notice of the submission guidelines posted at <http://www.semantic-web-journal.net/authors>

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- **Prateek Jain, Pascal Hitzler, Peter Z. Yeh, Kunal Verma, Amit P. Sheth, Linked Data is Merely More Data. In: Dan Brickley, Vinay K. Chaudhri, Harry Halpin, Deborah McGuinness: *Linked Data Meets Artificial Intelligence*. Technical Report SS-10-07, AAAI Press, Menlo Park, California, 2010, pp. 82-86. ISBN 978-1-57735-461-1. Proceedings of LinkedAI at the AAAI Spring Symposium, March 2010.**
- **Pascal Hitzler, Krzysztof Janowicz, *What's Wrong with Linked Data?* <http://blog.semantic-web.at/2012/08/09/whats-wrong-with-linked-data/> , August 2012.**
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- **Pascal Hitzler, Krzysztof Janowicz, Linked Data, Big Data, and the 4th Paradigm. Semantic Web 4 (3), 2013, 233-235.**
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- **Adila Alfa Krisnadhi, Frederick Maier, Pascal Hitzler, OWL and Rules. In: A. Polleres, C. d'Amato, M. Arenas, S. Handschuh, P. Kroner, S. Ossowski, P.F. Patel-Schneider (eds.), Reasoning Web. Semantic Technologies for the Web of Data. 7th International Summer School 2011, Galway, Ireland, August 23-27, 2011, Tutorial Lectures. Lecture Notes in Computer Science Vol. 6848, Springer, Heidelberg, 2011, pp. 382-415.**

Pascal Hitzler, Markus Krötzsch,
Sebastian Rudolph

Foundations of Semantic Web
Technologies

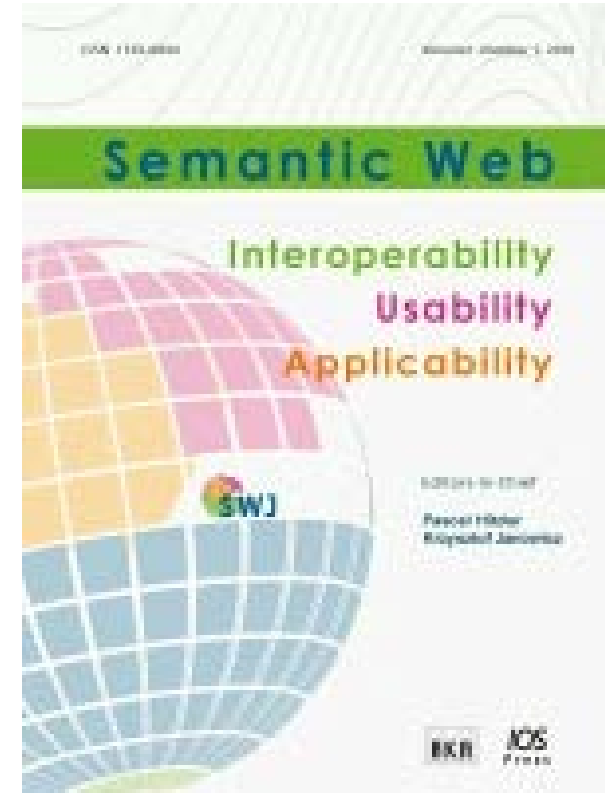
Chapman & Hall/CRC, 2010

**Choice Magazine Outstanding Academic
Title 2010 (one out of seven in Information
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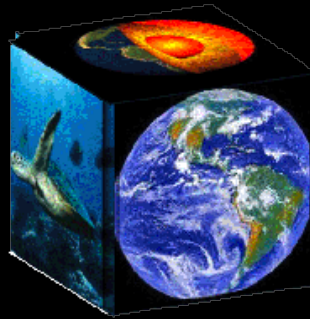


- **EiCs:** Pascal Hitzler
Krzysztof Janowicz
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EarthCube requires

- information integration
- interoperability
- conceptual modeling
- intelligent search
- data-model intercomparison
- data publishing support



Semantic Web studies

- information integration
- interoperability
- conceptual modeling
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