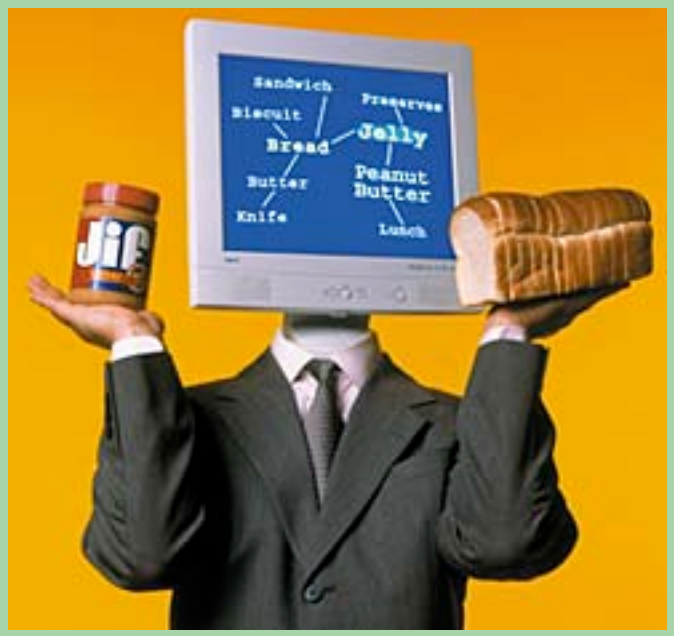
10 Practical Reasons why you need an Ontology



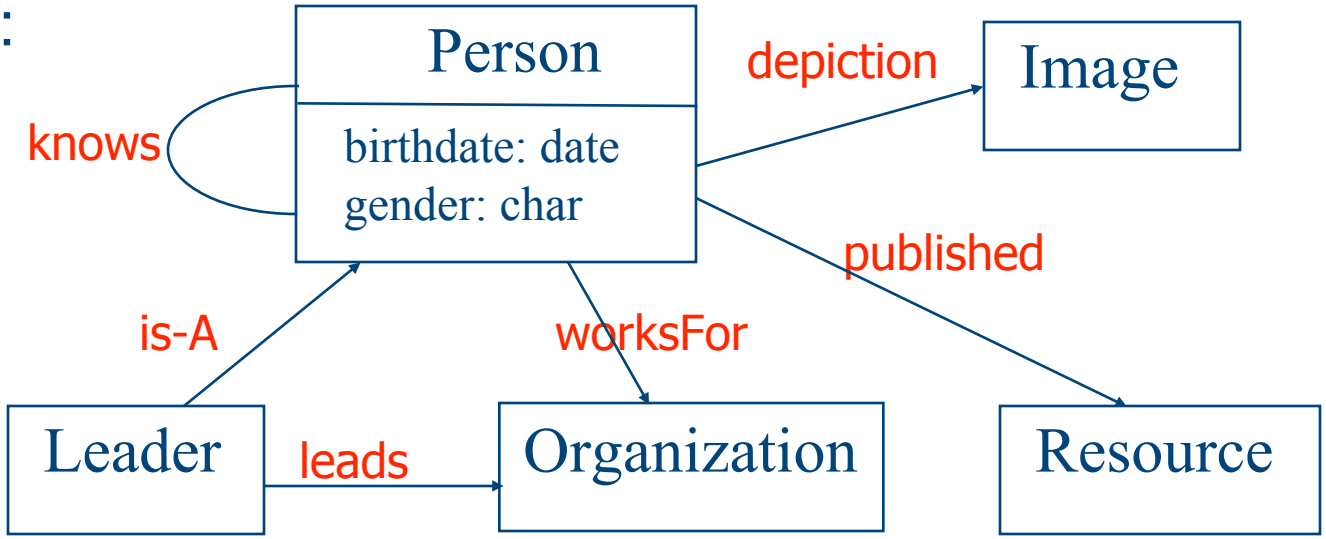
Michael C. Daconta
Chief Architect
Virtual Knowledge Base

Outline

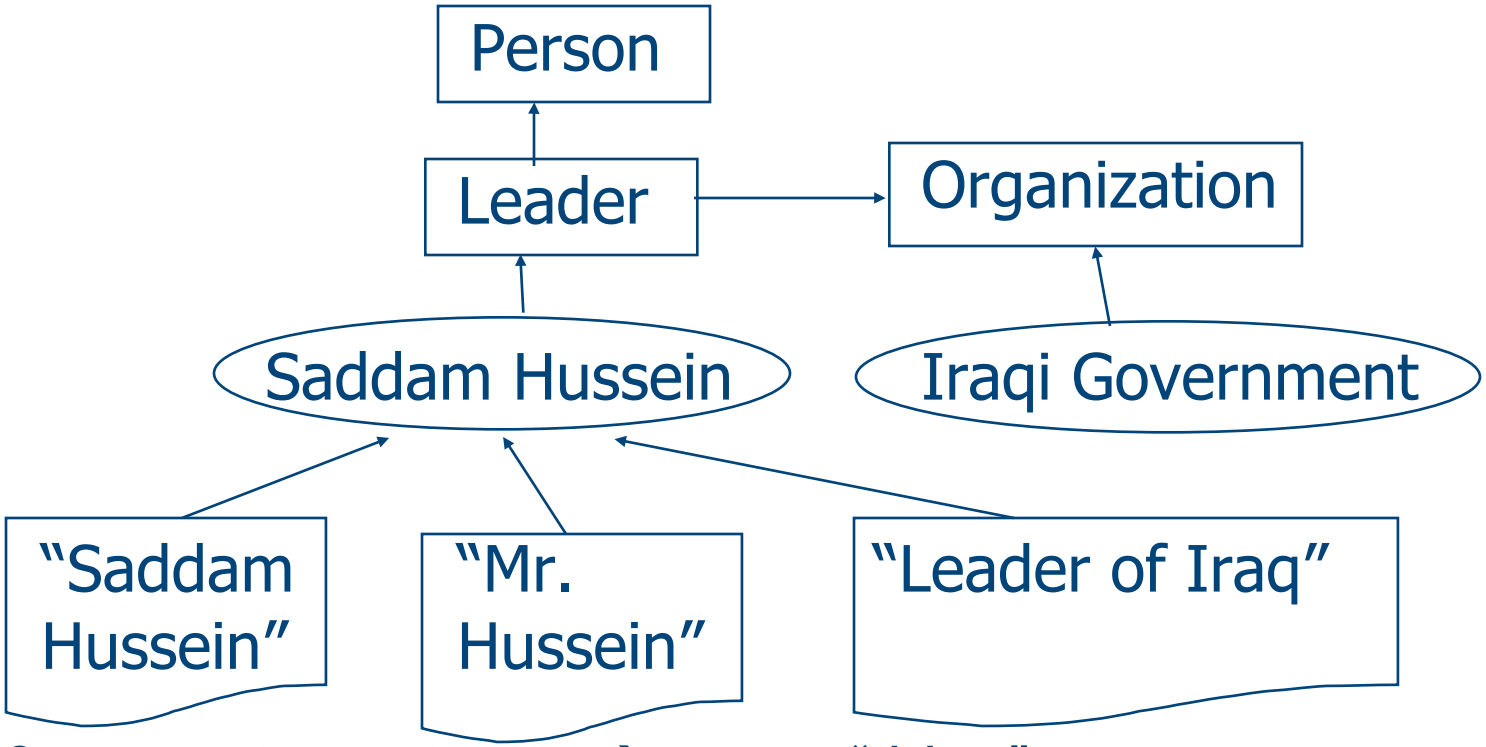
- What is an Ontology?
- 10 Practical Reasons
  - Ontologies unambiguously define things.
  - Associations bridge stove-piped domains.
  - Ontologies can expand/narrow search terms.
  - Ontologies enable “Activity-based” search.
  - Ontologies can validate taxonomy membership.
  - Ontologies can be distributed and aggregated.
  - Ontologies map to dbms, OOP and UML modeling.
  - Ontologies + Rules = Inference.
  - Ontology concepts are mature.
- Conclusion

What is an Ontology?

- Useless Definition:
  - "A specification of a conceptualization"
- Practical Definition:
  - An object model or entity-relationship model
- Example:

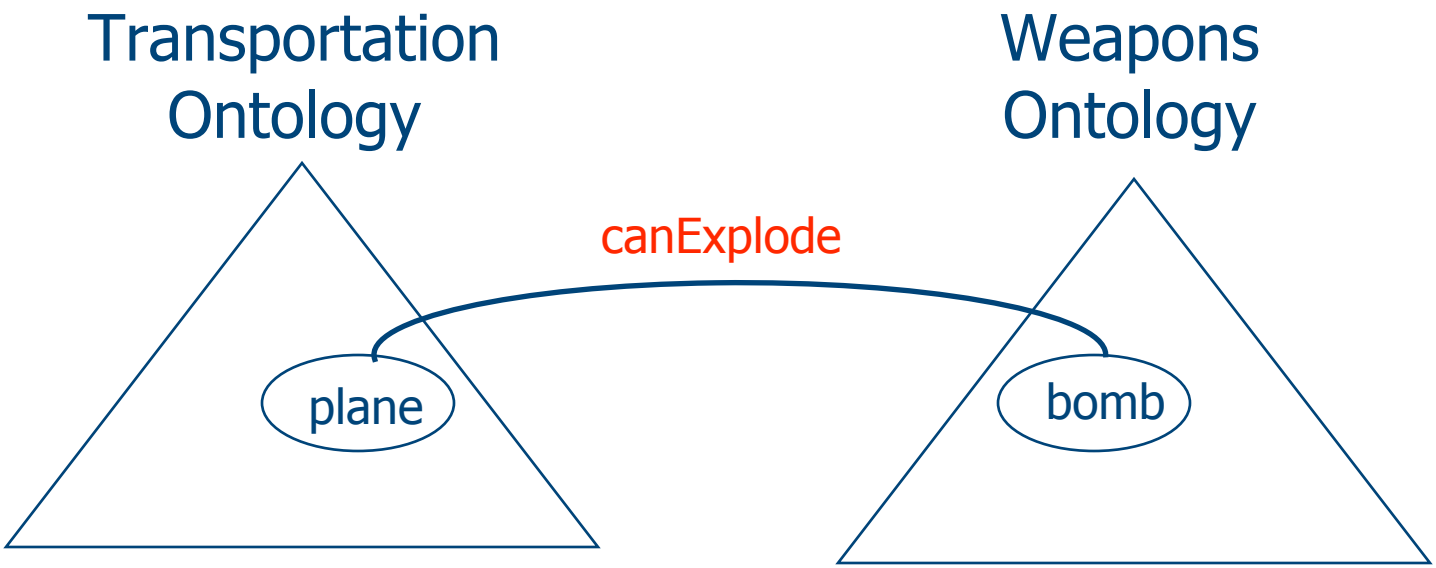


Reason #1: Ontologies unambiguously define things.



- 3 separate syntaxes → same "thing"
- Essential for Authoritative search.

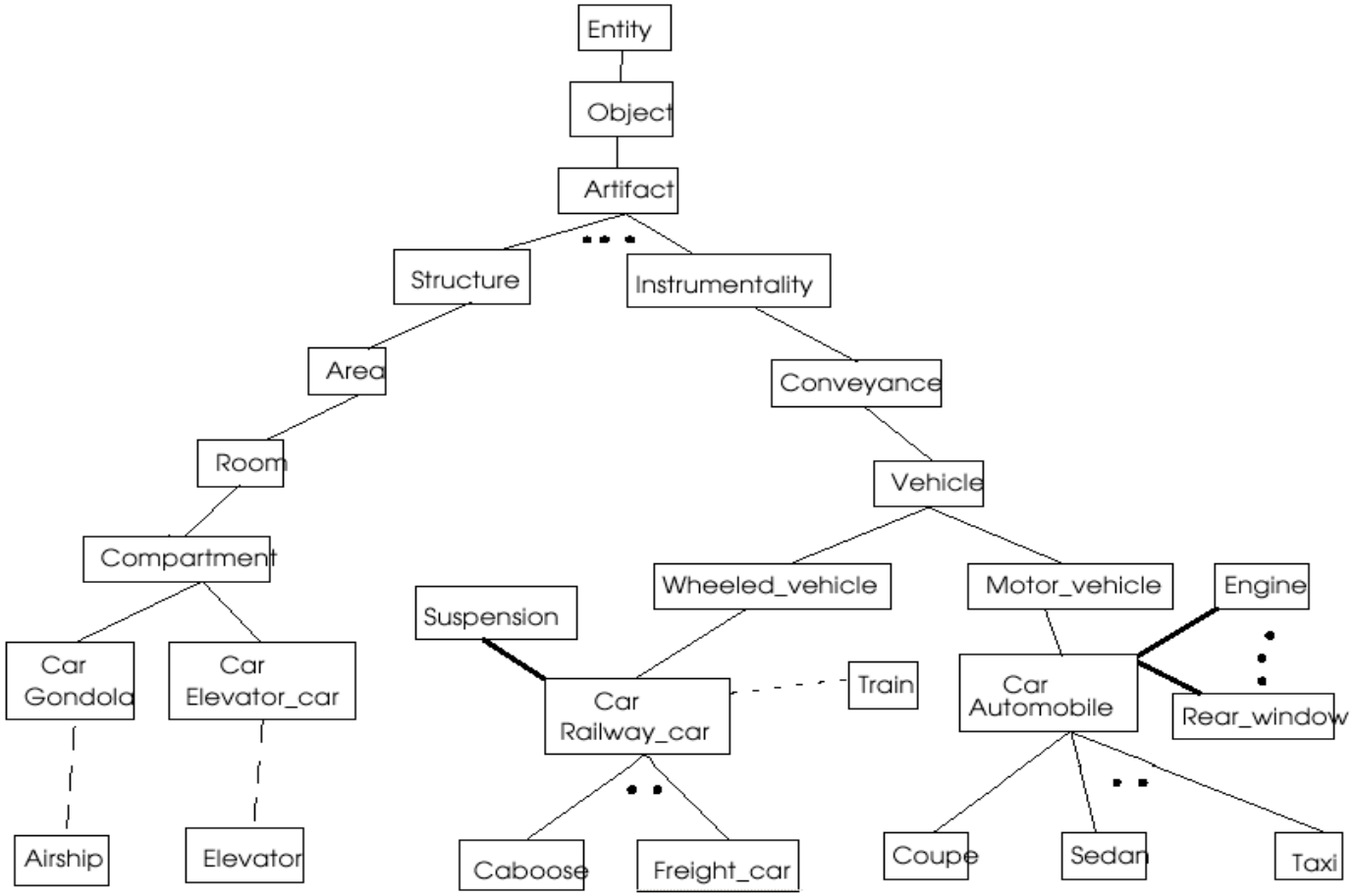
Reason #2: Associations bridge stove-piped domains



- Essential for Asymmetric Search
- "Search by association" is the "killer-app" for robust ontologies.

Reason #3: Ontologies can expand/ narrow search terms

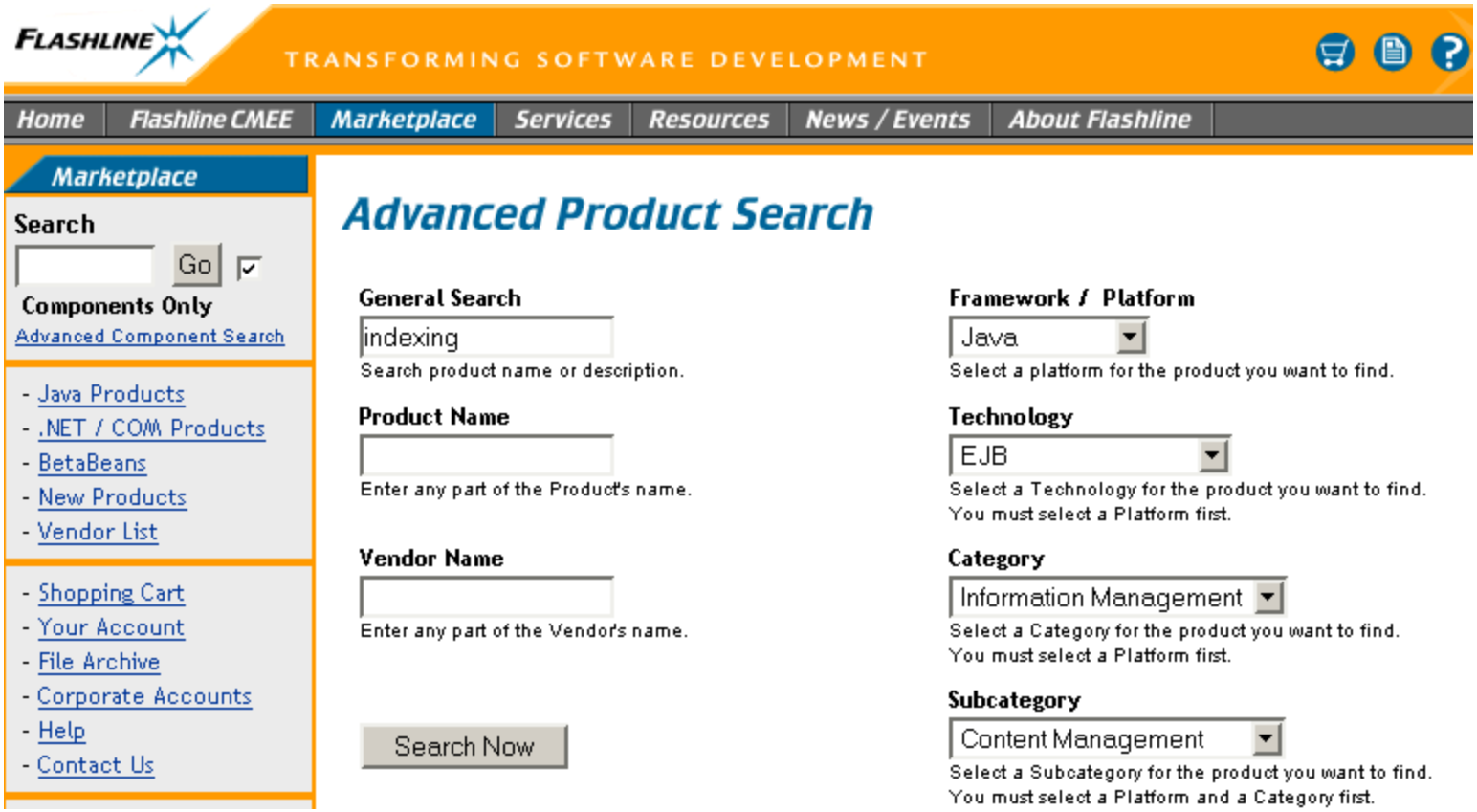
Wordnet Extract For Concept "car"



Wordnet Relations

Relation	Example		
Allow trigger links	Clinton	→	Whitewater
Allow synonym links	bike	↔	bicycle
Allow generalization links	tree	→	acacia
Allow specialization links	shoe	←	footwear
Allow comprises links	Turkey	⇠	Istanbul
Allow part-of links	CPU	⇢	computer
Allow antonym links	opaque	↮	clear
Allow rhyme links	Reno	R	casino
Allow sounds-like links	candle	S	cancel
Allow anagram links	Geraldine	A	realigned
Allow occupation links	Leonardo da Vinci	←	painter
Allow nationality links	Martin Luther	⇢	German
Allow birth year links	Orville Wright	B	1871
Allow death year links	Gilda Radner	D	1989
Allow biographical trigger links	Jesse Louis Jackson	→	rainbow
Allow *also known as* links	John Ono Lennon	↔	John Lennon

Narrowing Search



Semantic Search Example (TAP)

Google

Search Tips

Tim Berners Lee | Search

Semantics by TAP

Search WWW Search w3.org

Searched pages from **w3.org** for **Tim Berners Lee** . Results **1** - **10** of about **7,450**. Search took **0.16** seconds.

Tim Berners-Lee
Tim Berners-Lee. Weaving the Web by **Tim Berners-Lee** with Mark Fischetti, (Harper San Francisco; Hardback: ISBN:0062515861, Abridged **...**
Description: Includes biographies, information about his book, as well as questions and answers about his contribution...
Category: Computers > Internet > History > People > Berners-Lee, Tim
www.w3.org/People/Berners-Lee/ - 11k - Cached - Similar pages

People of the W3C
... Baron, Caroline: Administrative Support **Berners-Lee**, **Tim**: Management Booth, David:
Architecture Bos, Bert: Document Formats Bournez, Carine: Architecture Boyera **...**
www.w3.org/People/ - 17k - 9 Sep 2002 - Cached - Similar pages

Who's Who at the World Wide Web Consortium
... Management. **Tim Berners-Lee**, Director. **...** Amy van der Hiel. Amy van der Hiel is the
assistant to **Tim Berners-Lee** and works as part of the administrative team. **...**
www.w3.org/People/all - 100k - Cached - Similar pages

People who have contributed to the World Wide Web project
... (more). **Tim Berners-Lee**. Please see W3C People, a list of people involved with the World Wide Web Consortium. Thomas R Bruce. Formerly **...**
www.w3.org/People.html - 14k - Cached - Similar pages

Frequently asked questions by the Press - **Tim** BL

Tim Berners-Lee

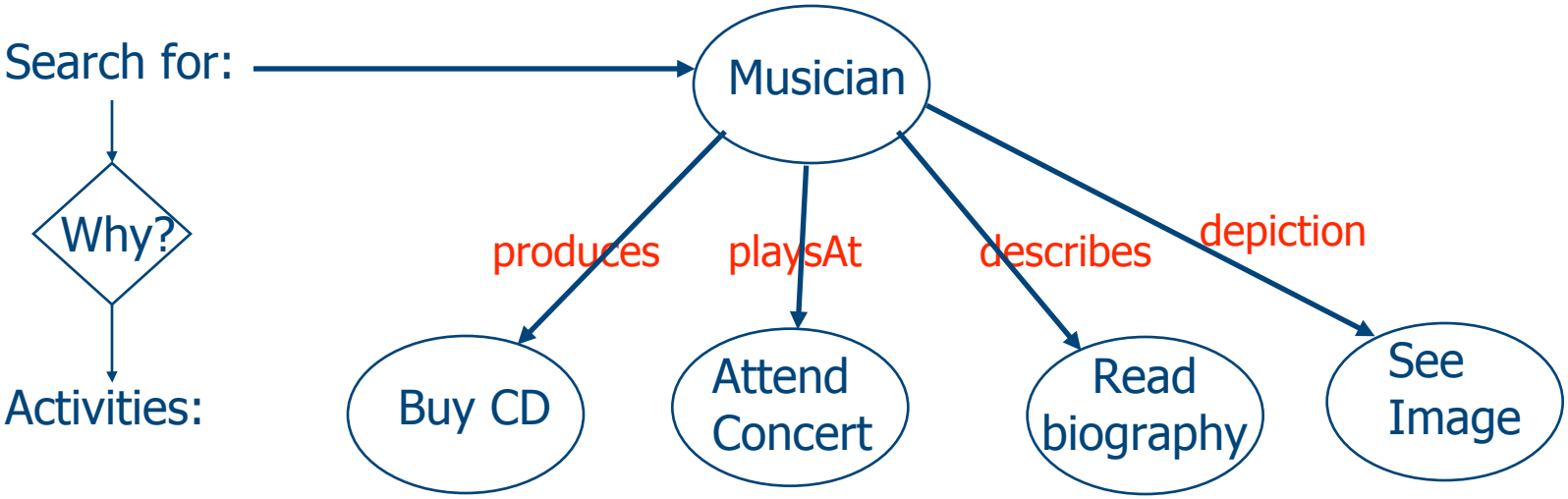
timbl@w3.org

Tim invented the World Wide Web in late 1990 while working at CERN, the European Particle Physics Laboratory in Geneva, Switzerland. He wrote the first WWW client ... ...

Related Activities:
W3C Semantic Web Activity

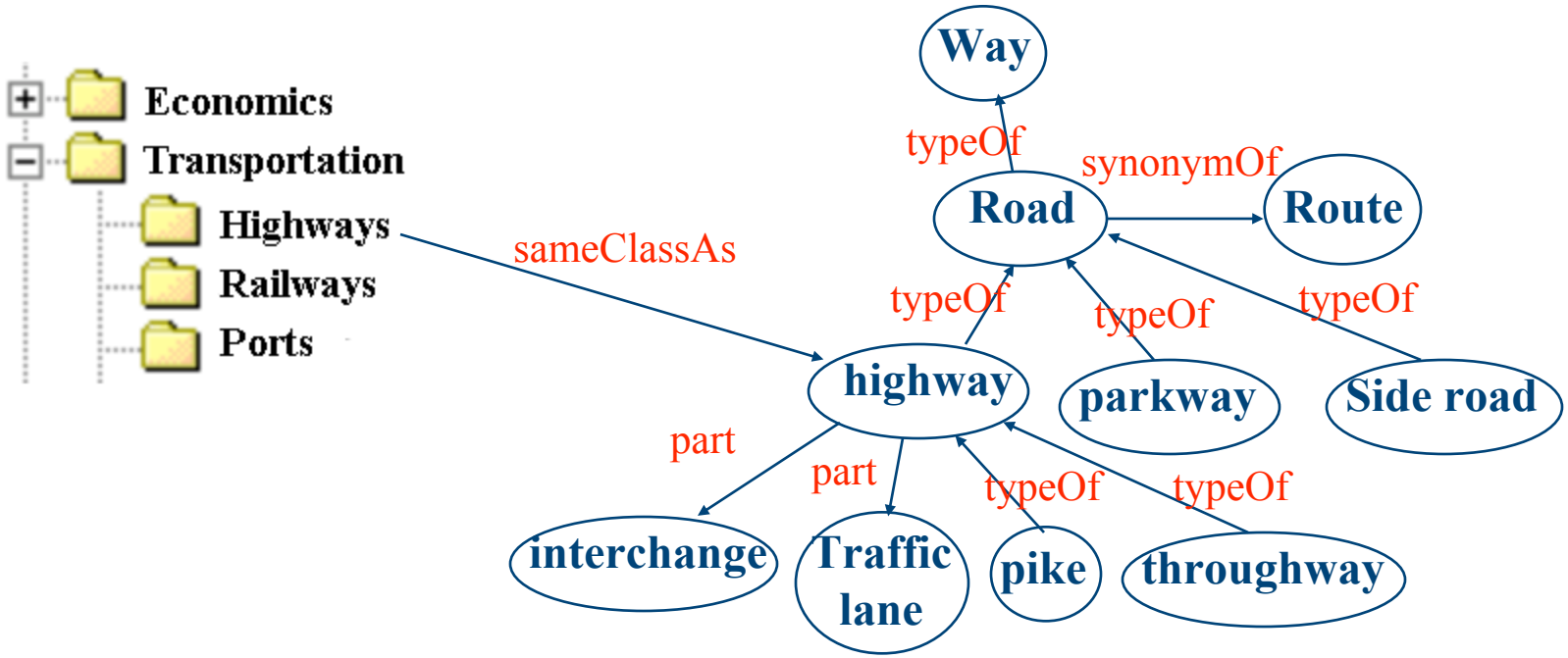
Related Recommendations:
Resource Description Framework (RDF) Model and Syntax Specification , 22 February 1999 . Ralph Swick, Ora Lassila

Reason #4: Ontologies enable "Activity-based" Search.



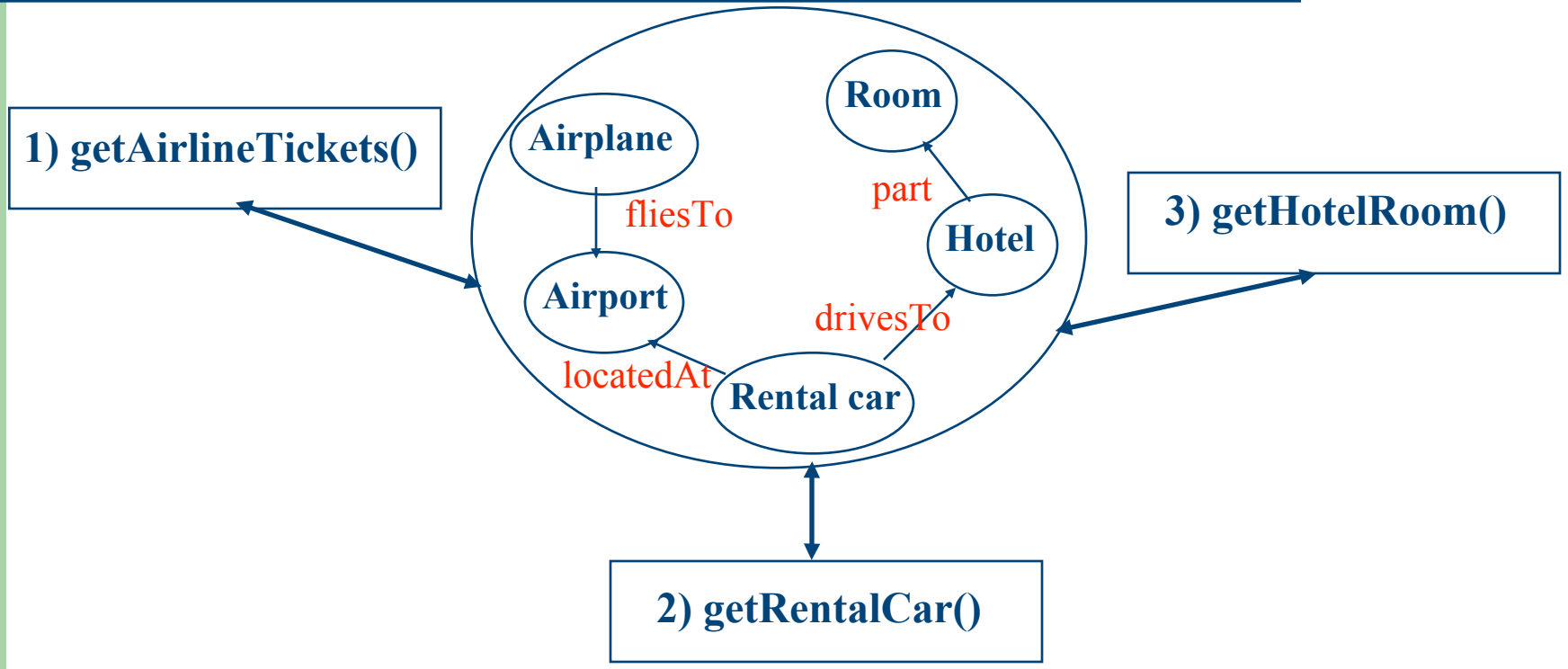
- Demos of Activity based search at http://tap.stanford.edu

Reason #5: Ontologies can validate taxonomy membership



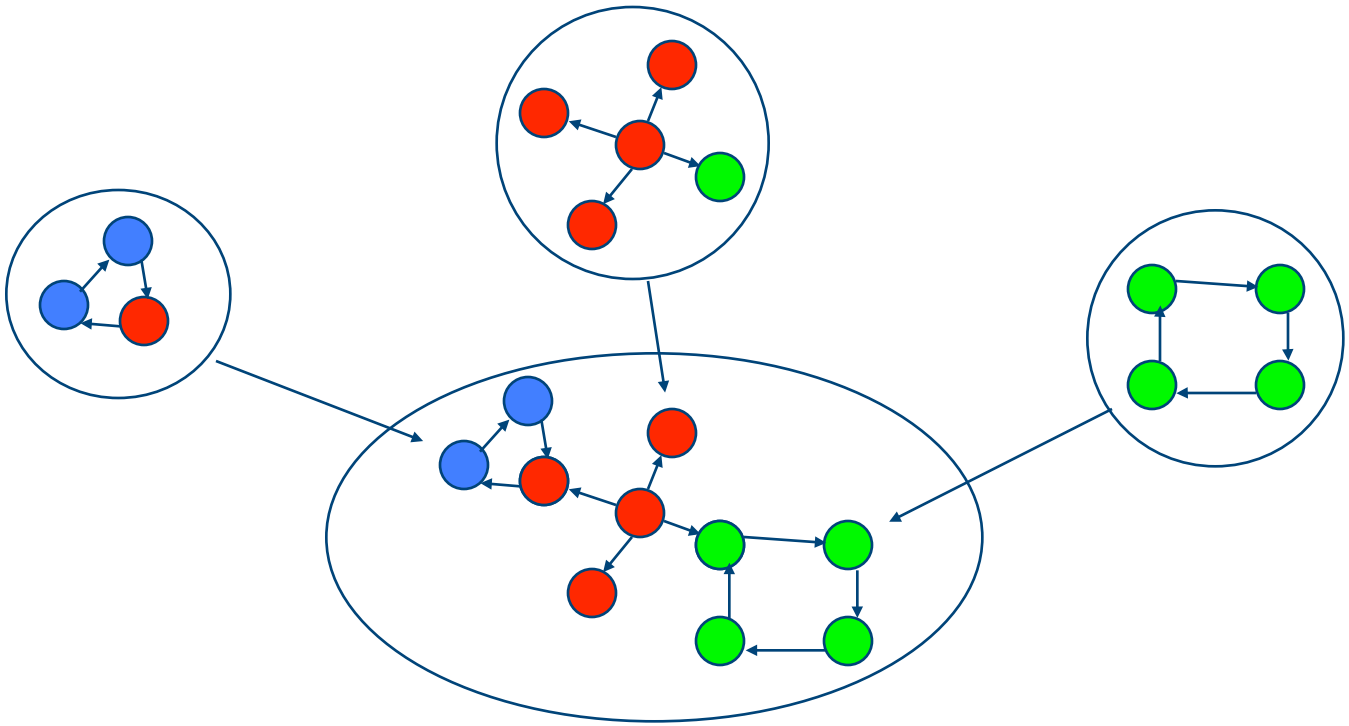
- Essential for authoritative machine categorization

Reason #6: Ontologies enable web-service orchestration.



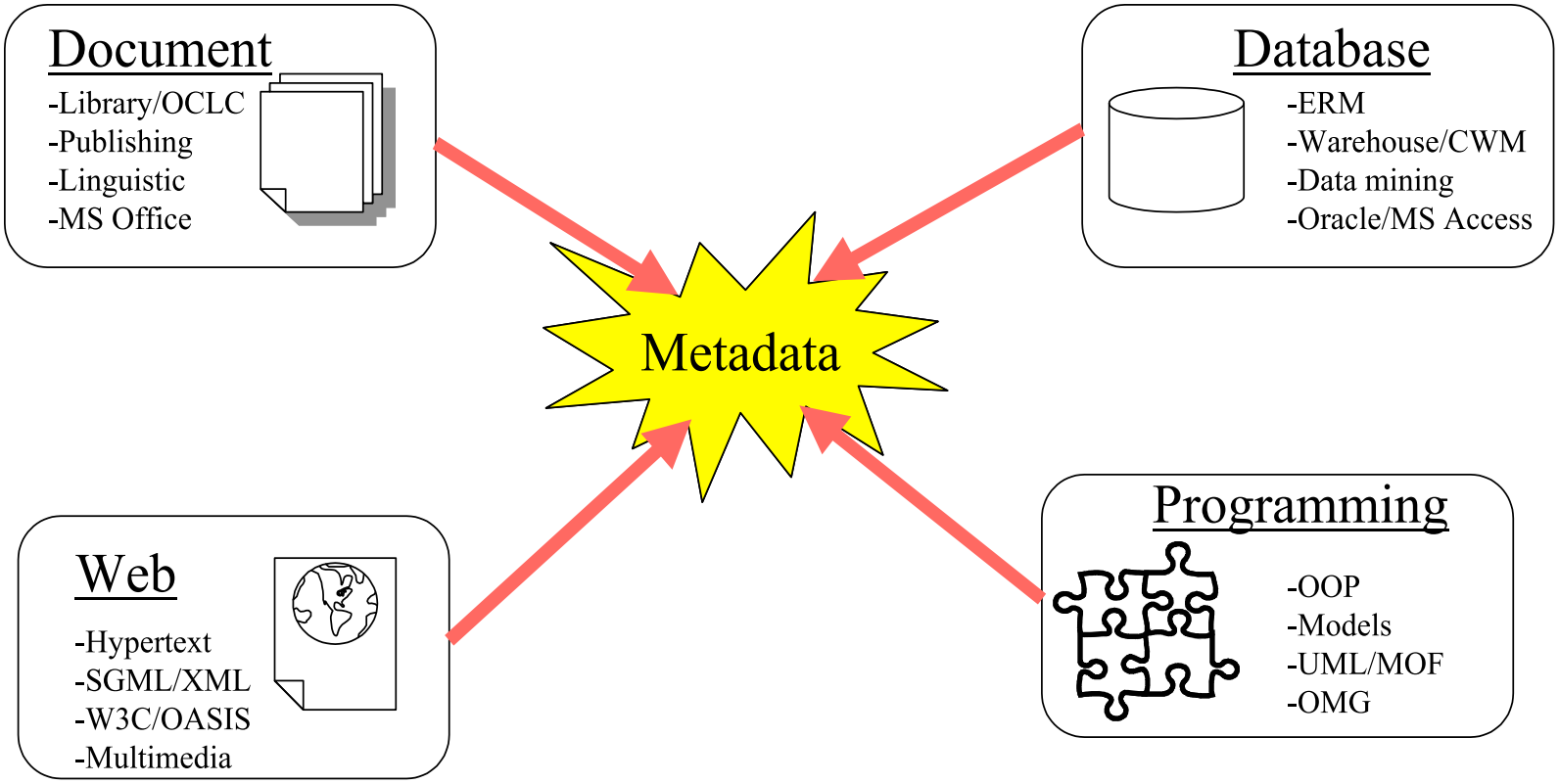
- Canonical Example: Trip reservations for airline, rental car and hotel need to be orchestrated.

Reason #7: Ontologies can be distributed and aggregated



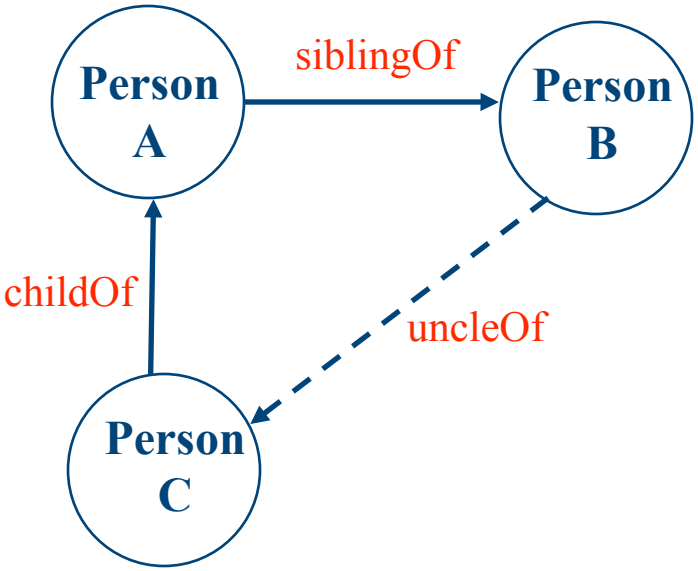
- Construction and maintenance can be distributed.

Reason #8: Ontologies map to DBMS, OOP and UML modeling



A convergence of 4 diverse "data communities"!

Reason #9: Ontologies + Rules = Inference



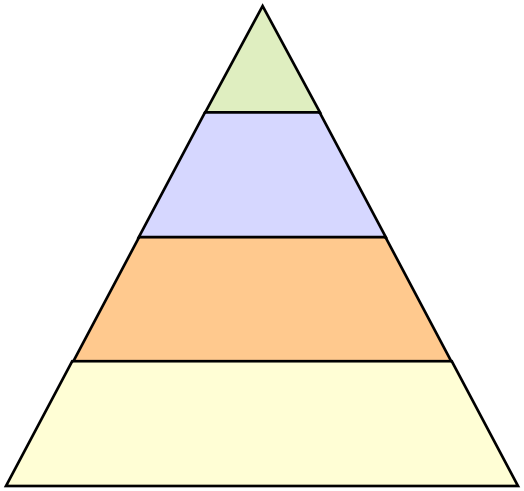
Rules

```
if (C.gender == "male" AND
     C == childOf(A))
    then C = sonOf(A);

if (B.gender == "male" AND
     B == siblingOf(A))
     then B == brotherOf(A);

if (C == sonOf(A) AND
    B == brotherOf(A))
    then B = uncleOf(C);
```

- Two given relations and one inferred relation (uncleOf)

Reason #10: Ontology concepts are mature

- Used for Knowledge Representation starting in **1968** by M.R. Quillan.
- Used extensively in healthcare and other industries: GIS, FDA, biotechnology, finance, law.
- Large-scale ontologies in production: CYC [Lenat], WordNet, OntoBroker [Fensel], TAP, SUMO.
- W3C Ontology Web Language (**OWL**) is now a working draft (extends DAML+OIL).



Conclusion

- Knowledge Bases need an Ontology to unambiguously integrate data sources.
- We should leverage the work of the Semantic Web Community.
- Ontologies have proven themselves applicable to this task.
- Questions?