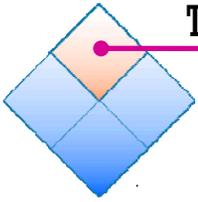


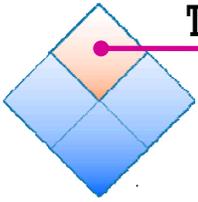
Bringing Semantics to Service-Oriented Architecture: Ontology-based Mediation for eGovernment

Dean Allemang
Chief Tech Consultant
TopQuadrant, Inc.

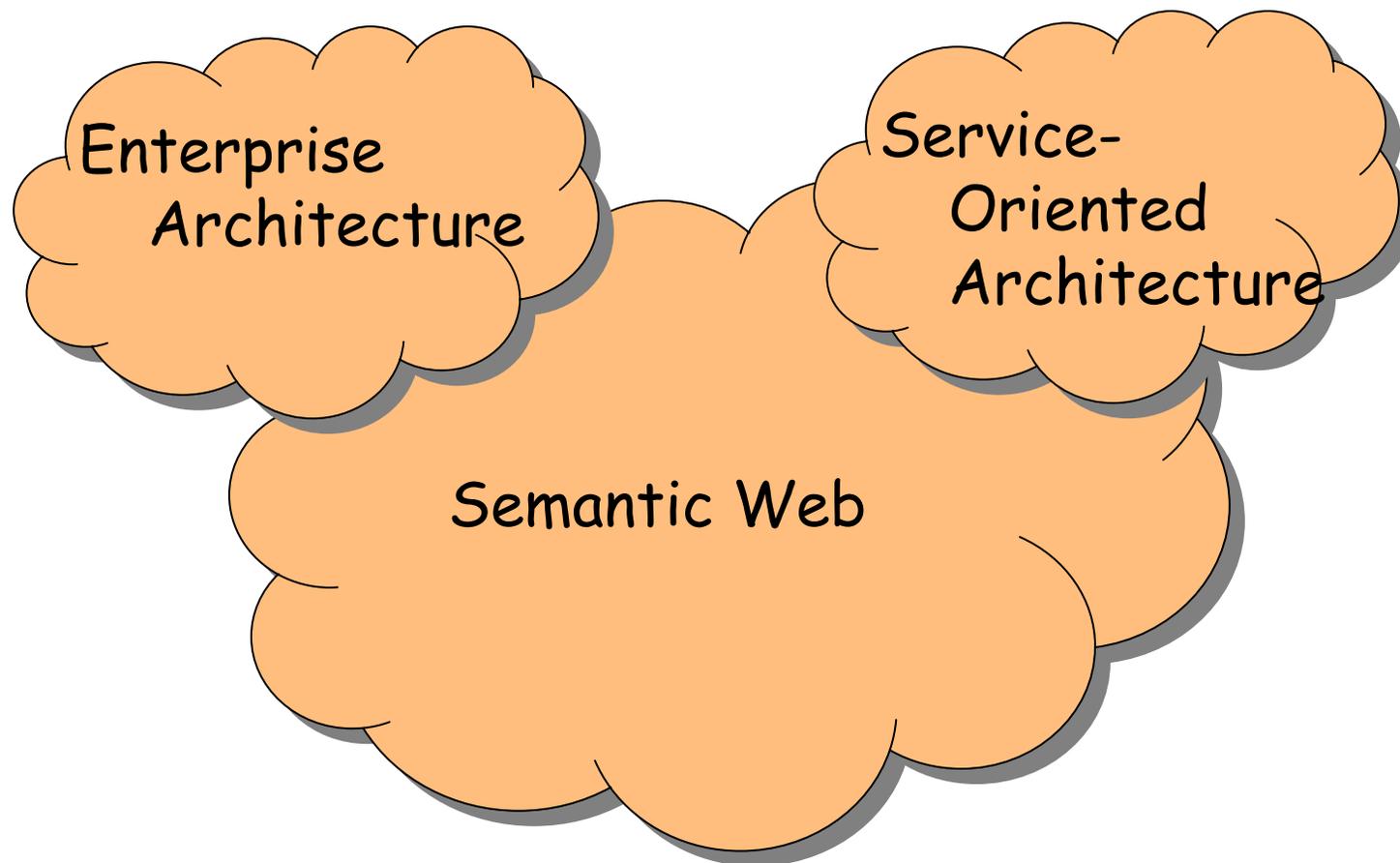


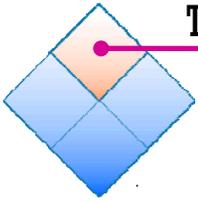
Topics covered

- Enterprise Architecture, Semantic Web, Service Oriented Architecture
- For successful EA - why SOA? Why Semantic Web?
- What is Semantic Web? How does it contribute to SOA and EA?
- Semantic Policy Engine and SOA

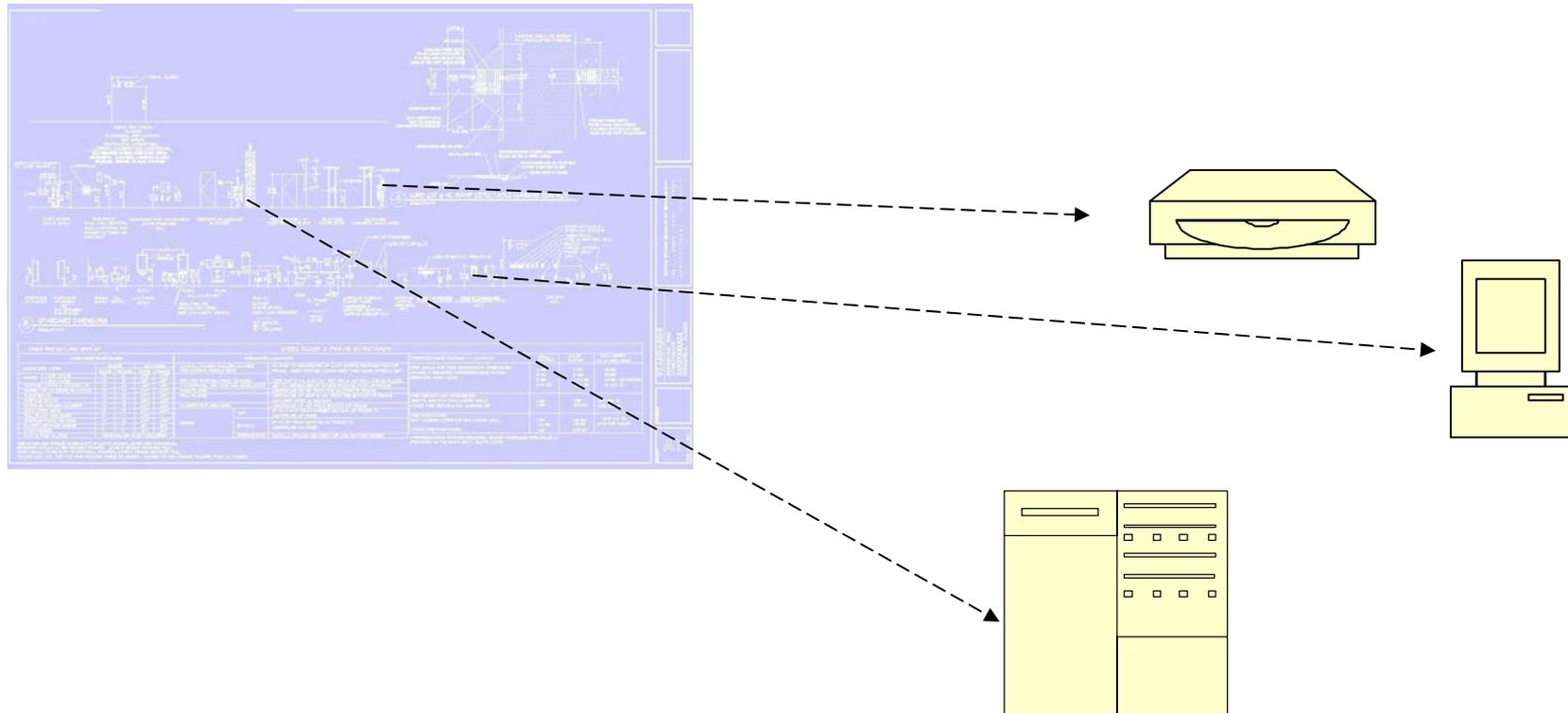


Semantic SOA and EA

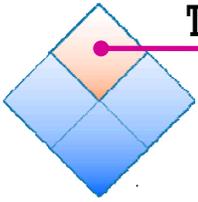




EA as “passive” repository

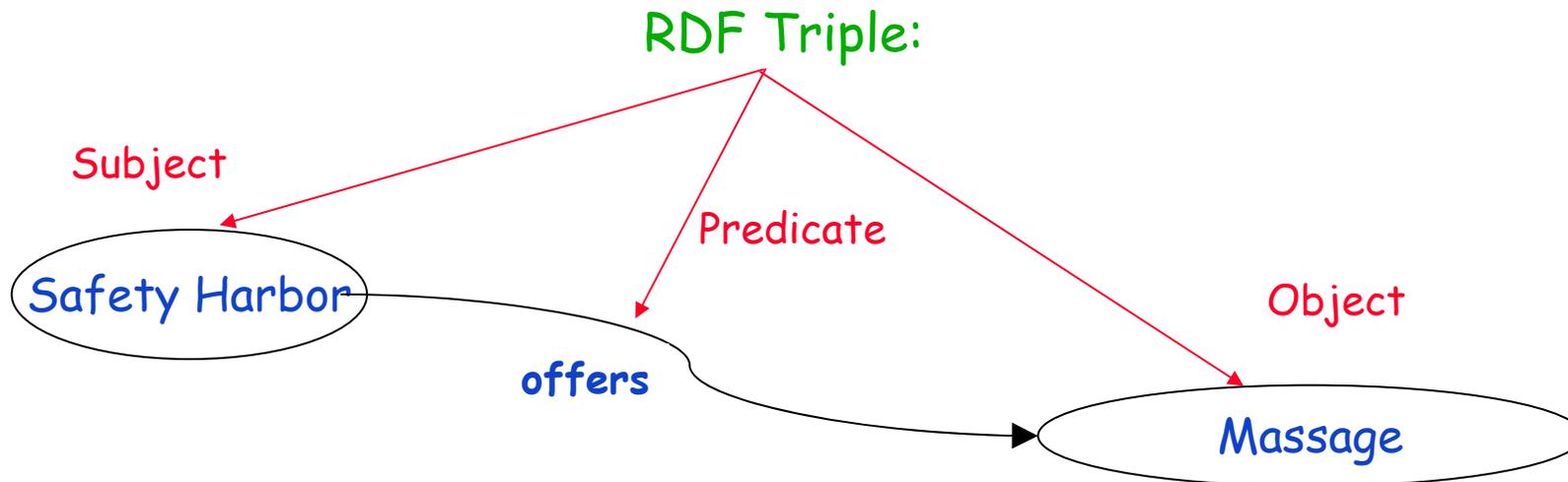


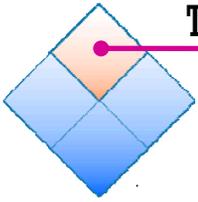
**Who maintains this?
How does it provide value?**



What is RDF?

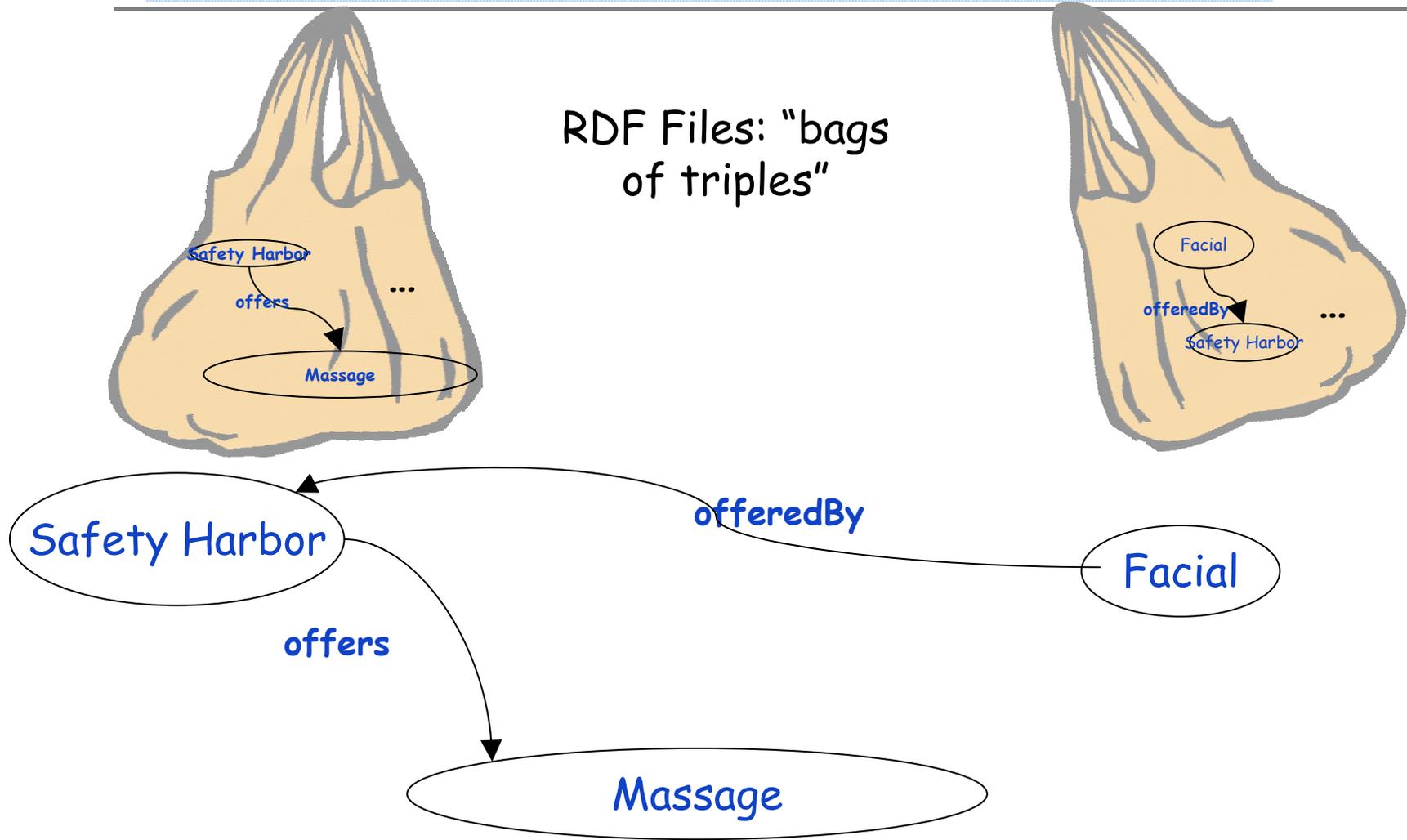
- ❑ RDF (Resource Description Framework) is an infrastructure for:
 - Encoding,
 - Exchange and
 - Distributing metadata

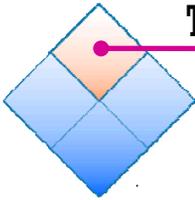




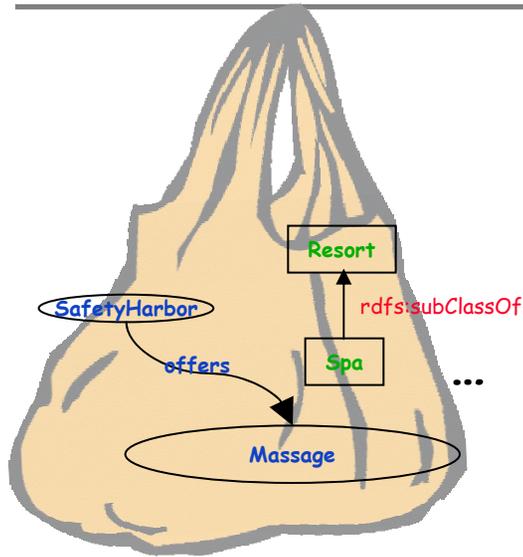
RDF: A distributed network of data!

RDF Files: "bags of triples"

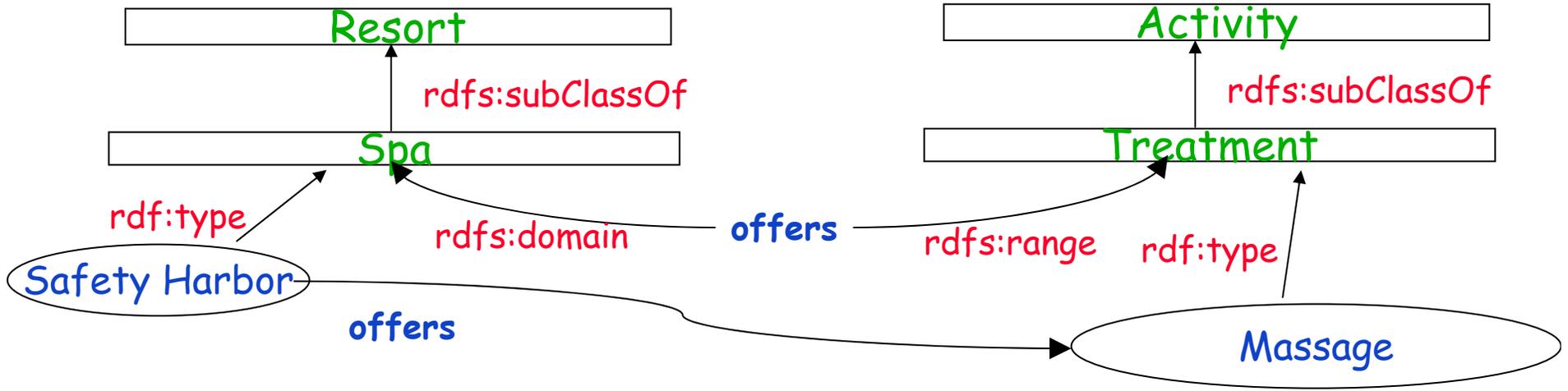
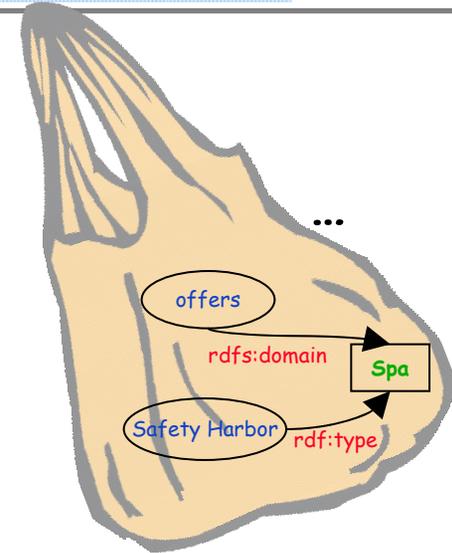


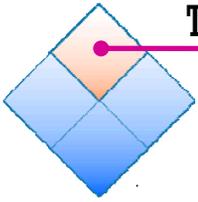


RDFS is RDF, too!

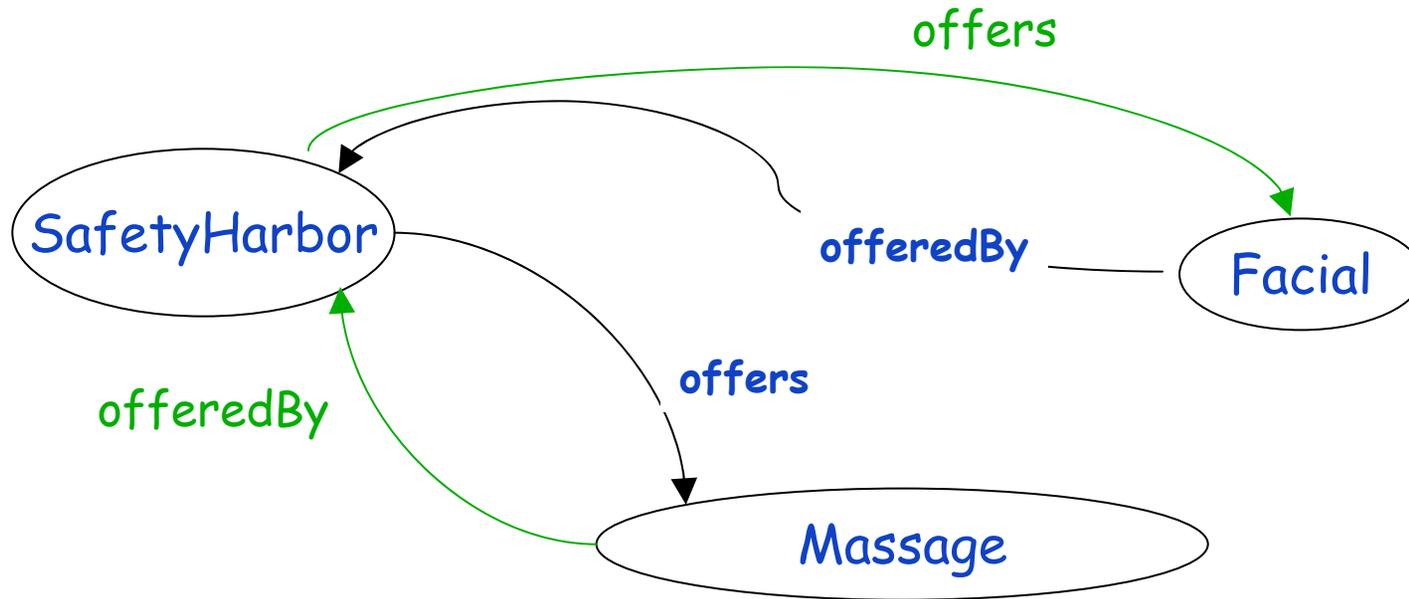


If the bags contain RDFS key symbols, then RDFS can infer certain conclusions

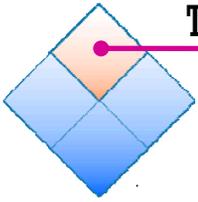




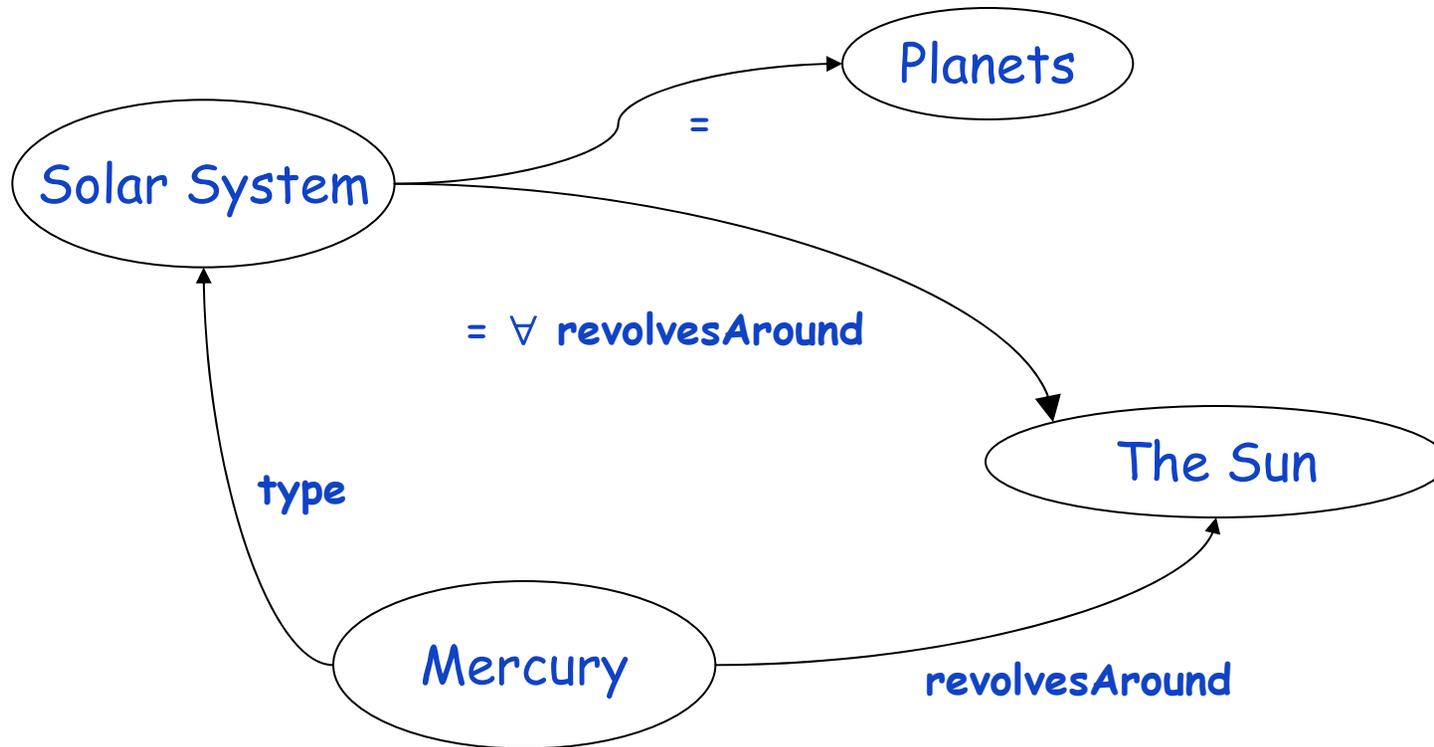
OWL can specify rich relationships: equivalence, inverse, unique, ...

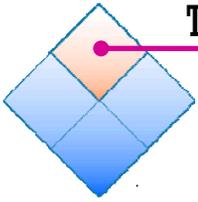


offers inverseOf offeredBy



OWL can describe classes, and determine membership





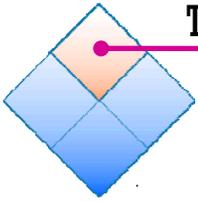
Why use RDF for an Enterprise Architecture?

EA Requirements

- Flexible, expressive models
- Extensible in many different ways
- Compatible with well-known modeling paradigms (e.g., OO)
- Incremental Construction
- Distribution of information

RDF Features

- General graph modeling
- Graph merging is a primitive operation
- RDFS provides frame structure
- "A little RDF goes a long way"
- RDF is natively "of the web"



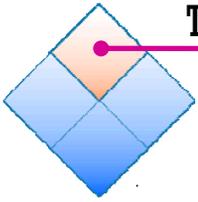
Why use RDF/OWL for a Service-Oriented Architecture?

SOA Requirements

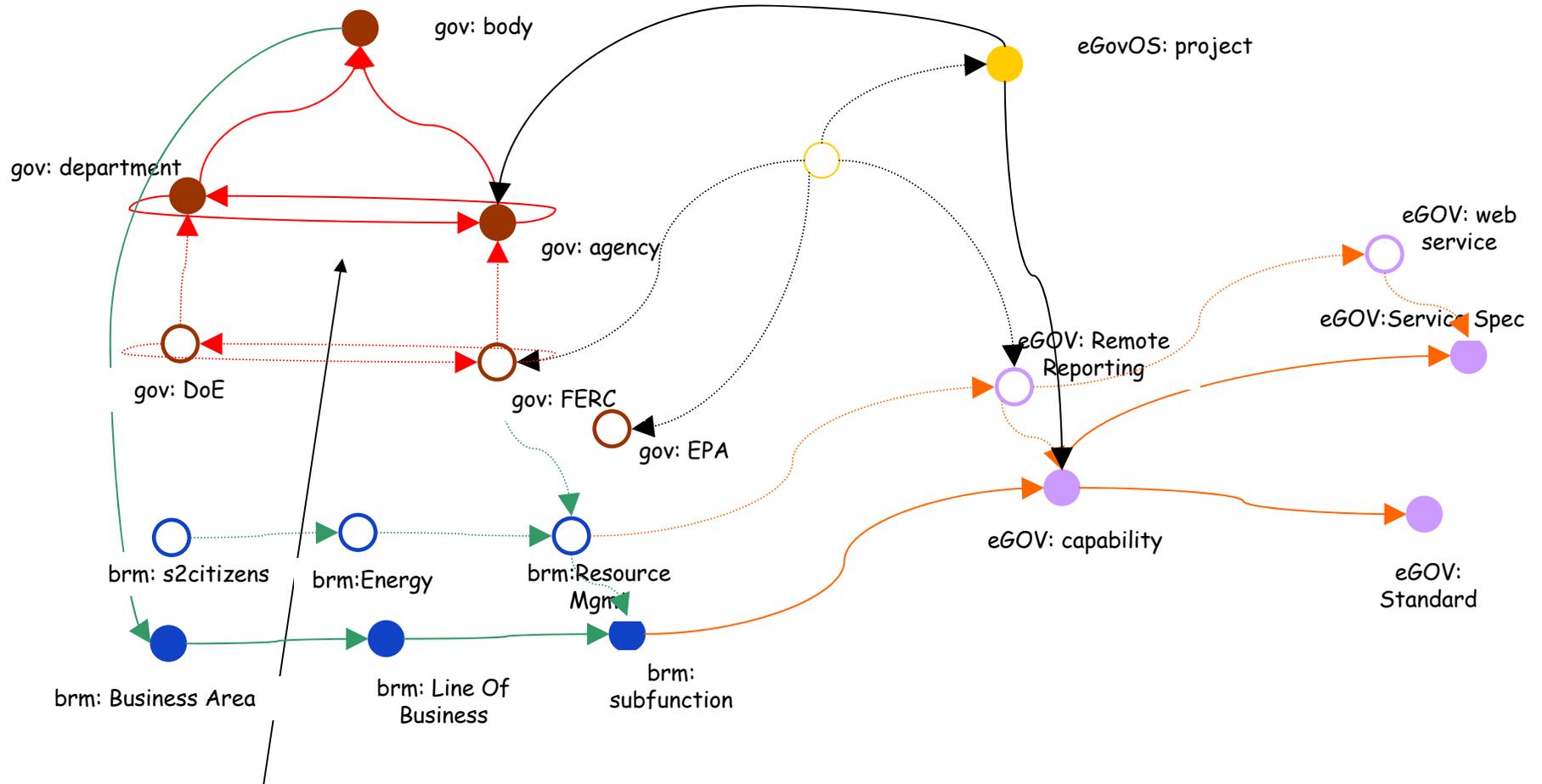
- Ability to describe entities for retrieval
- Well-defined semantics of a service offering
- Commonality and Variability analysis

OWL Features

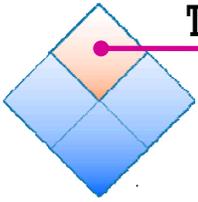
- DL Classification and Description Logic
- Formal graph-theoretic semantics
- "Tube map" combination



Incremental construction: A little RDF(S) goes a long way



A model of government agencies and departments. Such models are called *Ontologies*.



Challenge: Commonality and Variability

Organization Domain Modeling (ODM)*

<http://www.domainmodeling.com/stars.html#odm>

Methodology for engineering sets of reusable assets

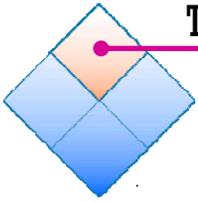
Stakeholder analysis

Exemplar study

Commonality and Variability modeling

Asset-base engineering

*not to be confused with the Ontology Definition Metamodel (ODM)

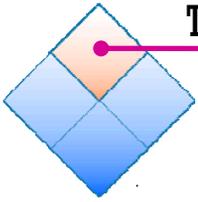


Challenge: Commonality and Variability

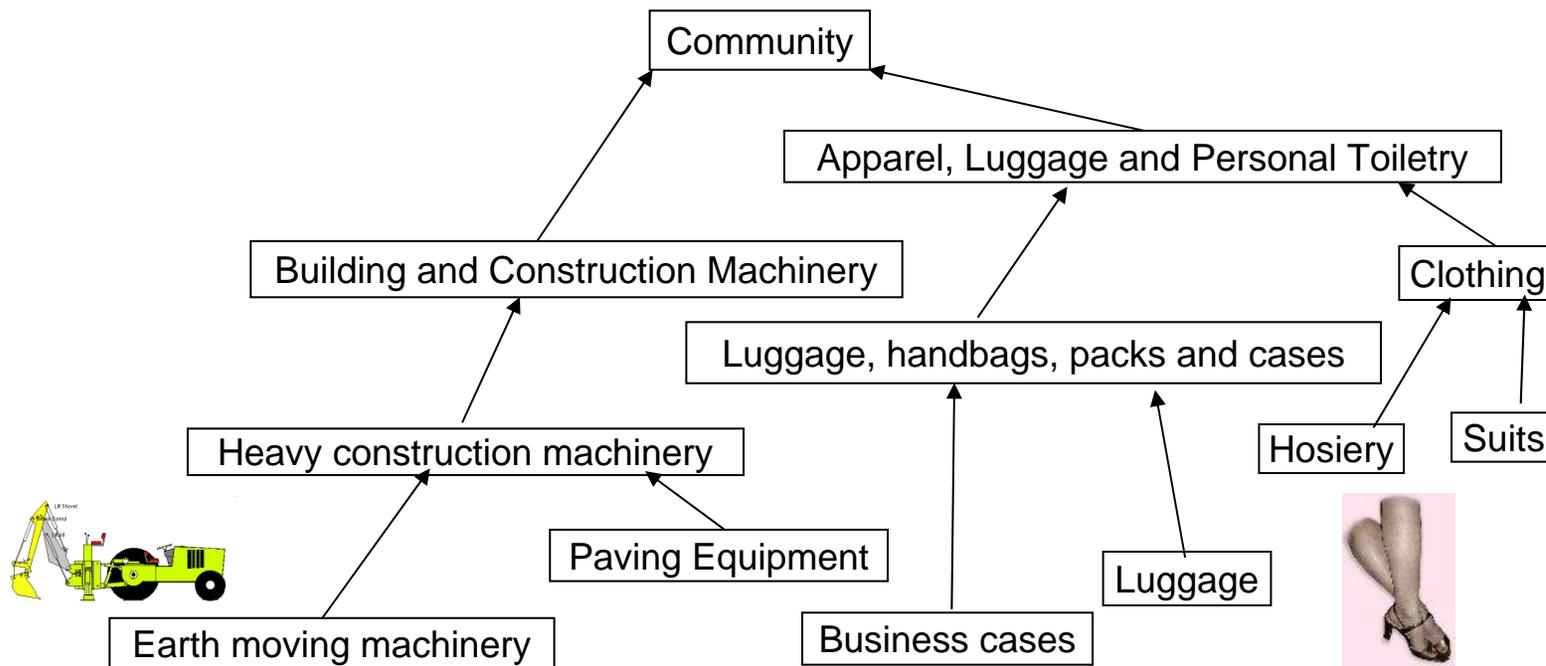
Exploit things in common . . .

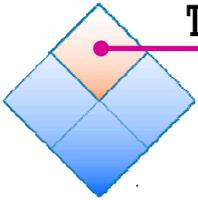


... while respecting variation

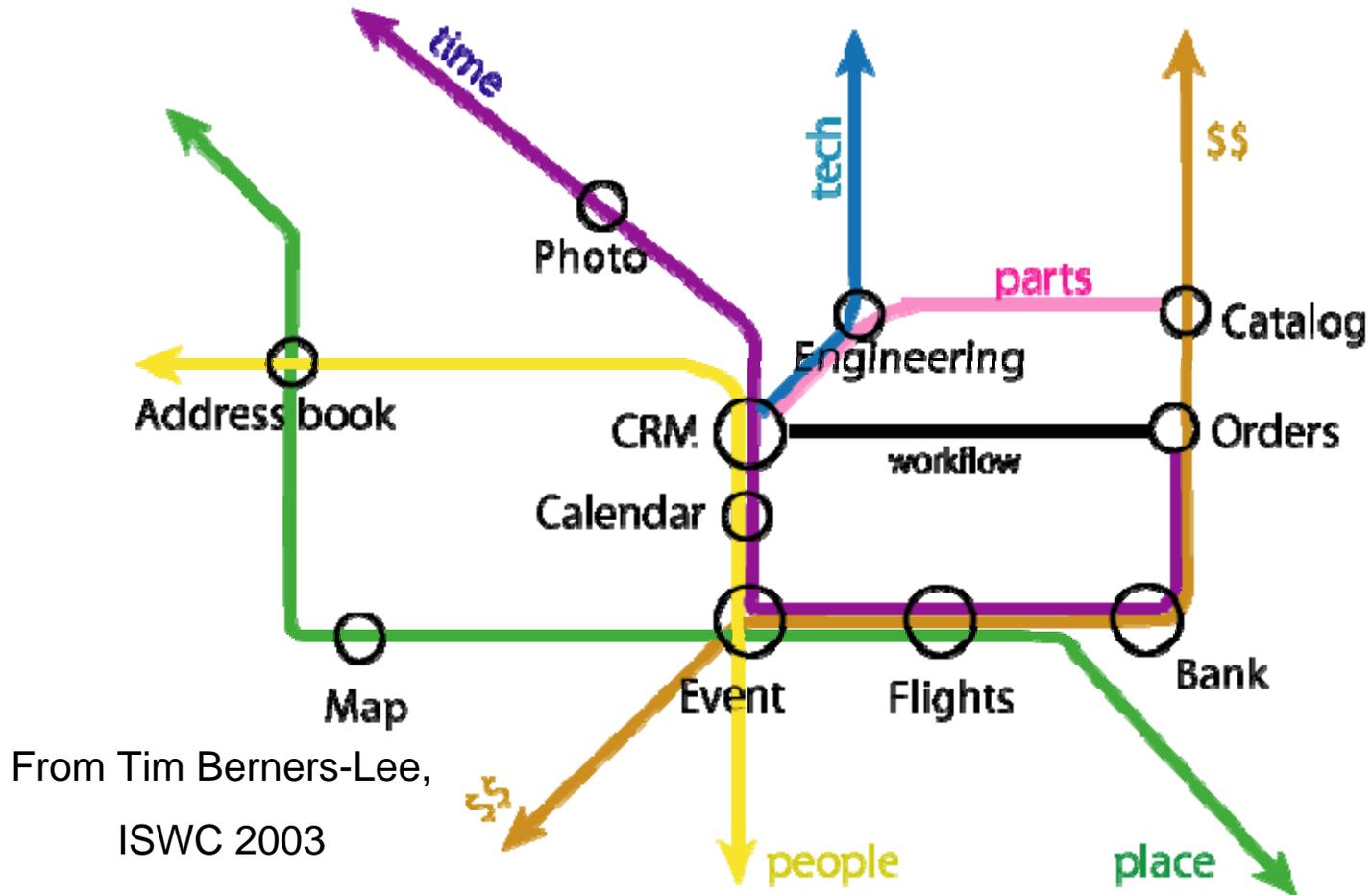


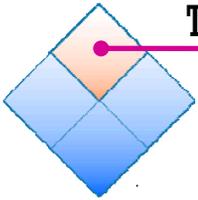
Commonality I – object models





Commonality II – schema sharing





Distributed data

- ❑ RDF refers to Resources, identified by URLs.
- ❑ This means that information about a single resource can come from many sources.

<http://www.china.org/geography/rivers#Yangtze>

```
<length>6300 kilometers</length>  
<startingLocation>western China's Qinghai-Tibet  
Plateau</startingLocation>  
<endingLocation>East China Sea</endingLocation>
```

<http://www.china.org/geography/rivers#Yangtze>

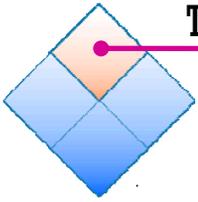
```
<name>Dri Chu - Female Yak River</name>  
<name>Tongtian He, Travelling-Through-the-Heavens River</name>  
<name>Jinsha Jiang, River of Golden Sand</name>
```

<http://www.china.org/geography/rivers#Yangtze>

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```

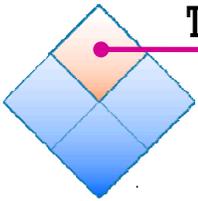
A distributed network of data!

Example adapted from Costello and
Jacobs, from XML to RDF



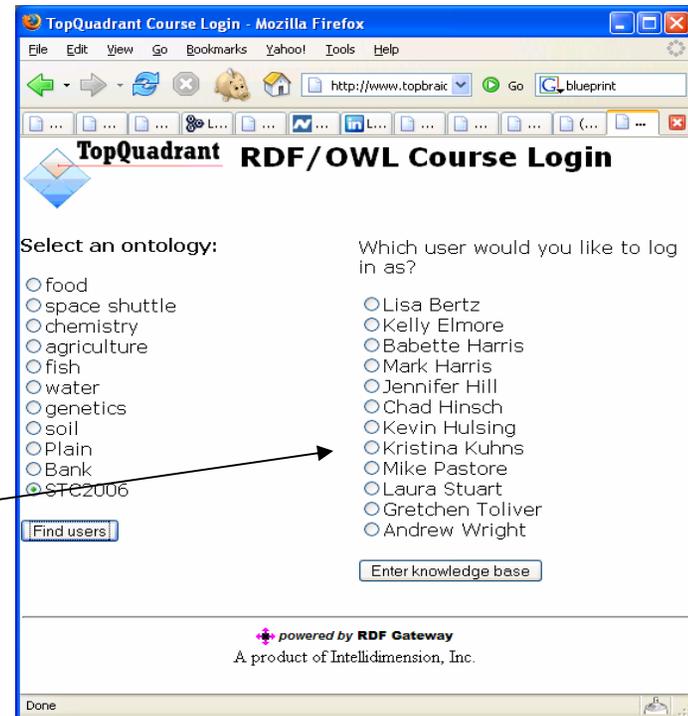
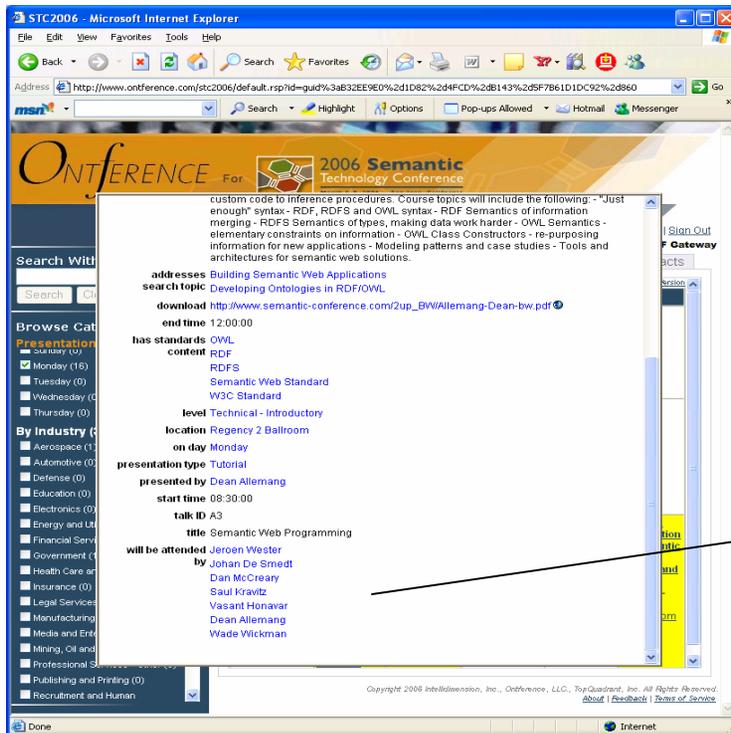
Service Capabilities supported by RDF/OWL

- Service discovery (what service satisfies my needs?)
- Service composition (how do I combine services to get what I want?)
- Service publication (how do I let people know about my service?)
- Composition verification (how do I know that a combination of services does what I want?)



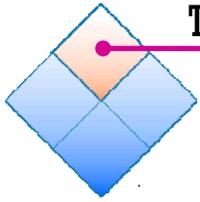
Service Policies

❑ Technology can be in place, but without policy, no interoperation will happen



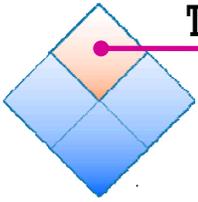
Privacy?

Policy is often more important than discovery, composition, description...



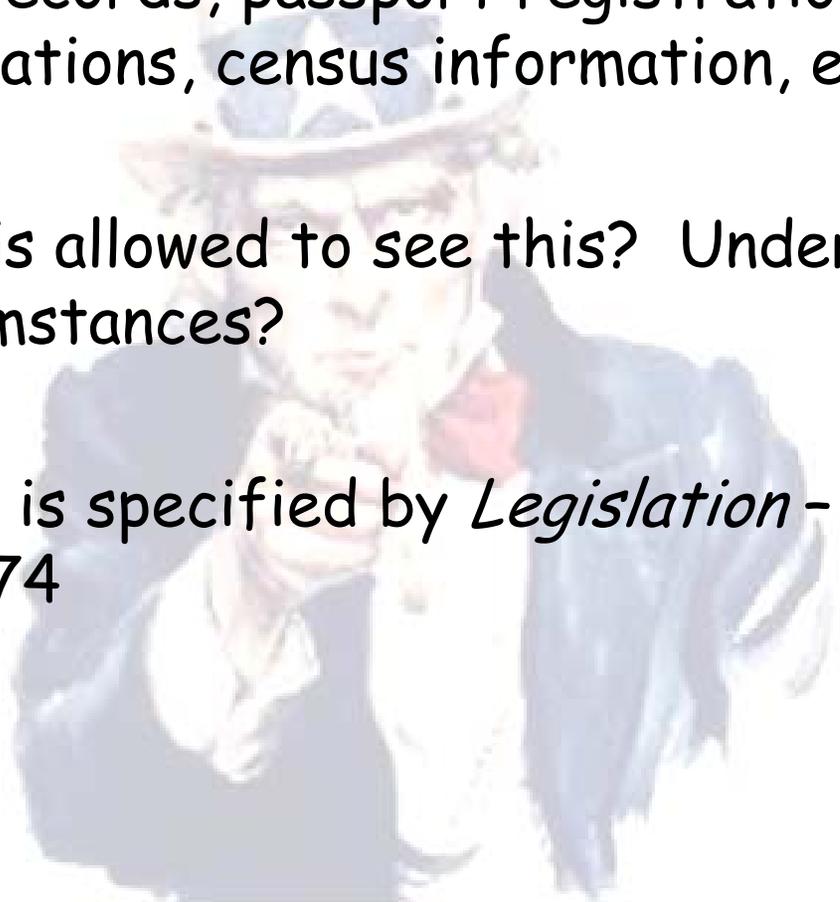
TopQuadrant

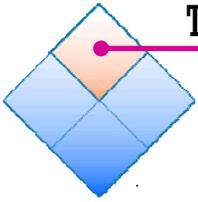
Case Study: Government Privacy Policy



Privacy Act of 1974

- ❑ The US Gov't has lots of information about YOU! (tax records, passport registration, visa applications, census information, etc.)
- ❑ Who is allowed to see this? Under what circumstances?
- ❑ Policy is specified by *Legislation* - the Privacy Act of 1974



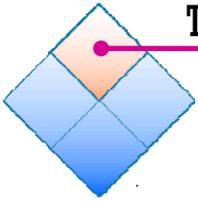


Privacy Act of 1974 in OWL

□ This policy can be represented in OWL, e.g.

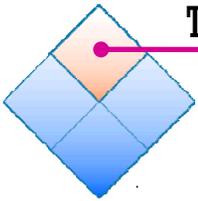
“Disclosures to FBI for a criminal investigation must be accompanied by a court order” or

“Disclosures to the Bureau of the Census are granted, as long as the data is used only for statistical purposes”

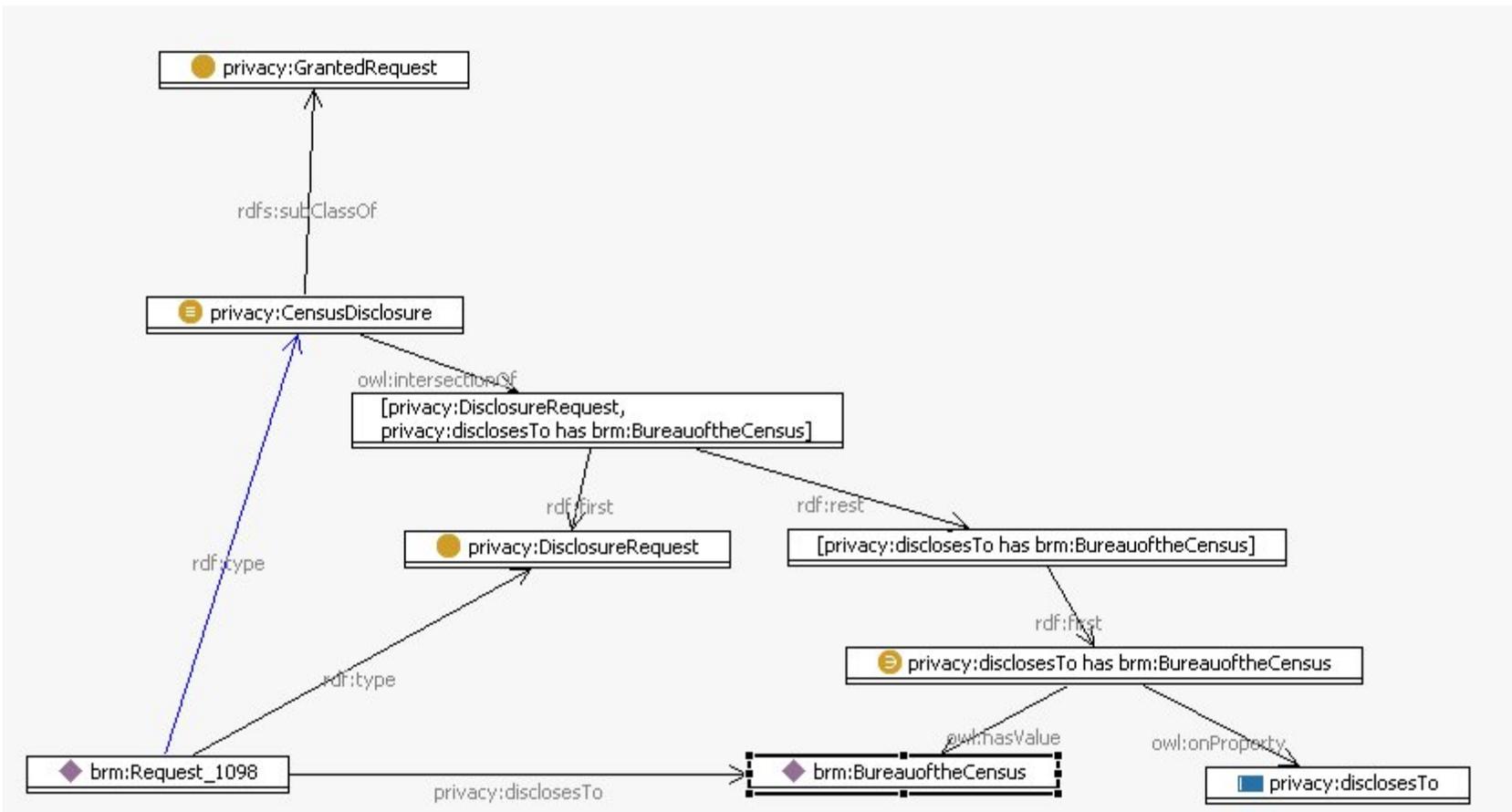


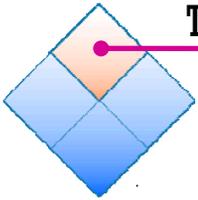
Capabilities for Privacy Model

- ❑ Extensible - allows new policies to be added, or policies to be used together
- ❑ Distributed - policy representation is not likely to be in the same place as any particular disclosure request
- ❑ Well-defined semantics - this is even better than most legislation!
- ❑ Automation - inferences can do classification



Privacy Policy Modeling - detail





Questions and Answers



Dean Allemang

E-mail: dallemang@topquadrant.com

www.topquadrant.com

724-846-9300