



The GoodRelations Ontology: Making Semantic Web-based E-Commerce a Reality

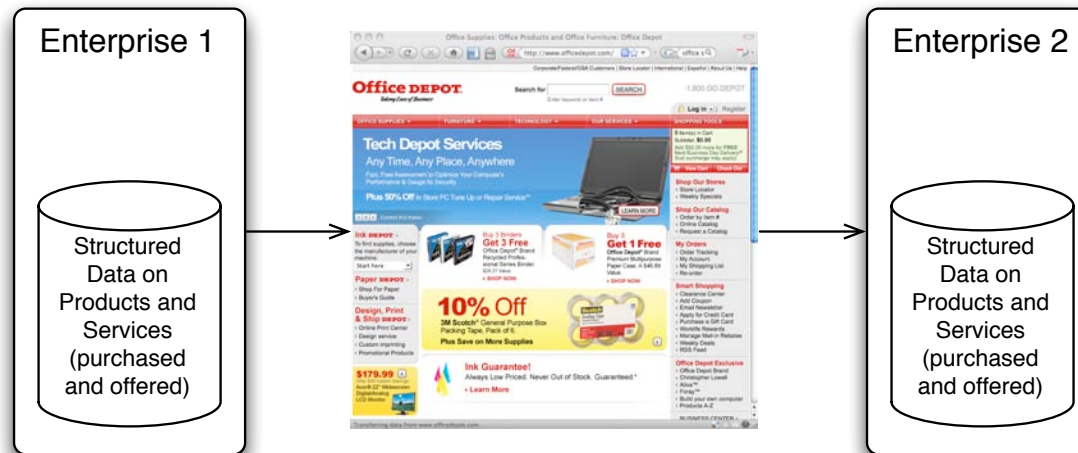
<http://purl.org/goodrelations/>

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E-Commerce on the Web

World Wide Web

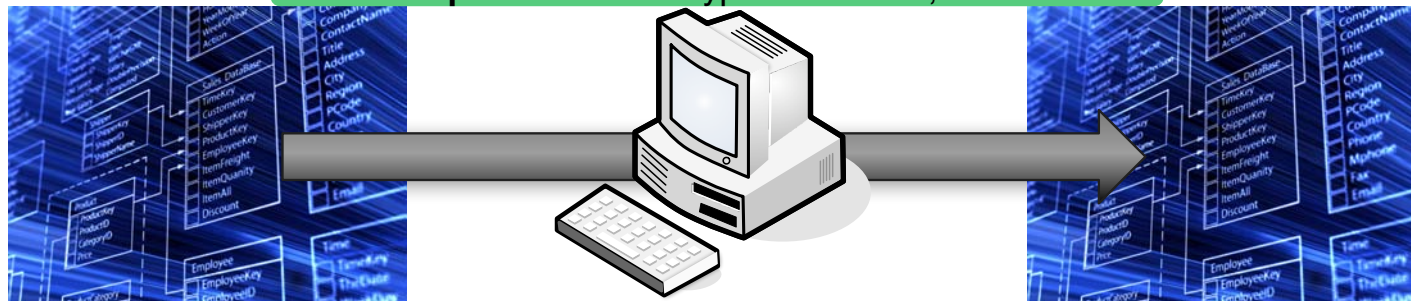


E-Commerce on the Semantic Web

World Wide Web



Product Specifications: Type of Product, Features etc.



Details of the Offering: Price, Eligible Regions, etc.

2001-2008: Semantic Web & E-Commerce: Lots of Papers, Limited Impact

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Use Cases

- Commodity offers
- Services offers
- Product model data interchange

The screenshot shows the Moosejaw website interface. The header includes the Moosejaw logo, navigation links (CLOTHING, GEAR, FOOTWEAR, MOOSEJAW, SALE, SIGN IN), and a search bar. The main content area displays three sleeping bag products with their respective prices and sale information. Four orange callout boxes are overlaid on the image, each pointing to a specific use case:

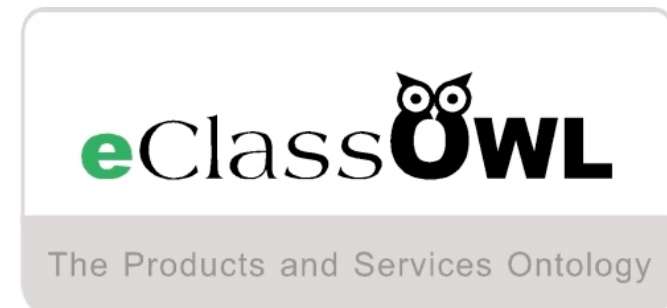
- Callout 1:** "We sell some sleeping bags." (Points to the first product, Marmot Sawtooth Sleeping Bag)
- Callout 2:** "We sell some instances of the Marmot sleeping bag model 1234." (Points to the second product, The North Face Blue Igloo Sleeping Bag)
- Callout 3:** "We sell a particular used instance of the Marmot sleeping bag model 1234." (Points to the third product, Mountainsmith Cypher Sleeping Bag)
- Callout 4:** "We clean and repair sleeping bags." (Points to the top right of the product grid)

Product details from the screenshot:

Product Name	Price / Sale
Marmot Sawtooth Sleeping Bag (Spring 2006)	PRICE \$199.00-\$239.00
The North Face Blue Igloo Sleeping Bag (Fall 2005 Discontinued)	PRICE \$199.00-\$209.00 SALE \$179.10-\$209.00
Mountainsmith Cypher Sleeping Bag (Spring 2005)	PRICE \$379.95 SALE \$322.96-\$379.95

Required Ontologies

- An ontology for **product types and features**
 - by function, usage, or nature
- An **ontology for offer specifications**
- An offer is basically a relation between
 - an agent,
 - a set of objects,
 - a set of property rights,
 - an audience, and
 - a set of terms and conditions.



eClassOWL and GoodRelations

eClassOWL

The Products and Services Ontology

- eClassOWL

`foo:myTVSet` instanceOf `eClassOWL:TVSet`



- GoodRelations

`foo:MillerInc` `goodRelations:offersToSell` `foo:myTVSet`

Competency Questions

CQ1: Which retrievable Web Resources describe an offer

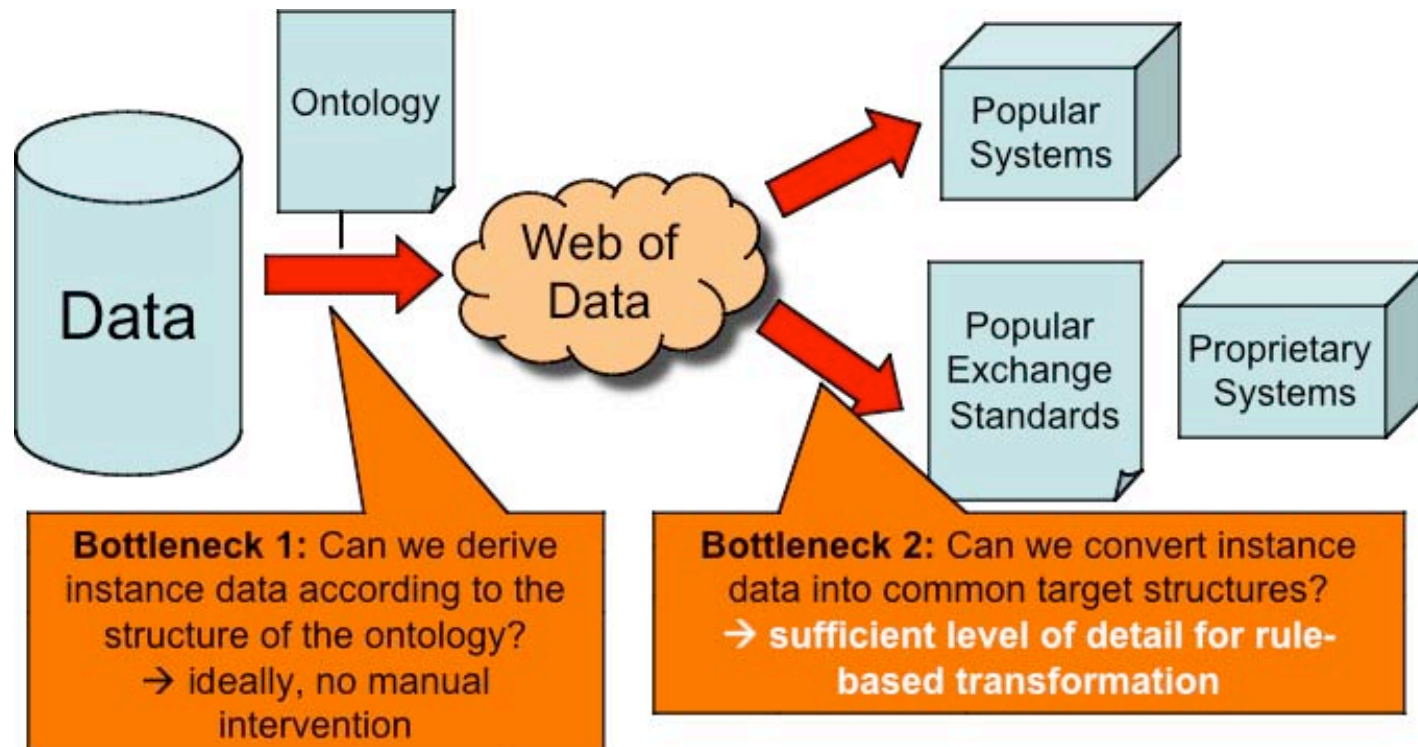
- {to sell | to provide the service of | to repair | to maintain | to lease out | to dispose}
- {a concrete individual | some unknown individuals} of
- a {given good | given service | spare part for a given good | consumables and supplies for a given good} described by a {type of good | specific make and model}
- that meet certain requirements on {properties | intervals for properties}
- for which the offering party accepts a given method of payment and
- provides a certain method of delivery
- to {consumers | retailers}
- in a given {country | region}?

+ Upper Ontology Part

Requirements / Features

- Support for **ranges and units of measurements**
- Support for all common **business functions**, like sell, lease, dispose, repair, etc.
- Compatible with eclassOWL and unspscOWL
- Supports all ISO 4217 currencies
- Supports defining **eligible regions**
- Suits both for explicit instances, product models, and anonymous instances
- Supports common **delivery and shipping methods**
- Supports accepted **payment methods**
- Offerings can be constrained to certain **eligible business entities**
- A **warranty promise**, i.e., its duration and scope can be specified
- Different prices for different types of customers or for different quantities can be expressed
- **Charges for certain payment or delivery options** can be specified; the latter also individually per region.
- Support for **product bundles**, for all kinds of units of measurements (2 kg butter + 2 cellphones for € 99 would be no problem).
- **Compatible with international standards**: ISO 3166, ISO 4217, UN/CEFACT, eCI@ss, and UNSPSC
- Minimal requirements on reasoner support - any RDF-S-style reasoner, OWL DLP, DL, or ter Horst reasoner will work.
- Supports **price ranges, list prices, time-zones, EAN/UCC/UPC codes, GLN/ILN, and DUNS**

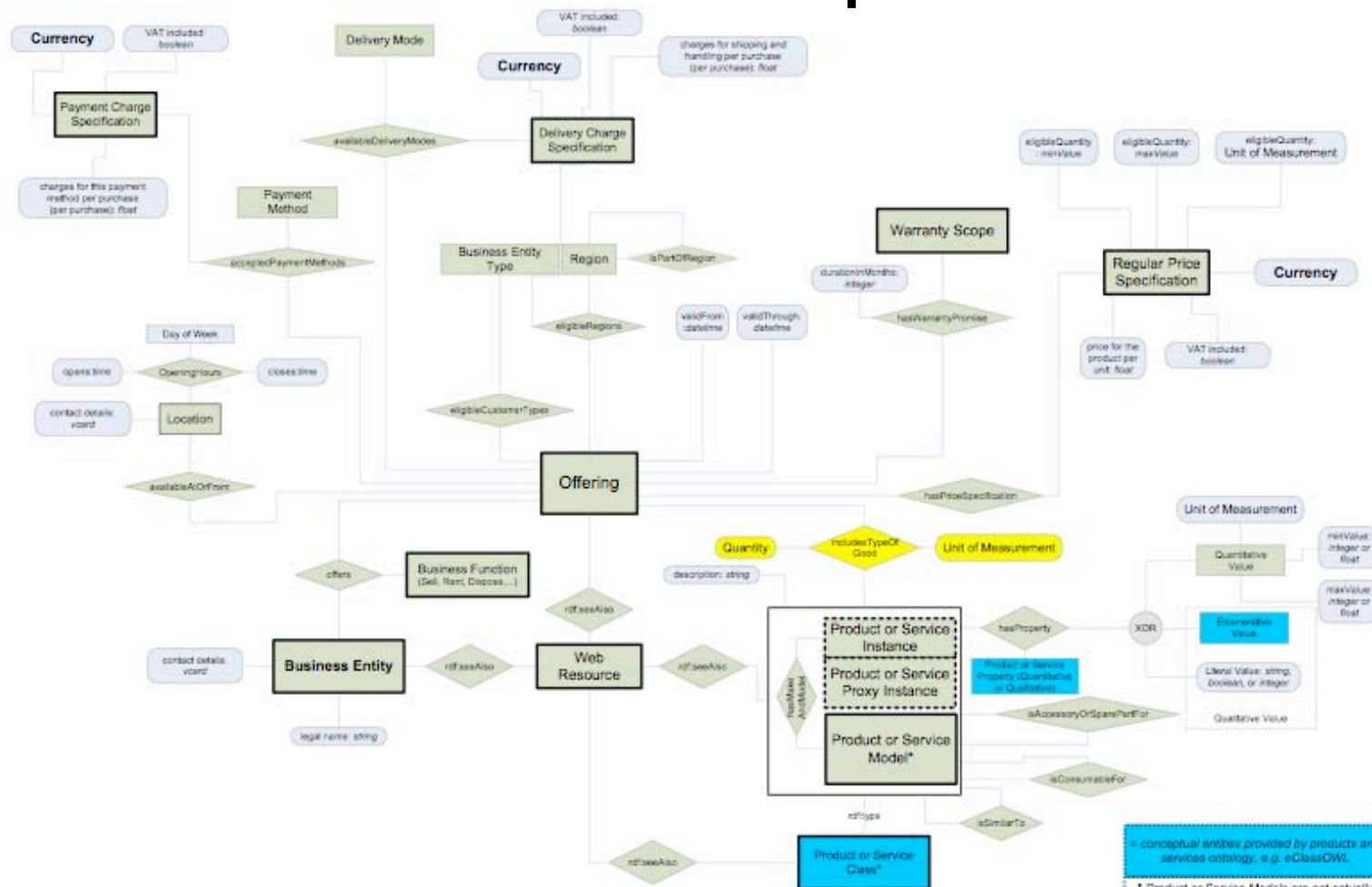
Data, Standards, Ontologies



Core Conceptual Structure

- Business Entities
- Offerings
- Products and Services
- Web Resources

Domain Capture



Design Considerations

- Suitable Ontology Language
- Ranges and Intervals; Datatypes
- Models, Classes, Instances
- Existential Quantification
- N-Ary Relations
- Licensing

Suitable Ontology Language

Requirements:

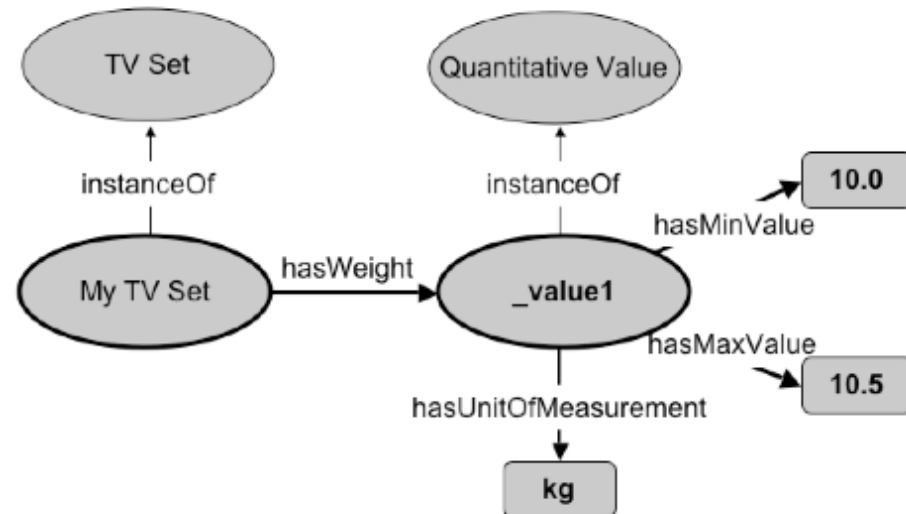
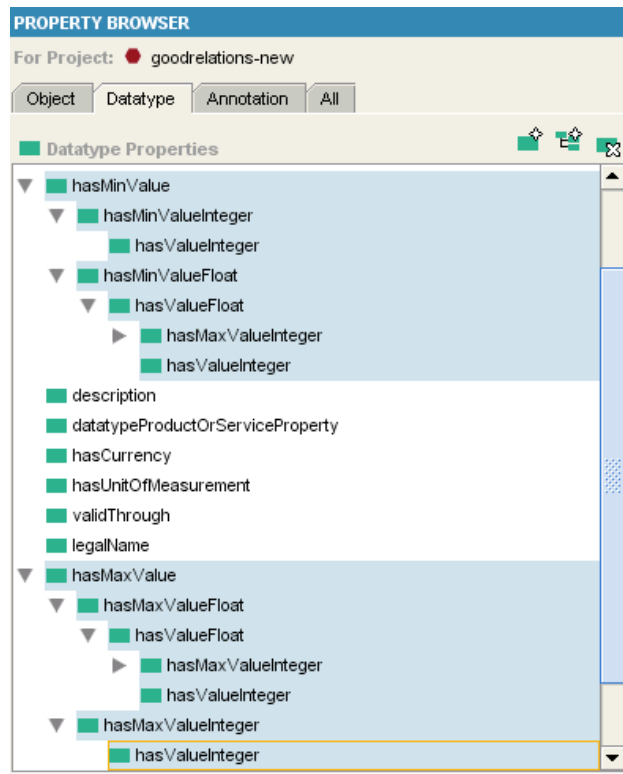
- Must work with Semantic Web infrastructure as available **today**
- Must work with lightweight, RDFS-style reasoners
- Combining the ontology with ontologies or knowledge bases in OWL DL should not lead to a model beyond DL (e.g. OWL Full)
- Avoid layering problems between RDFS and OWL

Approach: Use OWL DL syntax for RDF-S elements, i.e. a subset of the closure of OWL

DLP:

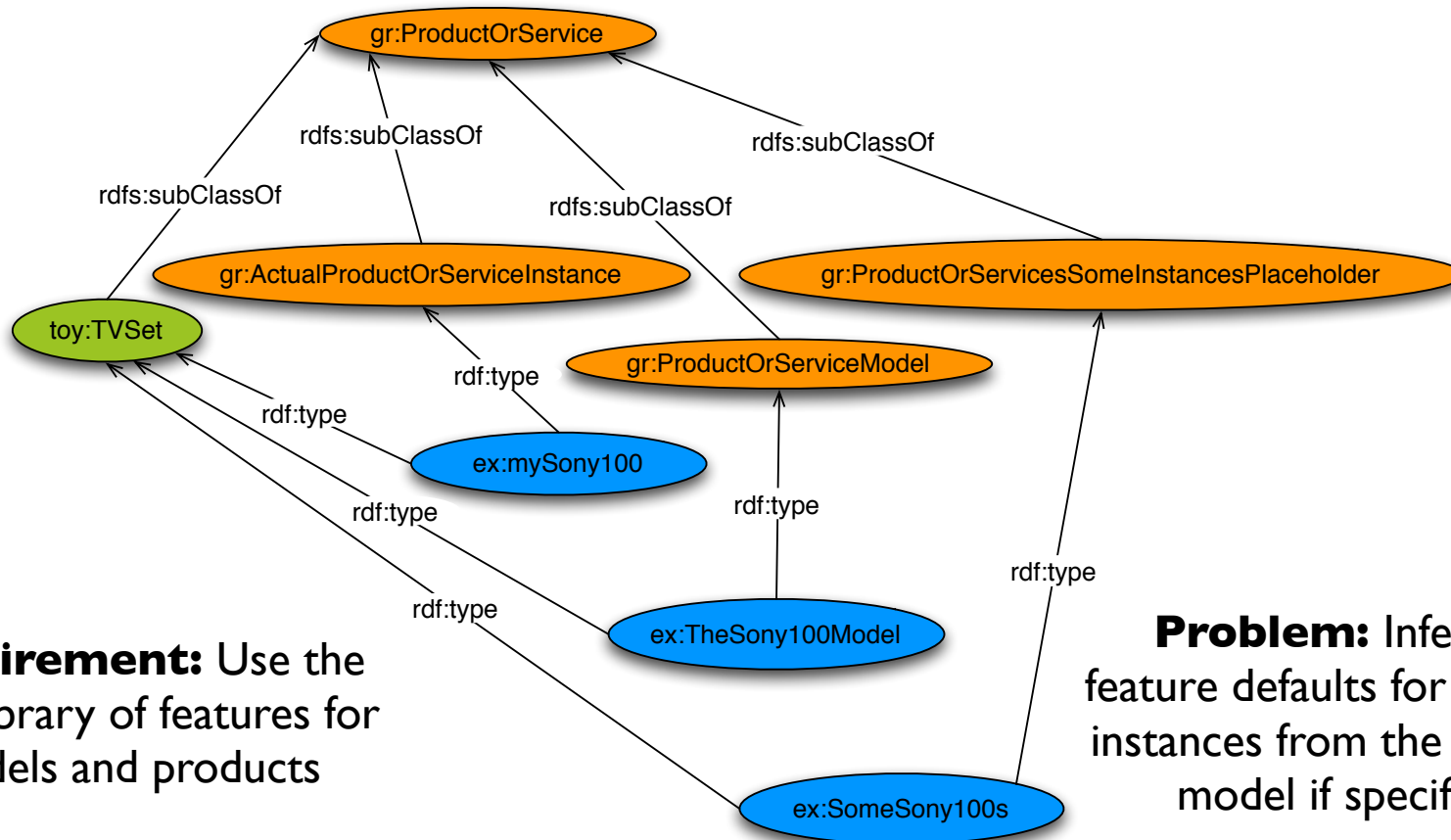
```
owl:Ontology
owl:Class
owl:ObjectProperty
owl:DatatypeProperty
rdfs:subClassOf
rdfs:subPropertyOf
rdfs:comment
rdf:datatype
rdf:type
```

Ranges and Intervals



hasValue `rdfs:SubPropertyOf` **hasMaxValue**, **hasMinValue**

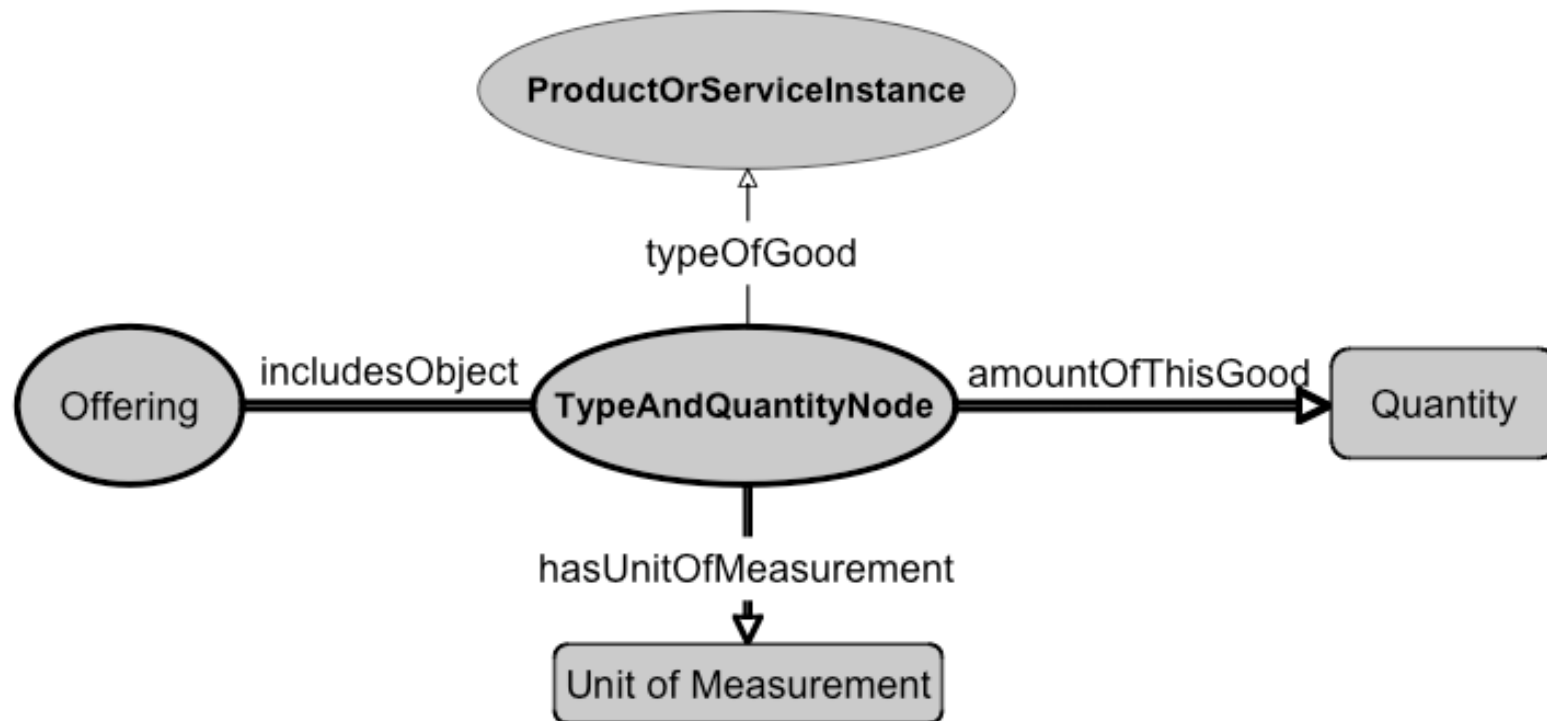
Models, Classes, Instances, and Existential Quantification



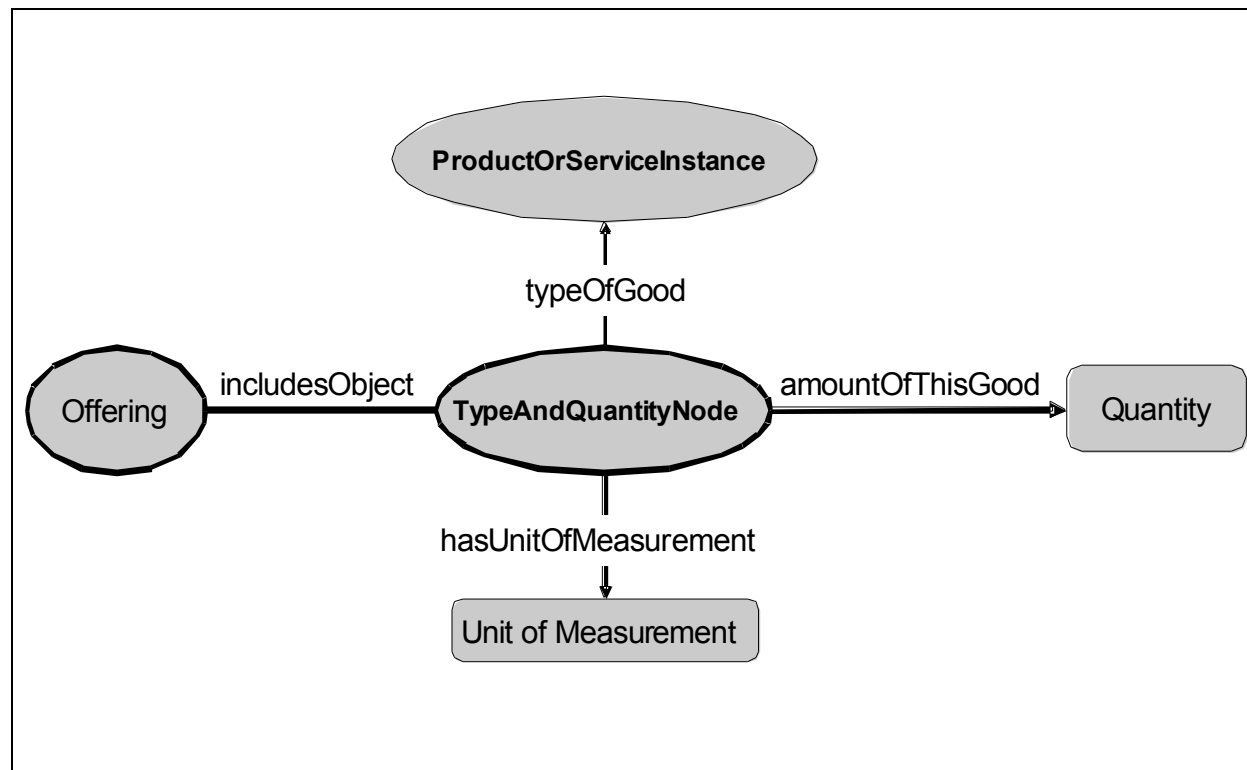
Requirement: Use the same library of features for models and products

Problem: Inferring feature defaults for product instances from the product model if specified.

Product Bundles



N-Ary Relationships



License

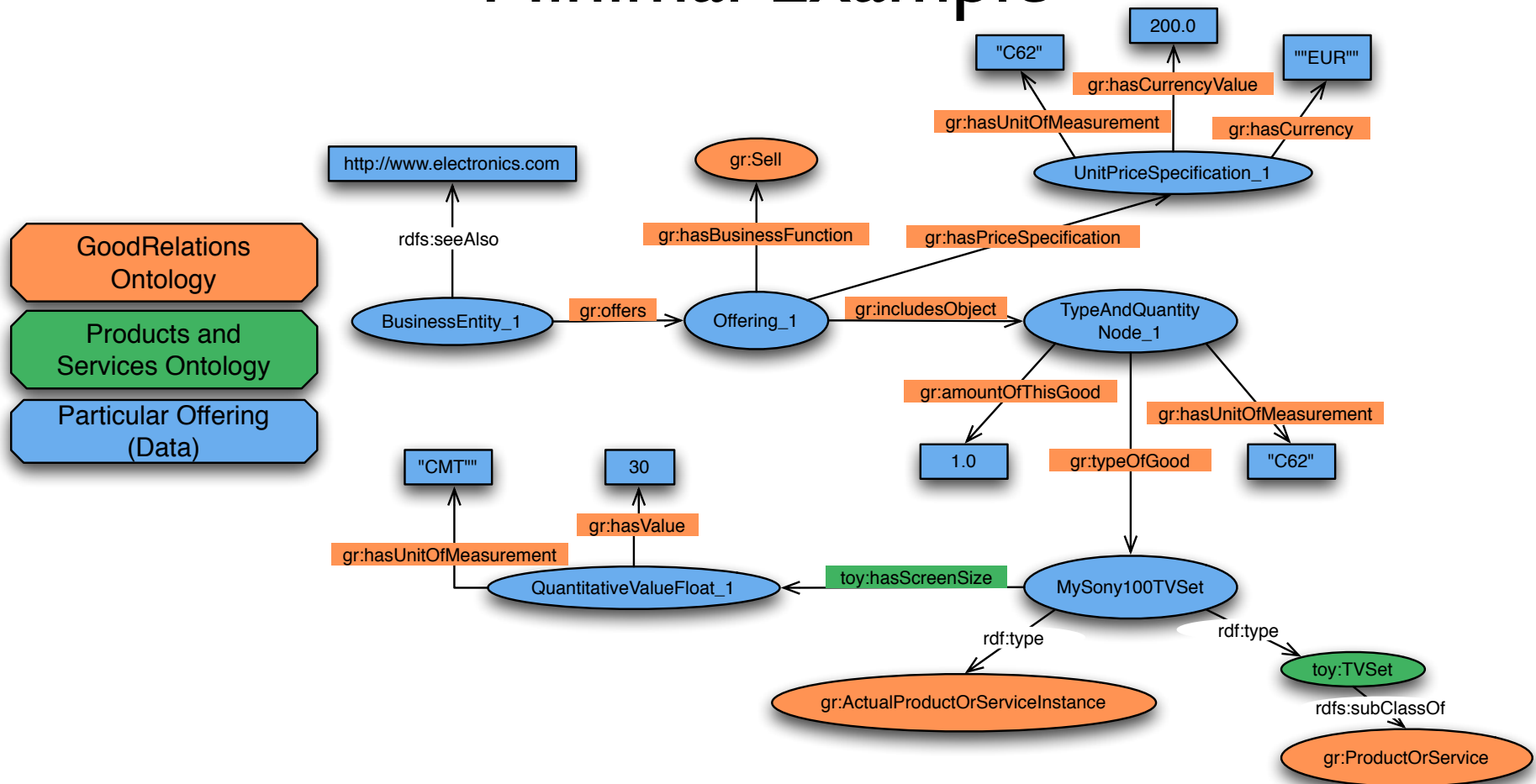
- **Goal:** Give adopters certainty about permanent, royalty free access to the ontology
- **Approach:** Creative Commons Attribution 3.0 license.



Reusing Existing Consensus

- Lot of pre-existing consensus
 - Countries
 - Currencies
 - Locations
- Two basic approaches for reuse
 - As ranges for literal values
 - Replication as ontological instances

Minimal Example



- GoodRelations Ontology
- Products and Services Ontology
- Particular Offering (Data)

Pick-up in Industry and Academia

- Smart Information Systems
- ebSemantics
- Yahoo! SearchMonkey
- Virtuose Sponger Catridges for Amazon, eBay, and others expected
- etc.

Diffusion Strategy

- Make Creating GoodRelations Data **Easy**
 - GoodRelations Annotator and Validator
 - Exporters for popular Web Shops (using Triplify)
 - Converters for Catalog Data Interchange Standards
 - Recipes and Patterns
- Make Creating GoodRelations Data **Attractive**
 - Search Engine Vendors
 - Recommender Systems
 - Foster the Development of **Compatible Vocabularies**
 - eClassOWL
 - ebSemantics
 - myOntology

Client-side Rendering vs. Content Negotiation

The screenshot shows a web browser displaying the GoodRelations Ontology page. The page title is "GoodRelations Ontology" and the creator is "Martin Hepp". The page content includes an ontology description and a list of classes. A code editor window is overlaid on the page, showing the RDF/XML code for the ontology.

Ontology Description

GoodRelations Ontology

- `rdfs:label` – GoodRelations Ontology *en
- `dc:title` – The GoodRelations Ontology for Semantic Web-based E-Commerce *en
- `dc:subject` – E-Commerce, E-Business, GoodRelations, Ontology, eClass, eClassOWL, UNSPSC, Recommender Systems *en
- `rdfs:comment` – The GoodRelations ontology provides the vocabulary for annotating e-commerce offerings (1) to sell, lease, repair between (1) Web resources, (2) offerings made by those Web resources, (3) legal entities, (4) prices, (5) terms and conditions, and of GoodRelations has changed to <http://purl.org/goodrelations/v1>. Please make sure you are only using element identifiers in this file from other locations, BUT THOSE LOCATIONS MUST NOT BE USED AS REFERENCES.
- `dc:creator` – Martin Hepp *en
- `dc:contributor` – Work on the GoodRelations ontology has been partly supported by the Austrian BMV/TIFG under the FIT-IT 3e, the Leopold-Franzens-Universität Innsbruck, and by the European Commission under the project SUPER (FP6-020860). *en
- `dc:rights` – The GoodRelations ontology is available under the Creative Commons Attribution 3.0 Unported license; see <http://creativecommons.org/licenses/by/3.0/> to import the ontology and create specializations of its elements, as long as you attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your work).
- `rdfs:seeAlso` – <http://purl.org/goodrelations/>

Classes

- AcceptedPaymentMethods**
 - `rdfs:comment` – This is a conceptual entity that holds together all aspects of the n-ary relation AcceptedPaymentMethods.
 - `rdfs:subClassOf` – `owl:Class`
- ActualProductOrServiceInstance**
 - `rdfs:comment` – An Actual Product or Service Instance is a single identifiable object or action that creates some increase in utility (in the economic sense) for the individual possessing or using this very action is being taken (Service). Products or Services are types of goods in the economic sense. For an overview of goods and commodities in economics, see Milgate (1987). Examples: MyThink, Volkswagen Golf, the haircut that I received or will be receiving at a given date and time. Note: In many cases, product or service instances are not explicitly exposed on the Web but only existentially (see section 3.3.3 of the GoodRelations Technical Report).
 - `rdfs:subClassOf` – `owl:Class`
- AvailableDeliveryMethods**
 - `rdfs:comment` – This is a conceptual entity that holds together all aspects of the n-ary relation AvailableDeliveryMethods
 - `rdfs:subClassOf` – `owl:Class`
- BusinessEntity**
 - `rdfs:comment` – An instance of this class represents the legal agent making a particular offering. This can be a legal body or a person. A Business Entity has at least a primary mailing address and one location data should be attached to a business entity. Since there already exist established vocabularies for this, the GoodRelations ontology does not provide respective attributes. Instead, the use of `hasGlobalLocationNumber` and `hasDUNS` properties are provided for linking to respective identifiers for business locations.

Code Editor Content:

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="v1.xsl"?>
<rdf:RDF
  xmlns="http://purl.org/goodrelations/v1#"
  xmlns:protege="http://protege.stanford.edu/plugins/owl/protege#"
  xmlns:rdfs="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xml:base="http://purl.org/goodrelations/v1">
  <!-- Definition of annotation properties as required per
  http://www.w3.org/TR/2004/REC-owl-ref-20040210/#AnnotationProperty-def -->
  <!-- DC terms are NOT annotation properties in general, so we consider the following
  claims scoped to this document. -->
  <owl:AnnotationProperty rdfs:about="http://purl.org/dc/elements/1.1/creator"/>
  <owl:AnnotationProperty rdfs:about="http://purl.org/dc/elements/1.1/title"/>
  <owl:AnnotationProperty rdfs:about="http://purl.org/dc/elements/1.1/contributor"/>
  <owl:AnnotationProperty rdfs:about="http://purl.org/dc/elements/1.1/rights"/>
  <owl:AnnotationProperty rdfs:about="http://purl.org/dc/elements/1.1/subject"/>

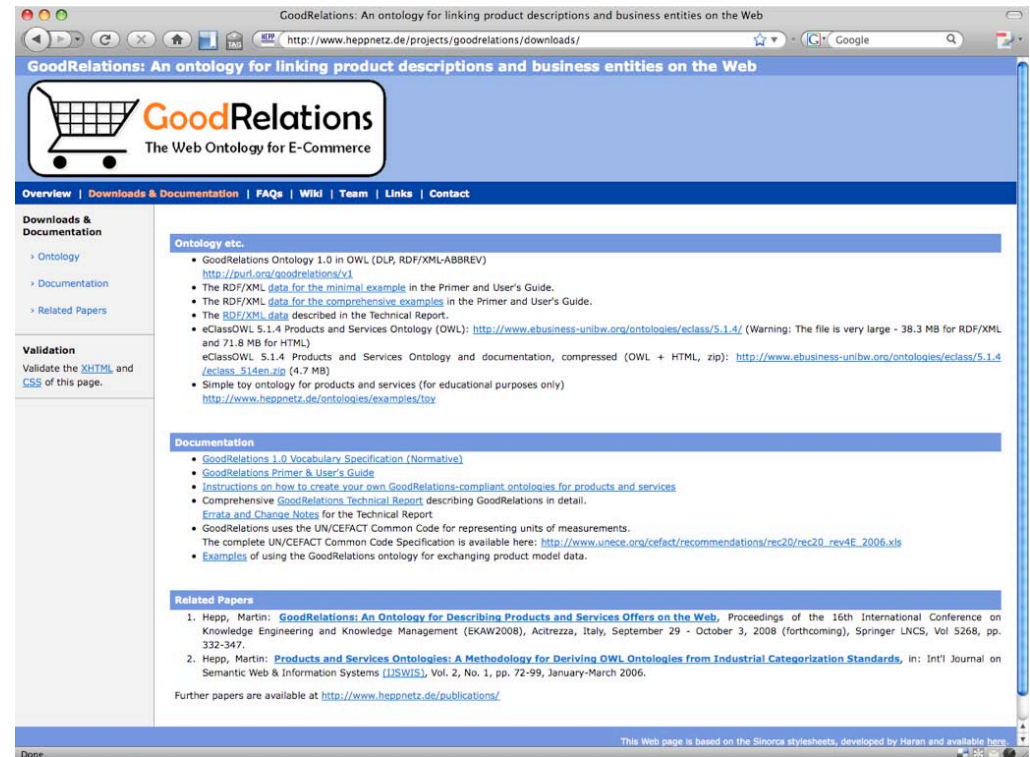
  <owl:Ontology rdf:about=" " >
    <rdfs:label xml:lang="en">GoodRelations Ontology</rdfs:label>
    <dc:title xml:lang="en">The GoodRelations Ontology for Semantic Web-based E-Commerce</dc:title>
    <dc:subject xml:lang="en">E-Commerce, E-Business, GoodRelations, Ontology, eClass, eClassOWL, UNSPSC, Re
    <rdfs:comment rdfs:datatype="http://www.w3.org/2001/XMLSchema:string">
    >The GoodRelations ontology provides the vocabulary for annotating e-commerce offerings (1) to sell, le
```


Discussion and Future Extensions

- Richer Axiomatisation?
 - Disjointness Axioms etc.
- Microformats Variant?

Additional Information

- Web Page
- Ontology
- Language Reference
- Primer
- Recipes
- Wiki



<http://purl.org/goodrelations/>

References

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4. Hepp, Martin: ProdLight: A Lightweight Ontology for Product Description Based on Datatype Properties, Proceedings of the 10th International Conference on Business Information Systems (BIS 2007), April 25-27, 2007, Poznan, Poland, in: Abramowicz, Witold (Ed.): BIS 2007, Springer LNCS, Vol. 4439, pp. 260-272, 2007.

These and other papers are available at <http://www.heppnetz.de/publications/>



Thank you!

<http://purl.org/goodrelations/>

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