

Semantic Web

Introduction

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Organisation

M2 CPS² and DSC

- 40 h courses and practical sessions
- All courses are done in computer rooms
- Lots of practical work
- All things that you produced during a session must be delivered **AT THE END OF THE SESSION**
- A **quiz** (5-10 minutes) at the beginning of each session on what you learnt the previous time
- Practical project by pairs of students
- Presentation of your work to all students at the last session

Organisation

Sessions are 4 hours (+ 15 minutes break)

- On Friday afternoon: 1:30 pm – 5:45 pm
- The same room is reserved for all sessions
- *You must bring your own laptops*

Website:

<http://www.emse.fr/~zimmermann/Teaching/SemWeb/>

Evaluation

- Evaluation will combine:
 - Results of quizzes (40%)
 - Assiduity: being present and delivering work as expected 20%
 - Project and presentation (40%)
- All documents are allowed during the quizzes

Requirements

- Compulsory:
 - Knowledge of OOP (ideally in Java)
 - Knowledge of SQL (SELECT queries, joins, aggregates)
- Preferable:
 - Knowledge of HTTP
 - Logics

Expectations

- I want you to attend **every** courses
 - If you don't, do the practical session at home and send me your work + learn by yourself for the quiz
- Be on time (i.e., 13:30 o'clock or before)
- Practical work should be made **individually if possible** (and never be more than 2 people per machine)
 - You can (quietly) talk to your classmates during practical sessions
 - You can ask questions
 - During classes
 - Outside classes (e.g., by email)
- You should work a little between classes, especially if you are not comfortable with the prerequisite
- **Personal laptops are welcome: please bring them!**

Project

- Select available data
- Model the domain for your data as an ontology
- Transform / clean data to store and present in a semantic-web fashion, conforming to your ontology
- Set up a web site that exposes the data, and a query access point
- More details will follow

The Semantic Web

Tim Berners-Lee's description

“The Semantic Web is not a separate Web but an extension of the current one, in which information is given well-defined meaning, better enabling computers and people to work in cooperation. The first steps in weaving the Semantic Web into the structure of the existing Web are already under way. In the near future, these developments will usher in significant new functionality as machines become much better able to process and "understand" the data that they merely display at present.”

Berners-Lee et al. 2001. *The Semantic Web*. Scientific American

The Semantic Web

my definition

A vision of the WWW where it is made easier for software agents to process information that **automates tasks that used to be mostly performed by people** browsing documents online; also, allowing software agents to perform **tasks that cannot be done by people** by browsing documents.

What we do with the Web?

- In the beginning (early 90s): read/share (mostly textual) documents
- Mid to late 90s: read/share multimedia content
- Late 90s to early 2000s: eCommerce
- Early 2000s: write/share/interact socially
- Now: do things, work, take decisions, create

Our use of the Web evolved...

- A Web of documents (for some people)
- A Web of multi-media documents (for most people)
- A Social Web (for all people)
- A Web of applications (for people and some machines)
- A Web of data (for some people and many machines)
- A Web of things (for machines)
- A Semantic Web (for people and machines)

What a machine should know, from the Web

- How many European people won a Physics Nobel price in the 20th century?
- Give me the price, duration of warranty, and technical features of phones that cost less than €300 and are not of Apple brand.
- Which arthropods from the north hemisphere have venom?

How a machine know?

- Understanding people's documents (text, image, sound, video) is **too difficult** for a machine (at the moment)
 - Machines understand **formal languages** (programming languages, data formats, etc.)
- ➔ Make **knowledge** accessible to and processable by machines in a formal language

Accessible and processable knowledge

- Web site owners must provide knowledge in a formal language
- Web site consumers (software agent) must have processors for this language
 - Requires a format for exchange of formal knowledge
 - Requires specification of how the language is processed
 - Formal knowledge on the Web depends on a **data model**

The Web of Data

- A vision of the Web as a huge database
- Can we query the Web as a database?

Who are the widows of murdered American presidents?

```
SELECT ?widow
FROM WorldWideWeb
WHERE
  (?widow marriedTo ?person) AND
  (?person isPresidentOf UnitedStates) AND
  (?person killedBy ?someKiller)
```

What were the most popular songs when Obama was elected?

```
SELECT ?song, COUNT(?vote) AS ?likes
FROM WorldWideWeb
WHERE
  (?vote inFavourOf ?song) AND
  (?vote madeAt ?date) AND
  (Obama electedAt ?date)
ORDER BY ?likes DESC
```

Structured data

Das Auto.

Search for:

Previous searches:
golf
touareg
bluemotion
passat
polo

Popular searches:
polo
golf
touareg
bluemotion
passat

Models containing 'golf'

Showing 1 - 4 of 5

 Golf From 15850.0 <input type="button" value="More info"/> <input type="button" value="Configure"/>	 Golf Plus From 17030.0 <input type="button" value="More info"/> <input type="button" value="Configure"/>	 Golf Estate From 17960.0 <input type="button" value="More info"/> <input type="button" value="Configure"/>	 New Golf Cabriolet From 20720.0 <input type="button" value="More info"/> <input type="button" value="Configure"/>
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Trims containing 'golf'

Showing 1 - 4 of 15

 Golf S From 15850.0 <input type="button" value="Which Model?"/> <input type="button" value="Configure"/>	 Golf Plus S From 17030.0 <input type="button" value="Which Model?"/> <input type="button" value="Configure"/>	 Golf Estate S From 17960.0 <input type="button" value="Which Model?"/> <input type="button" value="Configure"/>	 Golf Match From 18515.0 <input type="button" value="Which Model?"/> <input type="button" value="Configure"/>
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Pages containing 'golf'

Experience : Golf : Volkswagen UK
Ensures you can have performance as well as exceptional economy with low emissions.
Next Previous Back [Golf](#) Common Rail TDI Engine Ensures you can have performance as well

Golf : Volkswagen UK
View all Volkswagen [Golf](#) models. Compare the specifications, engines and pricing across the range

```
# Volkswagen (Company)
ex:VW a gr:BusinessEntity
    gr:legalName "Volkswagen"
    rdfs:label "Volkswagen"
    rdfs:comment "Volkswagen Group"
    foaf:page <http://www.vw.co.uk/>

# Base Model
ex:GolfBaseModel a coo:Model
    rdfs:label "Golf"
    rdfs:comment "The Golf is a five-door hatchback"
    gr:hasManufacturer ex:VW
    vso:modelDate "2012-01-01"
    vso:bodyStyle <http://www.vw.co.uk/vso/bodyStyle#hatchback>
    vso:axles [ a g:Axle
        vso:fuelTankVolume "45"
        vso:height [ a g:Height
            vso:length [ a g:Length
                vso:width [ a g:Width
                    vso:wheelbase [ a g:Wheelbase
                        vso:ACRISSTCode "GOLF"
                        foaf:page <http://www.vw.co.uk/golf/>
```

Interlinked data

Le Centrale.fr SARL GARAGE DES HAUTS DE JACQUARD - 42000 SAINT-ETIENNE



Nos coordonnées

SARL GARAGE DES HAUTS DE JACQUARD
 2 RUE ANTOINE ROCHE
 42000 SAINT-ETIENNE
 Contact : M. BACON et M. DELORME
 Tél : 04 77 32 62 17
 Fax : 04 77 47 11 75
[Contacter par e-mail](#)

Informations

Situé à Saint-etienne, SARL GARAGE DES HAUTS DE JACQUARD vous propose une sélection de véhicules d'occasion de marque RENAULT, PEUGEOT, CITROEN.

SARL GARAGE DES HAUTS DE JACQUARD Saint-etienne c'est 35 annonces de véhicules sur le site.

Accueil Sarl garage des hauts de jacquard > Volkswagen > Volkswagen Golf 4 Ivt 130 carat



VOLKSWAGEN Golf 4
 6 300 €

Garantie : durée pré

Informations générales

Version :	IV TDI 130 C
Année :	BV6 3P
Année :	2002
Kilométrage :	197 693 km
Puissance fiscale :	7 CV
Boîte de vitesse :	mécanique
Énergie :	Diesel
Nombre de portes :	3
Mise en circulation :	01/10/200
Couleur int. :	cuir beige
Couleur extérieure :	noir metal
Vendeur :	Professionn

model

price

Das Auto

Search for:

Enter search term

Previous searches:
 golf
 touareg
 bluemotion
 passat
 polo

Popular searches:
 polo
 golf
 touareg
 bluemotion
 passat

Modèles contenant 'golf' Showing 1 - 4 of 5

 Golf From 15550.0 <input type="button" value="More info"/> <input type="button" value="Configure"/>	 Golf Plus From 17030.0 <input type="button" value="More info"/> <input type="button" value="Configure"/>	 Golf Estate From 17960.0 <input type="button" value="More info"/> <input type="button" value="Configure"/>	 New Golf Cabriolet From 20720.0 <input type="button" value="More info"/> <input type="button" value="Configure"/>
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Pages containing 'golf'



Vehicle Sales Ontology

A [GoodRelations-compliant](#) domain vocabulary

V 1.0, Release 2010-10-02

Latest version: <http://purl.org/vso/ns> ([RDF/XML](#), [HTML](#))

Last update: 2010-10-02

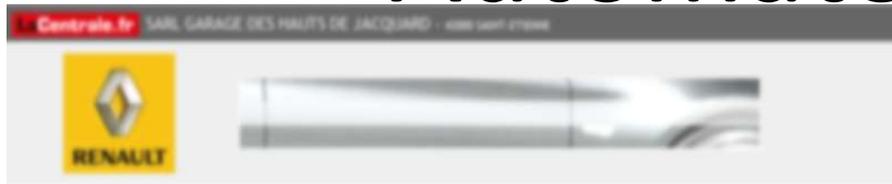
Author: Martin Hepp

The Vehicle Sales Ontology is a Web vocabulary for describing cars, boats, bikes, and other vehicles for e-commerce. The vocabulary is designed to be used in combination with [GoodRelations](#), a standard vocabulary for the commercial aspects of offers for sale, rental, repair, or disposal. GoodRelations is a language (also known as "schema", "data

lacentrale:AB-234-CD

lacentrale:AB-234-CD

Automate deductions



Nos coordonnées

 `lacentrale:AB-234-CD` \in `vso:Automobile`



`vso:Automobile` \subseteq `vso:Vehicle` 

Automated inference!

Author: Martin Hepp
The Vehicle Sales Ontology is a Web vocabulary for describing cars, boats, bikes, and...
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... a standard vocabulary for the commercial aspects of offers for sale,
rental, repair, or disposal. GoodRelations is a language (also known as "schema", "data

\Rightarrow `lacentrale:AB-234-CD` \in `vso:Vehicle`

Objective of this session

- Introduce the Semantic Web
- Present the principles for a Web of Data
- Introduce the foundations:
 - IRIs (uniform identification mechanism)
 - RDF (a common data model)

Online readings

- Berners-Lee, Hendler, Lassila (May 17, 2001). **The Semantic Web**. *Scientific American Magazine*. Text available at <http://bit.ly/2z2LZIE>
- Berners-Lee. *A roadmap to the Semantic Web*. Tim Berners-Lee's Design Issues, Sep. 1998. Available at <http://bit.ly/2z29fGP>
- Berners-Lee. *Linked Data*. Tim Berners-Lee's Design Issues, July 2006. Available at <http://bit.ly/21MR3Zt>
- Heath, Bizer. *Linked Data: Evolving the Web into a Global Data Space*. Synthesis Lectures on the Semantic Web: Theory and Technology, 136 pages. Morgan & Claypool, 2011. Text available at <http://bit.ly/2xlZKou>

Other references given at:

<http://www.emse.fr/~zimmermann/Teaching/SemWeb/>