

Profiles of Legal Knowledge Representation and Reasoning in the Semantic Web

An opportunity for AI in the Public Administration

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Scenario 1

OnLine Contract



Scenario 1

OnLine Contract



Consumer Protection Law

DIRECTIVE 8537/02 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 September 2002 concerning the distance marketing of consumer financial services and amending Council Directive 90/269/EEC and Directive 93/70/EEC

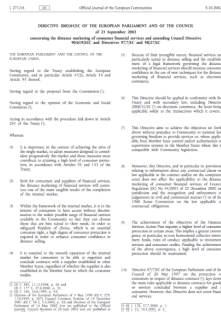
THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,
having regard to the Treaty establishing the European Community, and in particular Article 177, Article 184 and Article 251 thereof,
having regard to the proposal from the Commission (1),
having regard to the opinion of the Economic and Social Committee (2),
acting in accordance with the procedure laid down in Article 251 of the Treaty (3),
Whereas:
1. It is important, in the context of achieving the aims of the single market, to adopt measures designed to control more rigorously the quality and thus enhance trust and confidence in creating a high level of consumer protection, in accordance with Article 15 and 17 of the Treaty;
2. Within the framework of the internal market, it is to the interest of consumers to have more reliable financial services available in the Community so that they can choose from the wide range of products and services available and safeguard themselves against, where necessary, negligent practices of clients, which in an overall context implies a high degree of consumer vigilance in respect of the services available available in financial selling;
3. It is essential in the overall operation of the internal market for consumers to be able to compare and make choices between a greater number of alternative products available in the financial sector in which the consumer needs;
4. The Commission has, in accordance with Article 17(1) of the Treaty, submitted a proposal to amend Directive 90/269/EEC, Directive 93/70/EEC and Directive 93/13/EEC, in order to improve the protection of consumers in the financial sector;
5. The Commission has, in accordance with Article 17(1) of the Treaty, submitted a proposal to amend Directive 93/13/EEC, in order to improve the protection of consumers in the financial sector;
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Scenario 1

OnLine Contract



Consumer Protection Law



Interest in

- Consumer's rights (ex: *right of withdrawal*)
- Supplier's duties towards the Consumer (*implicit rights of the Consumer*)
- Procedures to fulfill the Consumer's duties and the sanctions in case of not compliance

Scenario 2

Speed Limits



Speed Limits



Speed Limits Regulation



Speed Limits



Speed Limits Regulation



Interest in

- Checking drivers' compliance with regulation about traffic speed
- Checking such compliance in presence of conflicting rules or rules changing over time (norm defeasibility)

Speed Limits



Speed Limits Regulation



Interest in

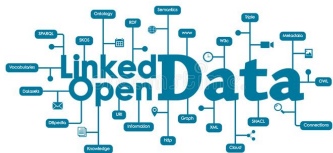
- Checking drivers' compliance with regulation about traffic speed
- Checking such compliance in presence of conflicting rules or rules changing over time (norm defeasibility)

Legal compliance checking system endowed with reasoning facilities

An Approach in the Semantic Web



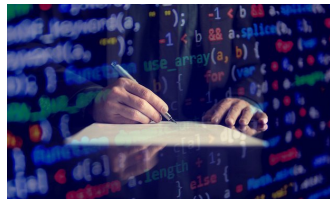
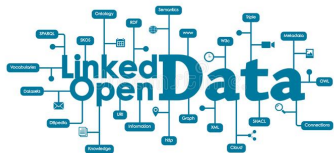
**Semantic
Web**



An Approach in the Semantic Web



**Semantic
Web**

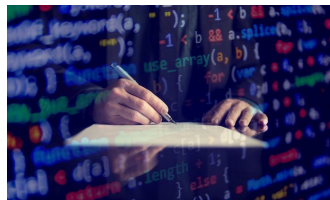
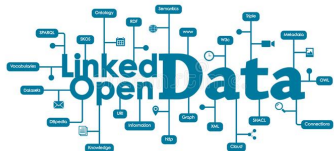


Law as Code

An Approach in the Semantic Web



**Semantic
Web**



Law as Code

Legal reasoning by OWL-DL and decidable reasoners

Legal Rules: Provisions and Norms

A Legal Rule can be seen in a twofold perspective:

Provision

A set of signs organized in words and sentences for creating a normative statement [Raz, 1980] [Biagioli, 2009]

- Textual object

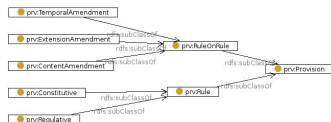
Norm

The applicative meaning of such normative statement
[Guastini, 2010], [Marmor, 2014]

- Social object

Modeling Provisions

for Semantic Annotation and
Advanced Legal Information Retrieval



Excerpt of EU Directive 2002/65/EC

Art. 5

1. The supplier shall communicate to the consumer all the contractual terms and conditions and the information referred to in Article 3(1) and Article 4 [...]

2. The supplier shall fulfil his obligation under paragraph 1 immediately after the conclusion of the contract, if the contract has been concluded at the consumer's request using a means of distance communication which does not enable providing the contractual terms [...]

3. At any time during the contractual relationship the consumer is entitled, at his request, to receive the contractual terms and conditions on paper. [...]

[...]

Art. 6

1. The Member States shall ensure that the consumer shall have a period of 14 calendar days to withdraw from the contract without penalty and without giving any reason [...]

[...]

Formal Profile: Set of paragraphs

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1. The supplier shall communicate to the consumer all the contractual terms and conditions and the information referred to in Article 3(1) and Article 4 [...]

Paragraph

2. The supplier shall fulfil his obligation under paragraph 1 immediately after the conclusion of the contract, if the contract has been concluded at the consumer's request using a means of distance communication which does not enable providing the contractual terms [...]

Paragraph

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Paragraph

[...]

Art. 6

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Paragraph

[...]

Semantic Profile: Set of Provisions

Art. 5

1. The supplier shall communicate to the consumer all the contractual terms and conditions and the information referred to in Article 3(1) and Article 4 [...]

Duty (*Supplier, Consumer*)

2. The supplier shall fulfil his obligation under paragraph 1 immediately after the conclusion of the contract, if the contract has been concluded at the consumer's request using a means of distance communication which does not enable providing the contractual terms [...]

Procedure (*Supplier, Consumer*)

3. At any time during the contractual relationship the consumer is entitled, at his request, to receive the contractual terms and conditions on paper. [...]

Right (*Consumer, Supplier*)

[...]

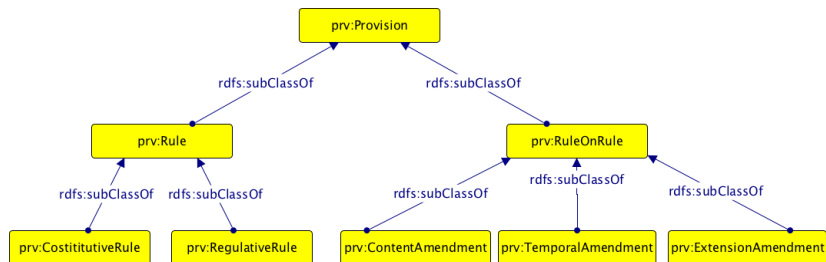
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Duty (*Member States, Consumer*)

[...]

Provision Model



Semantic sub-profiles: Logic Profile

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Duty (*Supplier, Consumer*)

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Right (*Consumer, Supplier*)

[...]

Art. 6

1. The Member States shall ensure that the consumer shall have a period of 14 calendar days to withdraw from the contract without penalty and without giving any reason [...]

Duty (*Member States, Consumer*)

[...]

Logical Relations (Hohfeldian relations)

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Duty (*Supplier*, Consumer)

3. At any time during the contractual relationship the consumer is entitled, at his request, to receive the contractual terms and conditions on paper. [...]

Right (Consumer, *Supplier*)

[...]

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Duty (*Member States*, Consumer)

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Logical Relations (Hohfeldian relations)

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Right (Consumer, Member States)

[...]

Technical Relations

Art. 5

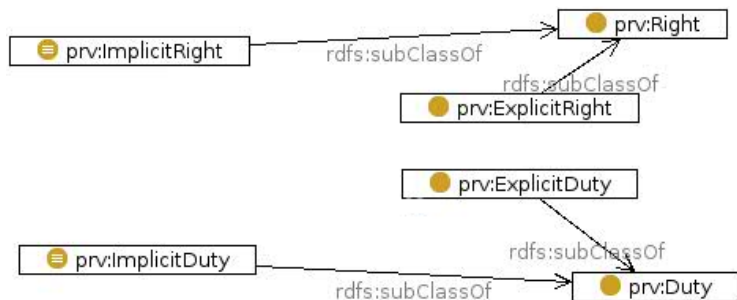
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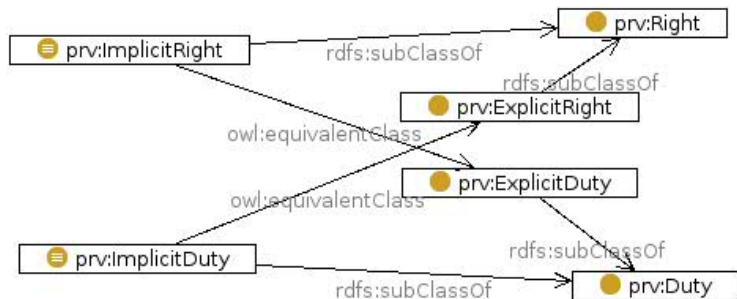
Duty (Supplier, Contractual terms...) Communication,

Procedure (Supplier, Contractual terms...) Communication,

Extension of the Provision Model: Provision Types



DL Axioms on correlative deontic concepts: Duty/Right



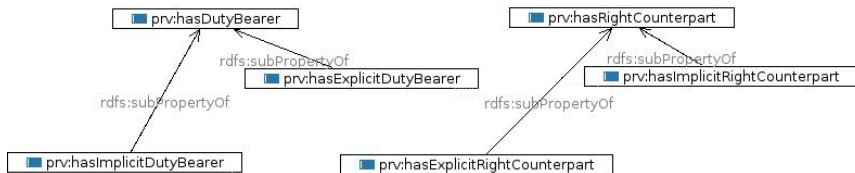
Axioms

[Francesconi, 2014] [Francesconi, 2016]

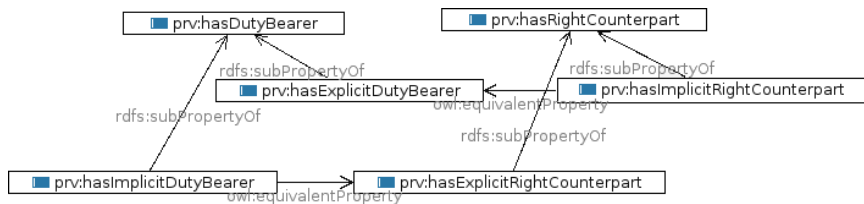
ImplicitRight \equiv ExplicitDuty

ImplicitDuty \equiv ExplicitRight

Extension of the Provision Model: Provision Attributes



Axioms on Provision Attributes (OWL-DL)



Axioms

[Francesconi, 2014] [Francesconi, 2016]

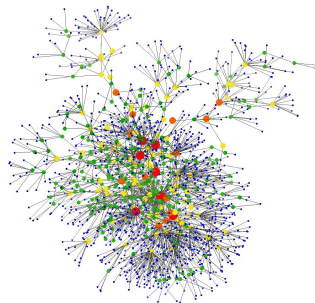
`hasImplicitDutyBearer` \equiv `hasExplicitRightCounterpart`

`hasImplicitRightCounterpart` \equiv `hasExplicitDutyBearer`

The same holds for `hasRightBearer` and `hasDutyCounterpart` in their explicit and implicit views.

Modeling Norms

by Domain Ontologies
for Legal Compliance Checking



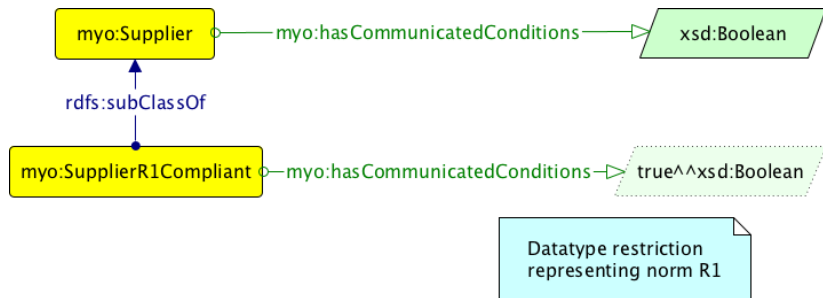
Norms Modeling: Obligation at R1

R1. *The supplier shall communicate to the consumer all the contractual terms and conditions*



Norms Modeling: Obligation at R1

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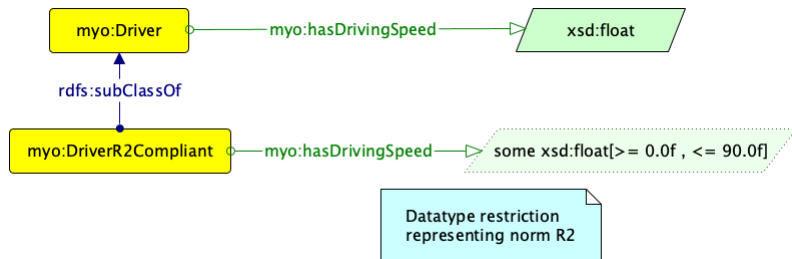
Norms Modeling: Obligation R2 compliant

R2. *According to a [country] law one cannot drive over 90 km/h*

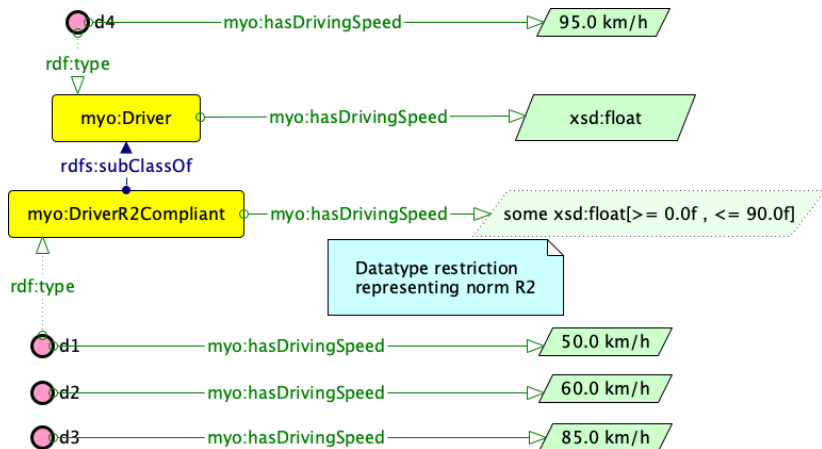


Norms Modeling: Obligation R2 compliant

R2. *According to a [country] law one cannot drive over 90 km/h*



Compliance checking: Drivers compliant with Obligation R2

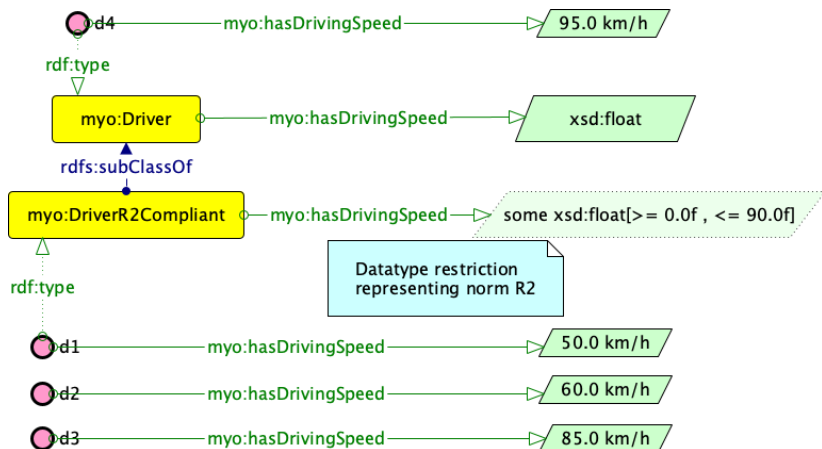


Handling Norm Defeasibility

in Legal Compliance Checking

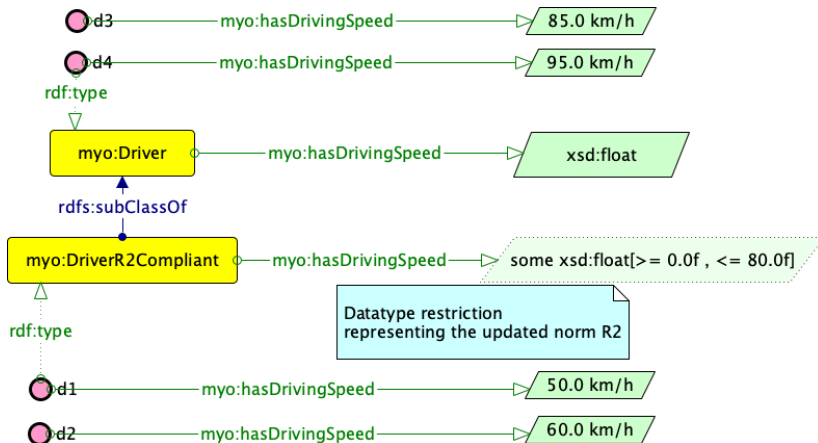


Model for R2



```
SELECT ?x WHERE { ?x rdf:type myo:DriverR2Compliant }
```

Updated model for R2



```
SELECT ?x WHERE { ?x rdf:type myo:DriverR2Compliant }
```

Conclusions

- Framework for transforming the Law as Code (actionable rules) in the Semantic Web



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- Approach for decidable legal reasoning (OWL-DL)



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- Based on the distinction between Provisions–Norms



Conclusions

- Framework for transforming the Law as Code (actionable rules) in the Semantic Web
- Approach for decidable legal reasoning (OWL-DL)
- Based on the distinction between Provisions–Norms
- Approach able to handle defeasible reasoning



Thanks for your attention!

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 Athan, T., Governatori, G., Palmirani, M., Paschke, A., and Wyner, A. (2015).

LegalRuleML: Design principles and foundations.

In *The 11th Reasoning Web Summer School*, number DOI: 10.1007/978-3-319-21768-0_6.

 Biagioli, C. (2009).

Modelli Funzionali delle Leggi. Verso testi legislativi autoesplicativi., volume 6 of *Legal Information and Communications Technologies Series*.

European Press Academic Publishing, Florence, Italy.

 Francesconi, E. (2014).

A description logic framework for advanced accessing and reasoning over normative provisions.

International Journal on Artificial Intelligence and Law, 22(3):291–311.

 Francesconi, E. (2016).

Semantic model for legal resources: Annotation and reasoning over normative provisions.

Semantic Web journal: Special Issue on Semantic Web for the legal domain, 7(3):255–265.



Guastini, R. (2010).

Le Fonti del Diritto. Fondamenti teorici.
Giuffrè, Milano.



Marmor, A. (2014).

The Language of Law.
Number 978-0-19-871453-8. Oxford University Press.



Pino, G. (2016).

Teoria analitica del diritto, chapter 2. Norma giuridica, pages 144–183.
Number 9788846744517. ETS.



Raz, J. (1980).

The Concept of a Legal System.
Oxford University Press.