AI and Law
Modeling Legal Knowledge

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Central South University, Changsha – 15 April 2019
Overview

- Approach to the **Semantic Web for Legal Resources**

- **Organizing the Semantics** of Legal Resources
  - Implementing the IFLA-FRBR model

- **Modeling Legal Knowledge** in the Semantic Web
  - Semantic Model of Normative Provisions, and related Axioms
The Semantic Web in the Legal Domain

- Improve **quality** and **accessibility** of legal information in different legal systems and languages;

- Promote **interoperability** among applications and legal information systems;

- Provide high **quality integrated services** both for **policy makers** and **citizens**.
The Semantic Web Layers

RDFS/OWL: (Legal) Knowledge Modeling

RDF: Semantic statements on data

XML: Legal Resources (Sources of Law)

URI: Legal Resources (Sources of Law) identifier

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The Semantic Web Layers

- **URI**: Legal Resources (Sources of Law) identifier

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The Semantic Web Layers

- **XML**: Legal Resources (Sources of Law) structure
- **URI**: Legal Resources (Sources of Law) identifier
The Semantic Web Layers

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The Semantic Web Layers

- **RDFS/OWL**: (Legal) Knowledge Modeling
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Sources of Law Identification
Sources of Law

Source of law is a wide concept including any document that can be conceived of as the originator of legal rules.

In particular:
- normative acts (legislation and regulations)
- administrative acts
- jurisprudential acts (case law)

Shared source of law naming convention and metadata set allow to identify, discover and query legal acts in a distributed environment.
Legal Resources Identifier: Desirable Characteristics

- Unique at international level
- Transparent
- Persistent
- Location-independent
- Language neutral
- Based on Open Standards (no vendors lock-in)
- Free adhesion (pure federative approach)
Why Transparent Identifiers?

- Based on **formal parameters of citations**
- Only rules syntax and formal parameters of identification are needed
- **Automatic document hyperlinking**
  - Independent from a remote service providing identifiers
- Possibility of implementing a **resolver** (centralized or distributed)
Sources of Law and IFLA-FRBR model

**IFLA**: International Federation of Library Associations and Institutions

**FRBR**: Functional Requirements for Bibliographic Record model:
- **Work**: a distinct intellectual creation
- **Expression**: any different version over the time or across languages (original, amended, localized)
- **Manifestation**: any different realisation of an expression (paper format, digital format, etc.)
- **item**: any single copy of a manifestation

Any level includes a set of metadata

Metadata used for identification and semantic description
Legal Identifiers based on the FRBR Model

- **LEX** naming convention (URN:LEX and http-based LEX)
- **ECLI, ELI** naming conventions
- **AkomaNtoso** naming convention
LEX Naming Convention

URI naming convention using **URN** and **HTTP-based** schemas

**Uniform Resource Names (URNs)** are unambiguous and lasting identifiers for legal resources, independent from:
- availability of the resource
- access modality
- physical location

URIs are used in several Legal XML projects:
- as univocal and persistent identifiers of legal documents
- as tools to represent relationships among them
LEX Identification Metadata (URN syntax)

urn:lex : jurisdiction : local name

Local name
work @ expression $ manifestation

Work level
authority : type : details : annex
urn:lex:uk:ministry.justice:decree:1999-10-07;45:annex.a

Expression level
version : language
urn:lex:ch:etat:loi:2006-05-14;22@originel:fr

Manifestation level
format : editor : components : other-features
urn:lex:it:stato:legge:2000-04-03;56$application-pdf;1.7:parlamento.it
LEX Identification Metadata (HTTP-based syntax)

http://<host-name>/lex/<jurisdiction>/<local name>

Local name
<work>/@/<expression>/$/<manifestation>

Work level
<authority>/<type>/<details>/<annex>
http://<host-name>/lex/uk/ministry.justice/decreed/1999-10-07;45/annex.a

Expression level
<version>/<language>

Manifestation level
<format>/<editor>/<components>/<other-features>
http://www.senato.it/lex/it/stato/legge/2000-04-03;56/$/application-pdf;1.7/parlamento.it
Art. 9

The provisions of Directive 77/799/EEC shall apply to the exchange of information under this Directive, provided that the provisions of this Directive do not derogate therefrom. However, Article 8 of Directive 77/799/EEC shall not apply to the information to be provided pursuant to this chapter.
Art. 9
The provisions of Directive 77/799/EEC shall apply to the exchange of information under this Directive, provided that the provisions of this Directive do not derogate therefrom. However, Article 8 of Directive 77/799/EEC shall not apply to the information to be provided pursuant to this chapter.
The Structure of the Sources of Law
Legal XML Schemas

- CEN Metalex
- AkomaNtoso
- Formex
- Qualified XHTML
Excerpt of the Structure of Directive 2002/65/EC, represented in CEN Metalex compliant XML

<article id="art5">
  <paragraph id="art5-par1">
    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>
  <paragraph id="art5-par2">
    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>
  <paragraph id="art5-par3">
    3. At any time during the contractual relationship the consumer is entitled, at his request, to receive the contractual terms and conditions on paper. [...]
  </paragraph>
</article>

<article id="art6">
  <paragraph id="art6-par1">
    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 [...]
  </paragraph>
</article>
The Semantics of the Sources of Law
Knowledge Models and Instances

RDFS/OWL (Knowledge Models / Ontologies)

RDF (Instances / Individuals)
Knowledge modeling is essential for implementing the Semantic Web

In the legal domain it provides advanced services

1. Semantic search facilities
2. Consolidation (by amendments description)
3. Analysis of coherence and impact of new texts on the legal systems (contradictory norms, RIA, etc.)
4. Legal Drafting based on semantics

Knowledge modeling as a mean to organize metadata for semantic annotation of the Sources of Law
Sources of Law metadata organization
Taxonomy of the bibliographic resources and FRBR

A Source of Law can be seen as a Bibliographic Resource

**Bibliographic Resource** in the International Standard Bibliographic Description (ISBD) sense

An entity, tangible or intangible, that comprises intellectual and/or artistic content and is conceived, produced and/or issued as a unit, forming the basis of a single bibliographic description.

Bibliographic Resources can be described by Metadata organized into FRBR model

Distinction between

- Taxonomy of resources
- Classes of the FRBR model
Taxonomy of the resources and FRBR

\[ \text{BibliographicResource} = \text{Work} + \text{Expression} + \text{Manifestation} + \text{Item} \]

(disjoint union FRBR classes) [Dunrise and Le Boeuf, 2013]

- The relationship between a Resource and its FRBR classes is therefore of part-of / aspect

- Every FRBR level is an aspect of a current resource and collector of the set of metadata at that level
Taxonomy of the resources and FRBR

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Resource taxonomy and FRBR model can be viewed as aspects of the same reality in two different perspectives (or logical layers) [Bianchini and Willer, 2014]:

- The web of data perspective
- The bibliographic data perspective

A resource is a set of data identified by a specific URI (web of data perspective)

A class of FRBR is an aspect of a specific resource when viewed as a bibliographic entity (bibliographic data perspective)
Benefits

- Queries (SPARQL) to access resource metadata are independent from the resource types
  
  ```sql
  SELECT ?work WHERE {?r hasWorkAspect ?work}
  ```

- Direct access to the FRBR metadata levels

- Metadata organized according to the FRBR taxonomy
Semantic Web means Smart Data
Smart Data and Advanced Legal Reasoning
Possible Scenario

OnLine Contract

Consumer Protection Law

Interest on 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

Retrieval system of norms endowed with reasoning facilities
Possible Scenario

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- Interest on Consumer's rights (ex: right of withdrawal)
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Possible Scenario

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- Consumer’s rights (ex: *right of withdrawal*)
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Possible Scenario

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

Retrieval system of norms endowed with reasoning facilities
Profiles of legislative texts

Laws and regulations may be seen as a set of provisions, carried by speech acts [Searle, 1969].

A legislative text can be viewed according to two different profiles:

- **Formal Profile**
  text organization in terms of chapters, articles, paragraphs, etc.

- **Semantic Profile**
  text organization according to partitions substantial meaning

The Semantic Profile can be represented in terms of normative provisions [Biagioli, 1997][Biagioli, 2009].
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 [...] 

[...]

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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 [...] 

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

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

Paragraph

[...]

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 [...] 

Paragraph

[...]
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)

[...] 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)

[...]
Art. 5
1. The supplier shall communicate to the consumer [...] 

2. The supplier shall fulfil his obligation [...] using a means of distance communication [...] 

3. [...] the consumer is entitled, at his request, to receive the contractual terms [...] 

Art. 6
1. The Member States shall ensure that the consumer shall have a period of 14 calendar days to withdraw from the contract [...]
Provision Model in the Legal Semantic Web

Semantic Web
Web of Documents $\rightarrow$ Web of Data

Legal Semantic Web
Web of Legislative Documents $\rightarrow$ Web of Normative Provisions
Provision Model contributes to Systematize the Law

A provision-centric view of legislative texts contributes to

1. Transparency
2. Semantic search facilities based on norms
3. Consolidation (by amendments description)
4. Analysis of coherence and impact of new texts on the legal systems (contradictory norms, RIA, etc.)
5. Legal Drafting based on semantics
A provision-centric view of legislative texts contributes to

2 Semantic search facilities based on norms
Advanced retrieval system based on Relations between Provisions

1. Logical relations
   Relations between provisions that are necessary from a logical point of view, as the classical Hohfeldian relations.

   ![Diagram of logical relations]

   - Right (correlative) to Duty
   - NoRight (correlative) to Privilege
   - Power (correlative) to Liability
   - Disability (correlative) to Immunity

   Opposite relations:
   - Right and NoRight
   - Duty and Privilege
   - Power and Liability
   - Disability and Immunity
Advanced retrieval system based on Relations between Provisions

1. **Logical relations**
   Relations between provisions that are **necessary** from a logical point of view, as the classical Hohfeldian relations.

   - Right \(\rightarrow\) correlative \(\rightarrow\) Duty
   - Opposite
   - NoRight \(\rightarrow\) correlative \(\rightarrow\) Privilege

2. **Technical relations**
   Relations **not necessary** from a logical point of view, but they derive from legislative techniques considerations, as the relations between

   - Power \(\rightarrow\) correlative \(\rightarrow\) Liability
   - Opposite
   - Disability \(\rightarrow\) correlative \(\rightarrow\) Immunity
Advanced retrieval system based on Relations between Provisions

1 Logical relations
Relations between provisions that are necessary from a logical point of view, as the classical Hohfeldian relations.

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   the Duty of a Bearer to accomplish a specific Action towards a Counterpart \(\leftrightarrow\)
   \(\leftrightarrow\) the Procedure describing how to fulfill such obligation
Advanced retrieval system based on Relations between Provisions

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[Diagram of Hohfeldian relations]

2. Technical relations
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   - the Duty of a Bearer to accomplish a specific Action towards a Counterpart
   - the Procedure describing how to fulfill such obligation
   - the Exceptions to it

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Advanced retrieval system based on Relations between Provisions

1. **Logical relations**
   Relations between provisions that are **necessary** from a logical point of view, as the classical Hohfeldian relations.

2. **Technical relations**
   Relations **not necessary** from a logical point of view, but they derive from legislative techniques considerations, as the relations between
   - the **Duty** of a **Bearer** to accomplish a specific **Action** towards a **Counterpart**
   - the **Procedure** describing how to fulfill such obligation
   - the **Exceptions** to it
   - as well as the **Sanction** such **Bearer** may face if he does not fulfill such obligation
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 fulfill 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)

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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 [...]

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. [...]
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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, Communication, Contractual terms...)

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, Communication, 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 [...] 

Right (Consumer, Supplier)
Approach

1. Representing Provision Types and Attributes (Provision Model)
Approach

1. Representing Provision Types and Attributes (Provision Model)

2. Expressing axioms on Provisions Types and Attributes
Approach

1. Representing Provision Types and Attributes (Provision Model)

2. Expressing axioms on Provisions Types and Attributes

3. Tools
   - RDF(S) and OWL-DL standards
   - Inferences by an OWL-DL reasoner
   - SPARQL as query language
Provision Types

- **Rules**
  - **Constitutive rules**: introduce or assign a juridical profiles to the regulated entities;
  - **Regulative rules**: discipline actions or the substantial and procedural defaults (remedies).

- **Rules on Rules** (amendments)
  - **Content amendments**: modify literally the content of a norm, or their meaning without literal changes;
  - **Temporal amendments**: modify the times of a norm (come-into-force and efficacy time);
  - **Extension amendments**: extend or reduce the cases on which the norm operates.
Provision Model Top Classes

- prv:TemporalAmendment
- prv:ExtensionAmendment
- prv:ContentAmendment
- prv:Constitutive
- prv:Regulative
- prv:Rule
- prv:RuleOnRule
- prv:Provision

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Regulatives provisions

- prv:Permission
- prv:Prohibition rdfs:subClassOf prv:RuleOnAction
- prv:Duty rdfs:subClassOf prv:RuleOnAction
- prv:Right rdfs:subClassOf prv:RuleOnAction
- prv:Violation rdfs:subClassOf prv:RuleOnAction
- prv:Remedy
- prv:Redress rdfs:subClassOf prv:RuleOnAction
Thematic Profile

- Relations between the concepts described in the legislative texts (regulated fields)
- Provision attributes contents
- They can be expressed by literals or concepts derived from thesauri or domain ontologies

Ex: DALOS “Consumer law” ontology
How to represent Logical Relations in the Provision Model

- Relations between Provisions types and Attributes
- Ex: Hohfeldian relations between Duty and Right

\[
\text{Duty}(\text{hasBearer}='\text{Supplier}', \text{hasCounterpart}='\text{Consumer}')
\]

\[\uparrow\
\]

\[
\text{Right}(\text{hasBearer}='\text{Consumer}', \text{hasCounterpart}='\text{Supplier}')
\]

Axioms

\[
\text{Duty} \equiv \text{Right}
\]

\[
\text{hasBearer} \equiv \text{hasCounterpart}
\]
How to represent Logical Relations in the Provision Model

- Relations between Provisions types and Attributes
- Ex: Hohfeldian relations between Duty and Right

\[
Duty(\text{hasBearer}=\text{`Supplier'}, \text{hasCounterpart}=\text{`Consumer'})
\]
\[\uparrow\]
\[
Right(\text{hasBearer}=\text{`Consumer'}, \text{hasCounterpart}=\text{`Supplier'})
\]

Axioms

\[
\text{Duty} \equiv \text{Right}
\]
\[\implies\]
\[
\text{Duty}(\text{hasBearer}=\text{`Supplier'}) \equiv \text{Right}(\text{hasBearer}=\text{`Supplier'})
\]

\[
\text{hasBearer} \equiv \text{hasCounterpart}
\]
\[\implies\]
\[
\text{Duty}(\text{hasBearer}=\text{`Supplier'}) \equiv \text{Duty}(\text{hasCounterpart}=\text{`Supplier'})
\]
How to represent Logical Relations in the Provision Model

- Relations between Provisions types and Attributes
- Ex: Hohfeldian relations between Duty and Right

\[
\begin{align*}
\text{Duty}(\text{hasBearer} = 'Supplier', \text{hasCounterpart} = 'Consumer') \\
\iff \quad \Downarrow \\
\text{Right}(\text{hasBearer} = 'Consumer', \text{hasCounterpart} = 'Supplier')
\end{align*}
\]
Attributes specified with respect to Provision types
Extension of the Provision Model: Provision Types

Axioms

\[ \text{ImplicitRight} \equiv \text{ExplicitDuty} \]

\[ \text{ImplicitDuty} \equiv \text{ExplicitRight} \]
**DL Axioms on correlative deontic concepts: Duty/Right**

![Diagram showing the relationships between concepts](image)

<table>
<thead>
<tr>
<th>Axioms</th>
<th>[Francesconi, 2014]</th>
<th>[Francesconi, 2016]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ImplicitRight $\equiv$ ExplicitDuty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ImplicitDuty $\equiv$ ExplicitRight</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Extension of the Provision Model: Provision Attributes

Axioms

\[ \text{hasImplicitDutyBearer} \equiv \text{hasExplicitRightCounterpart} \]

\[ \text{hasImplicitRightCounterpart} \equiv \text{hasExplicitDutyBearer} \]

The same holds for hasRightBearer and hasDutyCounterpart in their explicit and implicit views.
Axioms on Provision Attributes (OWL-DL)

[Francesconi, 2014] [Francesconi, 2016]

\[ \text{hasImplicitDutyBearer} \equiv \text{hasExplicitRightCounterpart} \]
\[ \text{hasImplicitRightCounterpart} \equiv \text{hasExplicitDutyBearer} \]

The same holds for \text{hasRightBearer} and \text{hasDutyCounterpart} in their explicit and implicit views.
Properties of the Proposed Relational Pattern

The proposed relational pattern aims to introduce

1. **Properties equivalence**
   - direct check on attributes contents (No conditional statement is needed, ex: “if (hasDutyCounterpart == ‘Consumer’)”)

2. **Abstract classes (“Implicit” classes)**
   - different views (Implicit and Explicit) of the same provision;
   - to retrieve provision instances which are not explicitly expressed (ex: provisions where ImplicitRightBearer == “Consumer”);

Benefits of the approach

- keep the problem within the OWL-DL complexity (without using SWRL or Rule-ML).
Inference facilities through an OWL reasoner
The Inferred Model

- Inference facilities through an OWL reasoner

- Pellet – Java based OWL-DL reasoner
The Inferred Model

- Inference facilities through an OWL reasoner
- Pellet – Java based OWL-DL reasoner

The result is a Provision Model where inferences are calculated from the asserted axioms.
SPARQL queries using the Provision Model and Ontology concepts

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX prv: <http://www.ittig.cnr.it/ProvisionModel/1.0#>
PREFIX cl: <http://www.ittig.cnr.it/ontologies/consumer-law/1.0#>
SELECT ?x
WHERE { ?x prv:hasRightBearer cl:Consumer }
1) Hohfeldian inference case-study: Querying the System

SELECT ?x WHERE { ?x prv:hasRightBearer cl:Consumer }

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 [...] ExplicitDuty (Supplier, Consumer)

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[...]

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 [...] ExplicitDuty (Mem. States, Consumer)
Logical relations

2) Query result based on the **Asserted Model**

```
SELECT ?x WHERE { ?x prv:hasRightBearer cl:Consumer }
```

Art. 5

[...]

Art. 6

[...]
Logical relations

2) Query result based on the **Asserted Model**

```
SELECT ?x WHERE { ?x prv:hasExplicitRightBearer cl:Consumer }
```

Art. 5

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

ExplicitRight (**Consumer**, **Supplier**)
3) Query result based on the **Inferred Model**

```
SELECT ?x WHERE { ?x prv:hasRightBearer cl:Consumer }
```

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ExplicitRight (Consumer, Supplier)

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ExplicitDuty (Mem. States, Consumer)
Logical relations

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SELECT ?x WHERE { ?x prv:hasRightBearer cl:Consumer }
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*ImplicitRight (Consumer, Supplier)*

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*ExplicitRight (Consumer, Supplier)*

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*ImplicitRight (Consumer, Mem. States)*
Logical relations
1) Hohfeldian inference case-study: Querying the System

SELECT ?x WHERE { ?x prv:hasImplicitRightBearer cl:Consumer }
Logical relations

2) Query result based on the **Asserted Model**

```sql
SELECT ?x WHERE { ?x prv:hasImplicitRightBearer cl:Consumer }
```

Art. 5

[...]

Art. 6

[...]
Logical relations

3) Query result based on the *Inferred Model*

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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 [...]  

   **ExplicitDuty** (*Supplier*, *Consumer*)

[...]

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SELECT ?x WHERE { ?x prv:hasImplicitRightBearer cl:Consumer }

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 [...]

ImplicitRight (*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 [...]

ImplicitRight (*Consumer*, *Mem. States*)

[...]

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Logical relations 1) Hohfeldian inference case-study: Querying the System

```
SELECT ?x WHERE { ?x prv:hasDutyBearer cl:Supplier }
```

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 [...] ExplicitDuty (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. [...] ExplicitRight (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 [...] ExplicitDuty (Mem. States, Consumer)

[...]
Logical relations  2) Query result based on the Asserted model

SELECT ?x WHERE { ?x prv:hasDutyBearer cl:Supplier }

Art. 5

[...]

Art. 6

[...]
Logical relations 2) Query result based on the Asserted model

SELECT ?x WHERE { ?x prv:hasExplicitDutyBearer cl:Supplier }

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 [...]}

ExplicitDuty (Supplier, Consumer)

[...]

Art. 6

[...]

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Logical relations  3) Query result based on the
Inferred Model

```
SELECT ?x WHERE { ?x prv:hasDutyBearer cl:Supplier }
```

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 [...] ExplicitDuty (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. [...] ExplicitRight (Consumer, Supplier)

[...]

Art. 6

[...]

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Logical relations 3) Query result based on the Inferred Model

```
SELECT ?x WHERE { ?x prv:hasDutyBearer cl:Supplier }
```

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 [...]  

ExplicitDuty (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. [...]  

ImplicitDuty (Supplier, Consumer)

[...]

Art. 6

[...]

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Art. 5 of EU Directive 2002/65/EC

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, Communication, Contractual terms..., 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, Communication, Contractual terms..., 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, Reception, Contractual terms..., Supplier)

[...]
Technical Relations

1) Querying the System by Selected Attribute Values

SELECT ?x WHERE {

{ ?x prv:hasDutyBearer cl:Supplier. ?x prv:hasDutyAction cl:Communication.
  ?x prv:hasDutyObject cl:ContractualTerms. ?x prv:hasDutyCounterpart cl:Consumer}
UNION

{ ?x prv:hasProcedureBearer cl:Supplier. ?x prv:hasProcedureAction cl:Communication.
  ?x prv:hasProcedureObject cl:ContractualTerms. ?x prv:hasProcedureCounterpart cl:Consumer}


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 [...] ExplicitDuty (Supplier, Communication, Contractual terms..., 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, Communication, Contractual terms..., 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. [...] ExplicitRight (Consumer, Supplier)

[...]
2) Expanded query result on the *Inferred Model*

```sql
SELECT ?x WHERE {
  { ?x prv:hasDutyBearer cl:Supplier. ?x prv:hasDutyAction cl:Communication.
    ?x prv:hasDutyObject cl:ContractualTerms. ?x prv:hasDutyCounterpart cl:Consumer}
  UNION
  { ?x prv:hasProcedureBearer cl:Supplier. ?x prv:hasProcedureAction cl:Communication.
    ?x prv:hasProcedureObject cl:ContractualTerms. ?x prv:hasProcedureCounterpart cl:Consumer}
}
```

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 [...]

ExplicitDuty (*Supplier*, *Communication*, *Contractual terms*..., *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*, *Communication*, *Contractual terms*..., *Consumer*)

[...]
Prototype of Legal Search Engine

ProMISE

Provision

Model-based

Inferential legal

Search

Engine

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The architecture of ProMISE

Search application (GWT, RESTful web API)

JENA API Calls - SPARQL

JENA Model Interface

JENA Model Storage

DBPedia

RDF Database Server (ex: Virtuoso)

RDF Provisions Triples

RDF Inferred Provisions Triples

Reasoner (ex: Pellet)

RDF/OWL Provision Model

URI/XML Legislation

Domain ontology (ex: DALOS)
Benefits of the approach

Legal Semantic Web approach through the Provision Model

Advantages

- **Pattern** for expressing fundamental relations between provisions
- **OWL-DL** computational tractability (no SWRL, RIF or XML description of rules)

Problems

- **Semantic annotation** burden
- **Knowledge acquisition** bottleneck


*Speech Acts: An Essay in the Philosophy of Language.*