
RAWE: An Editor for Rule Markup of Legal Texts

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Rules Advanced Web Editor

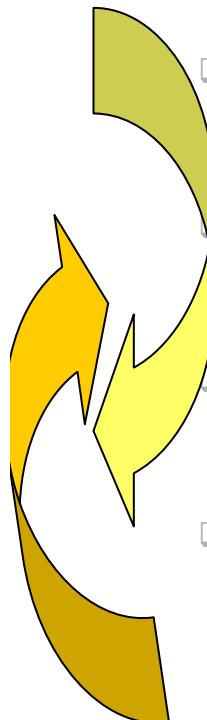


Outline

- Scenario
- Goal of the project
- Requirements of RAWE
- Functionalities
- Akoma Ntoso and LegalRuleML
- LegalRuleML and RDF
- Demo of the rule editor
- Demo of the RuleViewer

Scenario

- RAWE is a component of a project called “Fill the gap” funded by University of Bologna for extending the outcomes of several projects: EU-project *Estrella* (2007-2009) and UN project Akoma Ntoso
- In the legal domain we find different sources:
 - **norms**: abstract mandatory commands concerning rights or duties
 - **legal concepts**: abstract category of concepts (e.g. *good faith*) coming from the legal tradition
 - **textual provisions**: sequences of text expressing the norms and legal concepts
 - **rules**: interpretation of the text in logical rules and modelled with a formal representation



Scenario

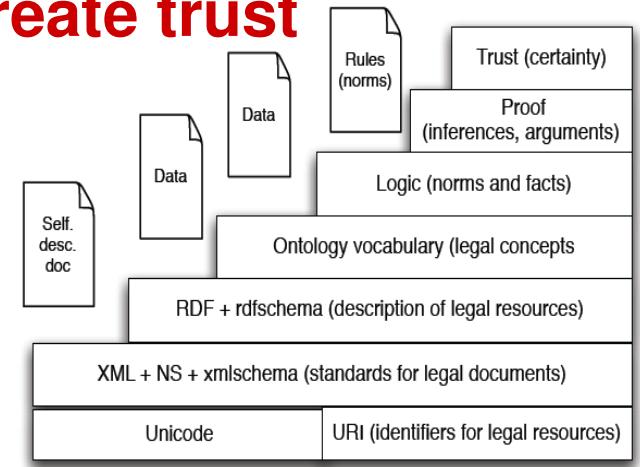
- Legal rules are an interpretation of the legally binding (legal) text and they are based also on legal concepts
- Legal rules need a logic formalization and it is a complex time consuming activity
- Legal experts want to see a reasonable evidence of the rules in the legal text
- Legal experts need to track changes over time in text and rules

**Minimize the effort Trust
Changes over time**



Goals of “Fill the Gap”

- Provide a set of integrated **XML standards** for modelling all the Semantic Web cake in legal domain: Akoma Ntoso and LegalRuleML
- Provide an integrated architecture able to take advantage from the integration of all the knowledge and fill the gap between **text, ontologies, rules**
- **RAWE: Editors oriented to legal expert for modelling in integrated way legal text and legal rules in order to foster the information, coordinate them over time, minimize the effort, create trust**



Sartor, 2009

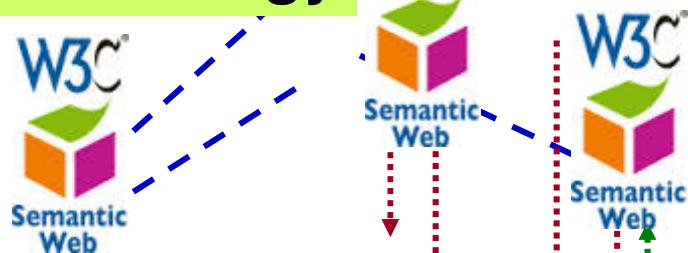
Legal Document, Legal Rules, Legal Open Data

Legal document in XML



**Combine rules with other dataset
Interoperability and interchange
Retrieve rules and documents**

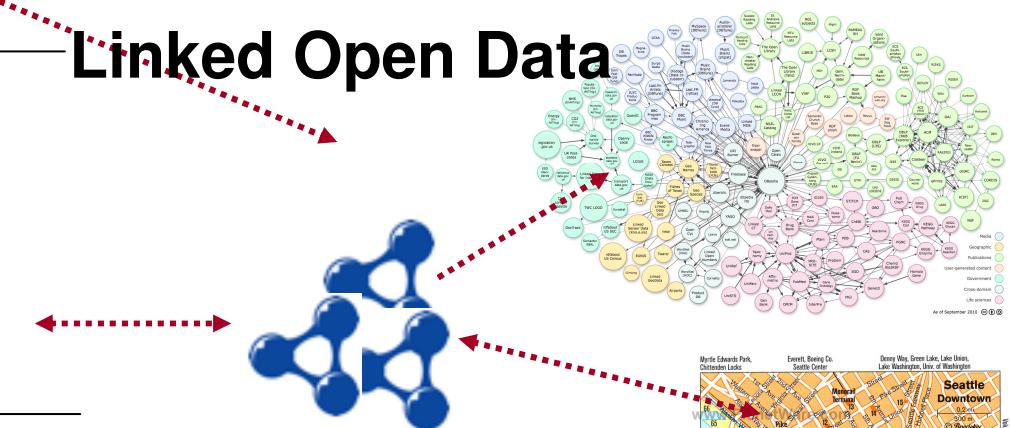
Legal Ontology



Logic Rules



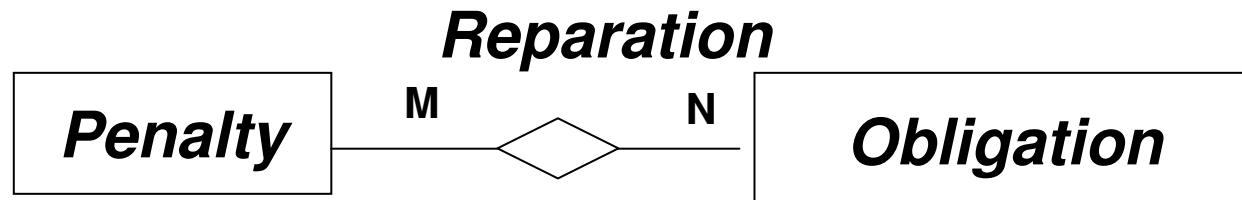
Linked Open Data



ENGINE

Legal domain Requirements

- **Isomorphism:** connections between legal text and legal rules
- **Context of the rule:** Author, Jurisdiction, Authority, Temporal properties, etc.
- **Rule semantics:** connection with legal ontology
- **Defeasibility:** hierarchy of rules
- **Deontic operators:** obligations, rights, permissions (strong and week), etc.
- **Reparation and Penalty**
- **Meta-Rules:** rules on rules (e.g. abrogation of a rule, violation of a rule, interpretation of rules, etc.)



Some problems in the state of the art

- AI&Law literature developed in the last 20 years good academic rule systems, but not usable by legal end-users [Cabaret, Hypo, Cato, Carneades, etc.]
- Other commercial systems don't take too much care of the special needs of the legal domain (e.g. defeasibility, legal metadata)
- Legal document modelling and Rule modelling communities are not so much connected, the same with the Semantic Web

Some problems from usability

- Rule modelling is a time consuming and high skill activity, complex and often the model needs to be optimized for the legal reasoning
- Existing editors on the market are not able to connect the original text with legal rules
- Problem of traceability over time of the changes
- Problem of usability of the tools (HCI)

RAWE

The screenshot shows the RAWE software interface with several key components highlighted by yellow boxes:

- LegalRuleML Conversion**: Located in the top-left corner of the main window.
- Text modelling Tool bar**: Located in the top-right corner of the main window.
- Legal Text**: The central area where legal text is displayed, containing sections like (2) and (d).
- Legal Text Tree Structure**: Located at the bottom-left of the main window.
- Rule Tool Bar**: Located at the bottom-right of the main window.

The main window includes:

- Outline**: A tree view of the document structure on the left.
- Document editor**: The main text editing area with a toolbar above it.
- Document markup**: A panel on the right containing "Document structure" and "Common elements" tabs.
- Add rule**: A panel on the right for defining rules with fields for Type, Rel 1, Var 1, Ind 1, and Then.

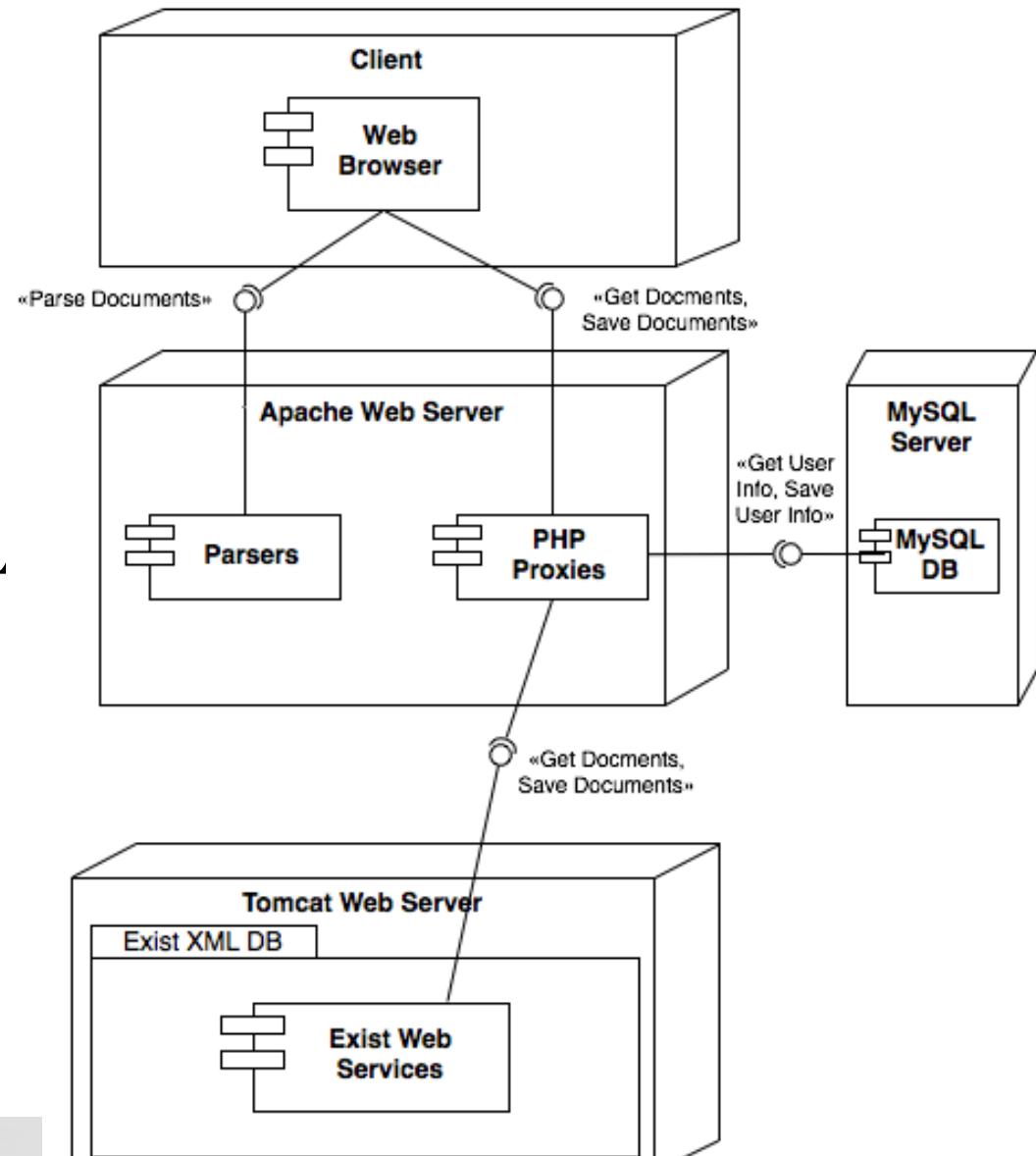
The status bar at the bottom shows the path: act > body > title (Title 17) > chapter (Chapter 5) > section (§ 504.) > clause ((c)).

System tray icons are visible at the bottom-left, and system information is at the bottom-right (15:42, 04/07/2013).

RAWE

- Web based WYSIWIG
- Multilingual, user profiling, legal tradition customization
- Based on the Akoma Ntoso and LegalRuleML standards
- Contextual interface based on the XML-schemas
- Based on XML native repository


The Language Independent Markup Editor



 Sencha Ext JS

Functionalities

- ***Contextual Composition of the Rule.***
 - In LegalRuleML we have four groups of rules:
 - Prescriptive, Constitutive, Penalty, Reparation.
 - Each group permits some particular modeling following the XML-schema
- ***Reparation*** is a relationship between a penalty and a prescriptive rule or violation. Interface tool for creating this relationship
- ***Metadata in Context.*** RAWE permits to import the metadata by Akoma Ntoso according with the text fragment
- ***Extra isomorphism rules.*** Sometimes we need to include extra rules not directly linked to the legal text. RAWE permits to model this particular situation

Open issues

- **Usability.** Some problems with complex rules in term of interface (drag and drop, cut and past, etc.)
- **Ontology.** Some elements of rule modeling need to be enriched with definitions from an external vocabulary or ontology
- **Meta-Rules.** In the future LegalRuleML will be also be able to manage meta-rules (rules about other rules), and we need to find a mechanism for linking rules as antecedents and consequents
- **Multiple interpretation.** In this version of the editor is not possible to have multiple interpretations of the same legal textual document fragment by different authors
- **Granularity.** For now the granularity of the isomorphism is on the rule level. In the future we will be able to also manage the same functionality on the body, head, and atom

Akoma Ntoso and LegalRuleML

Metadata of Rules

Metadata of Text

105-304—OCT. 28, 1998

W 105-304—OCT. 28, 1998

```
<!-- A  
<akoma  
<!-  
<a
```

2013

Public Law 105-304
105th Congress

An Act

Oct. 28, 1998
[H.R. 2281]

Digital
Millennium
Copyright Act.
17 USC 101 note.

To amend title 17, United States Code, to implement the World Intellectual Property Organization Copyright Treaty and Performances and Phonograms Treaty, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Digital Millennium Copyright Act".

SEC. 2. TABLE OF CONTENTS.

Sec. 1. Short title.
Sec. 2. Table of contents.

TITLE I—WIPO TREATIES IMPLEMENTATION

Sec. 101. Short title.
Sec. 102. Technical amendments.
Sec. 103. Copyright protection systems and copyright management information.
Sec. 104. Evaluation of impact of copyright law and amendments on electronic commerce and technological development.
Sec. 105. Effective date.

TITLE II—ONLINE COPYRIGHT INFRINGEMENT LIABILITY LIMITATION

Sec. 201. Short title.
Sec. 202. Limitations on liability for copyright infringement.
Sec. 203. Effective date.

TITLE III—COMPUTER MAINTENANCE OR REPAIR COPYRIGHT EXEMPTION

Sec. 301. Short title.
Sec. 302. Limitations on exclusive rights; computer programs.

TITLE IV—MISCELLANEOUS PROVISIONS

Sec. 401. Provisions Relating to the Commissioner of Patents and Trademarks and the Register of Copyrights.
Sec. 402. Ephemeral recordings.
Sec. 403. Limitations on exclusive rights; distance education.
Sec. 404. Exemption for libraries and archives.
Sec. 405. Scope of exclusive rights in sound recordings; ephemeral recordings.
Sec. 406. Assumption of contractual obligations related to transfers of rights in motion pictures.
Sec. 407. Effective date.

TITLE V—PROTECTION OF CERTAIN ORIGINAL DESIGNS

AKOMA NTOSO XML

signs.
title.
Sec. 500. Industrial design.

```
<lrml:Rule key="rule1">  
  <lrml:if> ...</lrml:if>  
  ....  
  <lrml:then>... </lrml:then>  
</lrml:Rule>...
```

LegalRuleML XML

Metadata of Rules T2

```
<lrml:Rule key="rule2-v2">  
  <lrml:if> ...</lrml:if>  
  ....  
  <lrml:then>... </lrml:then>  
</lrml:Rule>...
```

LegalRuleML skeleton



```
<lrm1:LegalRuleML>
  <lrm1:References>
    <Reference> ...
  </lrm1:References>
  ...
  <lrm1:Context key="ruleInfo1-v2">
    <lrm1:Association>
      <lrm1:appliesSource keyref="#sec2.1-list1-item31-par1-v2"/>
      <lrm1:toTarget keyref="#rulebase1-v2"/>
    </lrm1:Association>
  </lrm1:Context>
  <lrm1:hasStatements key="rulebase-v2">
    <lrm1:ConstitutiveStatement key="rule1a">
      <ruleml:if> ... </ruleml:if>
      <ruleml:then>... </ruleml:then>
    </lrm1:ConstitutiveStatement>
  </lrm1:hasStatements>...
</lrm1:LegalRuleML>
```

The diagram illustrates the LegalRuleML skeleton with four colored boxes:

- Red Box (References):** Points to the `<lrm1:References>` element in the XML. It is associated with the **Textual References** box.
- Green Box (Context):** Points to the `<lrm1:Context key="ruleInfo1-v2">` element. It is associated with the **Rule Context parameters like agents, times, sources** box.
- Blue Box (Associations):** Points to the `<lrm1:Association>` element within the Context block. It is associated with the **Association between Text and Rules N:M relationship** box.
- Yellow Boxes (Rules):** There are two yellow boxes. One is associated with the `<ruleml:if>` and `<ruleml:then>` elements within the Constitutive Statement, labeled **Rules**. The other is associated with the entire `<lrm1:hasStatements>` block, labeled **Rules**.

- An open XML standard for all legal documents used in Parliamentary processes and judgments
- Started in 2004-2005 within the project “Strengthening Parliaments’ Information Systems in Africa”, promoted by the UNITED NATIONS Department for Economics and Social Affairs (UNDESA)
- Akoma Ntoso means “**Linked Hearts**” and it is a symbol used by the Akan people of West Africa to represent understanding and agreement

Successful case histories

- LexML Brazil – customization in Portuguese
- European Parliament – Amendments of Bills
- Uruguay Parliament – Lifecycle of Bills
- California State Law – conversion to Akoma Ntoso
- Kenya Law Report – Legacy Database exported to Akoma Ntoso
- South Africa Parliament – early implementation phase
- Senate of Italy – as bill open data standard
- Federal Chancellery of Switzerland – for the official journal publication

Akoma Ntoso: fostering metadata

```
<akomantoso xmlns="http://www.akomantoso.org/1.0">
  <act>
    <meta>
      Metadata annotation by sources
      Ontology annotation by editors
      Lifecycle metadata by editors
      Analysis metadata by scholars
    </meta>
    <preface>
      Authorial content by the author
    </preface> /
    <preamble>
      Authorial content by the author
    </preamble> /
    <body>
      Authorial content by the author
    </body>
    <attachments>
      Authorial content by the author
    </attachments>
  </act>
</akomantoso>
```

Akoma Ntoso: fostering metadata

```
<akomantoso  
  xmlns="http://www.akomantoso.org/1.0">
```

```
  <act>
```

```
    <meta>
```

Permanent URI

Metadata annotation by editors

Legal and document
Ontology classes

Ontology annotation by editors

Temporal lifecycle
of the events

Lifecycle metadata by systems

Qualification of the
textual provisions

Analysis metadata by scholars

```
  </meta>
```

Temporal metadata exported

CLAUSE

(b) Actual Damages and Profits

- The copyright owner is entitled to recover the actual damages suffered by him or her as a result of the infringement, and any profits of the infringer that are attributable to the infringement and are not taken into account in computing the actual damages. In establishing the infringer's profits, the copyright owner is required to present proof only of the infringer's gross revenue, and the infringer is required to prove his or her deductible expenses and the elements of profit attributable to factors other than the copyrighted work.

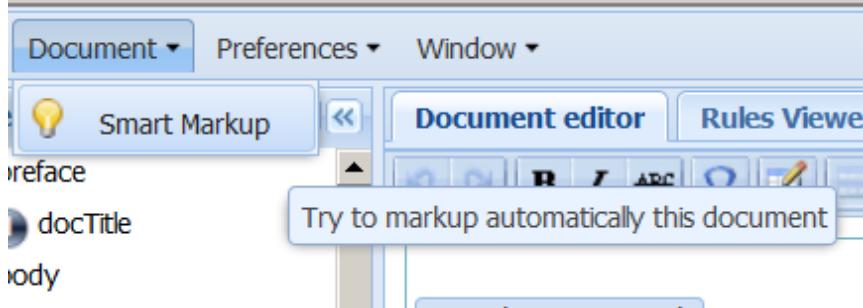
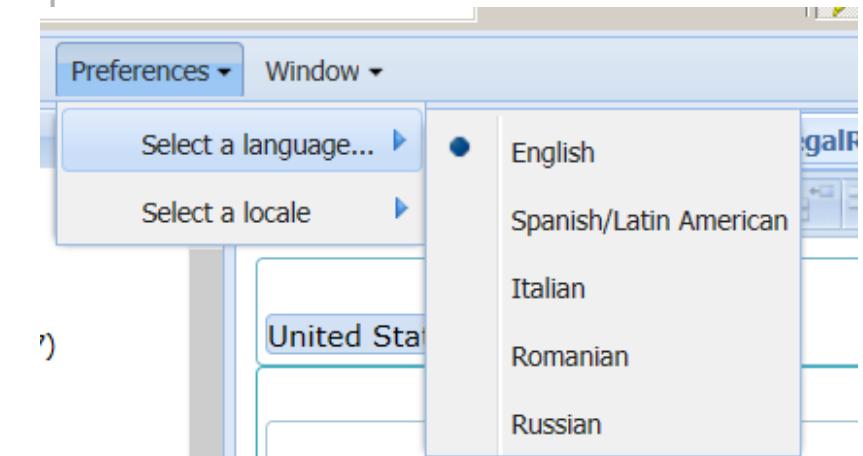
Intervals definition in Akoma Ntoso in the metadata block

```
<temporalData  
source="#palmirani">  
  <temporalGroup id="t5">  
    <timeInterval  
      refersTo="#inforce" start="e6"/>  
      <timeInterval  
        refersTo="#efficacy" start="e6"/>  
    </temporalGroup>  
  </temporalData>
```

Intervals definition in LegalRuleML

```
<lrm:TemporalCharacteristics  
key="tblock1">  
  <lrm:TemporalCharacteristic  
key="e2-e">  
    <lrm:forRuleStatus  
iri="&lrmv;#Efficacious"/>  
    <lrm:hasStatusDevelopment  
iri="&lrmv;#Ends"/>  
    <lrm:atTimeInstant  
keyref="#t6"/>  
  </lrm:TemporalCharacteristic>  
</lrm:TemporalCharacteristics>
```

Basic Functionalities



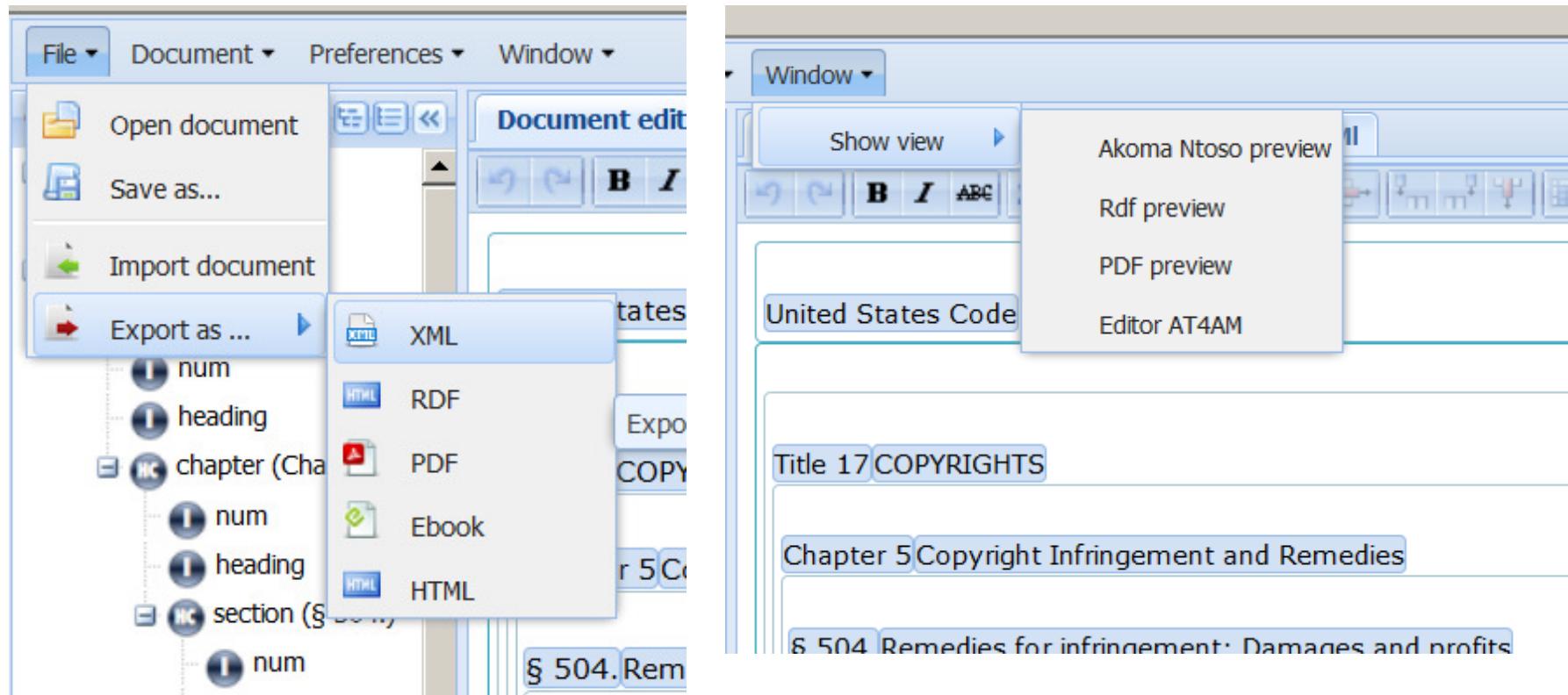
- Multilingual interface and parser

- Parser of the text

- Structure
 - Normative references
 - Dates

- Contextual interface based on the legal tradition

Export formats and View



- Multiple export formats of the documents and rules

Copyright law: copyright infringement

- US “Digital Millenium Act” and modifications
- goal: in t_x calculate the proper *statutory damage* in case of violation of the copyright taking in consideration all the exceptions and the modifications respect an fact.

17 USC Sec. 504

Remedies for infringement: Damages and profits

**three
versions**

Enter in force of the norm	Interval of efficacy of the norm	Statutory Damages
Oct. 19, 1976	[1976-10-19, March 1, 1989 [\$250 <= statutoryDamages <= \$10,000
Oct. 31, 1988	[March 1, 1989, Dec. 9, 1999 [\$500 <= statutoryDamages <= \$20,000
Dec. 9, 1999	[Dec. 9, 1999, ∞	\$750 <= statutoryDamages <= \$30,000

Version 1

- (c) **Statutory Damages**. -
 - (1) Except as provided by clause (2) of this subsection, the **copyright owner** may elect, at any time before final judgment is rendered, to
 - R1 recover, instead of actual damages and profits, an award of **statutory damages** for all infringements involved in the action, with respect to any one work, for which any **one infringer** is liable individually, or for which any two or more infringers are liable jointly and severally, in a **sum of not less than \$250 or more than \$10,000** as the court considers just. For the purposes of this subsection, all the parts of a compilation or derivative work constitute one work.
 - R2 (2) In a case where the **copyright owner sustains the burden of proving**, and the court finds, that **infringement was committed willfully**, the court in its discretion may **increase** the award of statutory damages to a sum of not more than **\$50,000**. In a case where the **infringer sustains the burden of proving**, and the court finds, that such infringer was not aware and had no reason to believe that his or her acts constituted an infringement of copyright, the court in its discretion may **reduce** the **award of statutory damages to a sum of not less than \$100**.
- <http://www.law.cornell.edu/uscode/text/17/504>

Version 1
[Jan. 1, 1978, March 1, 1989 [

(c) Statutory Damages. -

The copyright owner may elect an award of statutory damages for infringements in a sum of not less than **\$250** or more than **\$10,000** as the court considers just.

Version 2
[March 1, 1989, Dec. 9, 1999 [

(c) Statutory Damages. -

The copyright owner may elect an award of statutory damages for infringements in a sum of not less than **\$500** or more than **\$20,000** as the court considers just.

Version 3
[Dec. 9, 1999, ∞

(c) Statutory Damages. -

The copyright owner may elect an award of statutory damages for infringements in a sum of not less than **\$750** or more than **\$30,000** as the court considers just.

Rules

- **R1:** if (X is a copyright owner and Y is a copyright infringer and X claims the statutory damages) than (Y pay a statutory damages - fee)
Penalty1(min **\$250**- max **\$10,000**)
- **R2:** if (X copyright owner sustains the burden of proving and Y infringes copyright **willfully**) than (Y pay a statutory damages)
Penalty2(Y pay a min **\$250** - max **\$50,000**)
- **R3:** if (Y copyright infringement sustains the burden of proving and Y infringes copyright NOT **willfully**) than (Y pay a statutory damages)
Penalty3(Y pay a min **\$100** – max **\$10,000**)
- **Reparation1:** R1, **Penalty1**
- **Reparation2:** R2, **Penalty2**
- **Reparation3:** R3, **Penalty3**
- **Defeasability:** R3>R2>R1
- Fact (t_k ; burden of proving [null,0,1]; willfully [null, 0, 1]; idwork; Y)

Editor and RuleViewer

- Editor <http://sinatra.cirsfid.unibo.it/rawe/>
- RuleViewer <http://sinatra.cirsfid.unibo.it/ruleviewer/>

Creation of a rule

Panel of rules

The screenshot shows the Rawe - Rules Viewer application running in Mozilla Firefox. The main window displays a document structure with sections like 'preface', 'body', 'title (Title 17)', 'chapter (Chapter 5)', and 'section (§ 504.)'. The 'Document editor' tab is active, showing text from a legal document about statutory damages. The 'Rules' panel on the right is highlighted with a red box. It shows the configuration of a new rule:

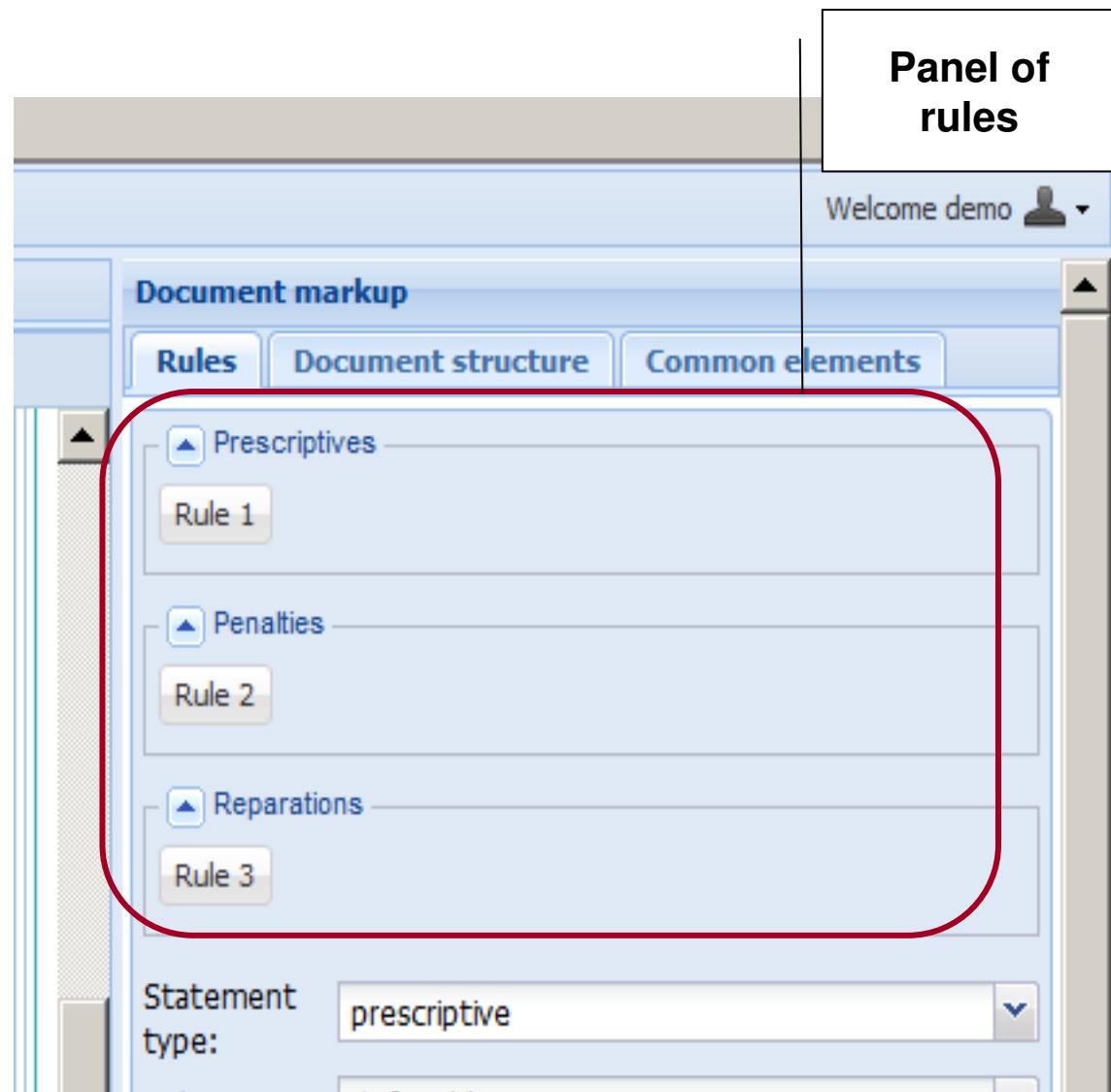
- Statement type:** prescriptive
- Rule type:** defeasible
- Overrides:** (empty)
- If:** (empty)
- Operator AND:**
 - Atom:** Deontic 1
 - Type:** And
 - Deontic operator:** obligation
 - Rel 1:** owner
 - Var 1:** X
 - Var 2:** Y
 - Ind 1:** (empty)
 - Atom 2:** (empty)

The status bar at the bottom shows the path: act > body > title (Title 17) > chapter (Chapter 5) > section (§ 504.) > clause. The system tray indicates the time is 20:54 on 12/07/2013.



- Type of statement
- Type of deontic op.
- Type of strength
- Operators:and/or/not
- Atom:Rel,Var,Ind

Type of statements



Reparation composition

1

Rules	Reparation
Penalties Rule #pen2	
Prescriptives Rule #ps1	

Apply

2

Rules	Reparation
Penalties Rule #pen2	
Prescriptives Rule #ps1	

Apply

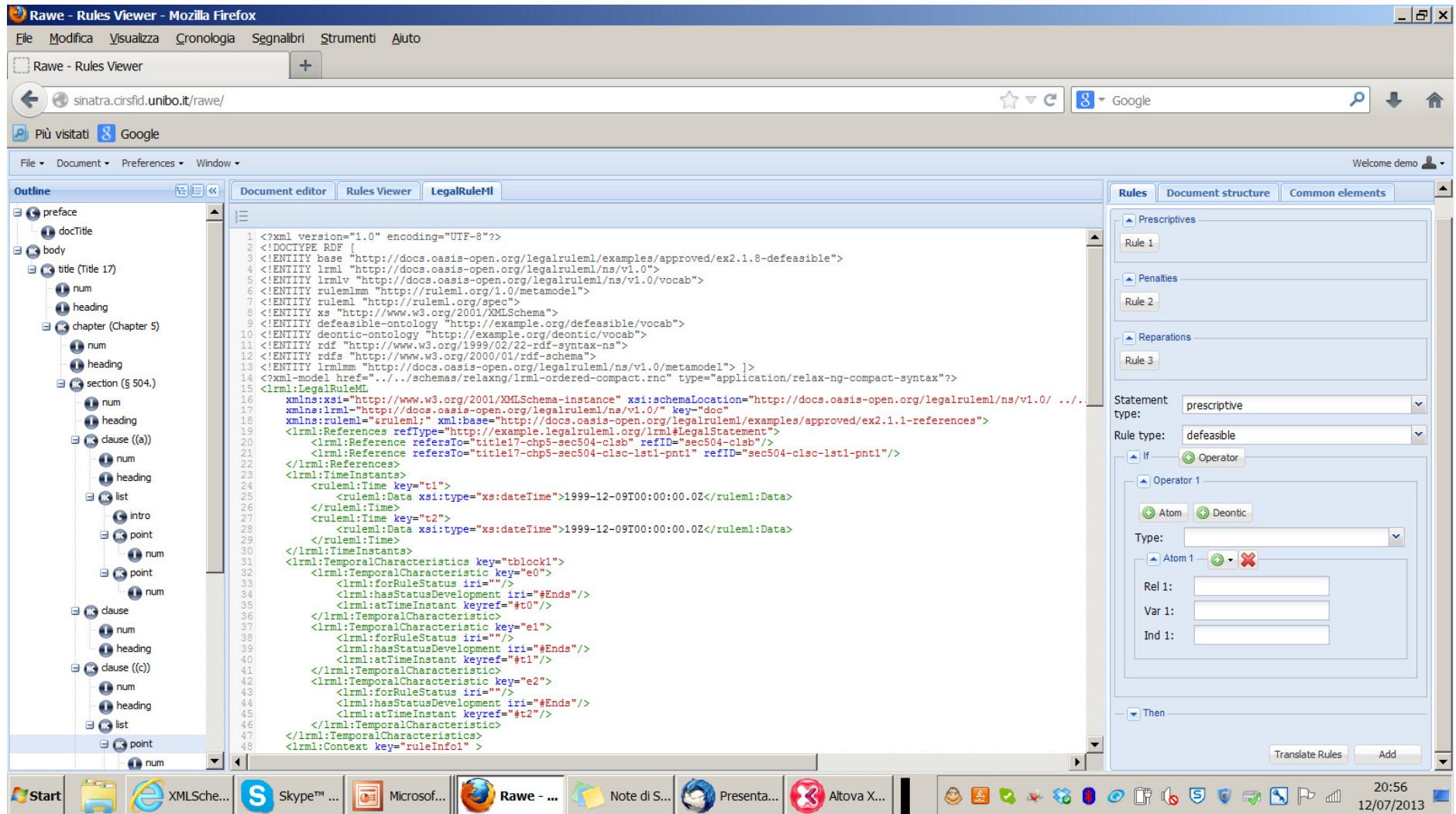
3

Rules	Reparation
Penalties Rule #pen2	Rule #pen2
Prescriptives Rule #ps1	Rule #ps1

Apply

- Composition of a reparation as association of prescriptive rules and penalty

LegalRuleML conversion



RDF

File ▾ Document ▾ Preferences ▾ Window ▾

Outline Document editor Rules Viewer LegalRuleML Rdf preview

RDF conversion

Statement type: prescriptive
Rule type: defeasible
If Operator
Atom Deontic
Type:
Atom 1
Rel 1:
Var 1:
Ind 1:
Then

```
<?xml version="1.0"?>
<!DOCTYPE RDF [
  !ENTITY base "http://docs.oasis-open.org/legalruleml/examples/approved/ex2.1.8-defeasible";
  !ENTITY lrmlmm "http://docs.oasis-open.org/legalruleml/ns/v1.0";
  !ENTITY lrmlmv "http://docs.oasis-open.org/legalruleml/ns/v1.0/metamodel";
  !ENTITY rulelmm "http://ruleml.org/1.0/metamodel";
  !ENTITY ruleml "http://ruleml.org/spec";
  !ENTITY xs "http://www.w3.org/2001/XMLSchema";
  !ENTITY defeasible-ontology "http://example.org/defeasible/vocab";
  !ENTITY deontic-ontology "http://example.org/deontic/vocab";
  !ENTITY rdf "http://www.w3.org/1999/02/22-rdf-syntax-ns";
  !ENTITY rdfs "http://www.w3.org/2000/01/rdf-schema";
]>
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:rulelmm="http://ruleml.org/1.0/metamodel#"
  xmlns:lrmlmm="http://docs.oasis-open.org/legalruleml/ns/v1.0/metamodel#" xml:base="http://docs.oasis-open.org/legalruleml/ns/v1.0">
  <rdf:Description rdf:about="www.example.2.1.1.xml#rule1">
    <lrmlmm:appliesTemporalCharacteristics
      xmlns:lrmlmm="http://docs.oasis-open.org/legalruleml/ns/v1.0/"
      xmlns:ruleml="&ruleml;">
      <lrmlmm:TemporalCharacteristic rdf:about="tblock1">
        <lrmlmm:TemporalCharacteristic rdf:about="e0">
          <lrmlmm:forRuleStatus rdf:resource="" />
          <lrmlmm:hasStatusDevelopment rdf:about="#Ends" />
          <lrmlmm:atTimeInstant rdf:resource="#t0" />
        </lrmlmm:TemporalCharacteristic>
        <lrmlmm:TemporalCharacteristic rdf:about="e1">
          <lrmlmm:forRuleStatus rdf:resource="" />
          <lrmlmm:hasStatusDevelopment rdf:about="#Ends" />
          <lrmlmm:atTimeInstant>
            <ruleml:Time rdf:about="t1">
              <ruleml:Data xsi:type="xs:dateTime">1999-12-09T00:00:00.0Z</ruleml:Data>
            </ruleml:Time>
          </lrmlmm:atTimeInstant>
        </lrmlmm:TemporalCharacteristic>
        <lrmlmm:TemporalCharacteristic rdf:about="e2">
          <lrmlmm:forRuleStatus rdf:resource="" />
          <lrmlmm:hasStatusDevelopment rdf:about="#Ends" />
          <lrmlmm:atTimeInstant>
            <ruleml:Time rdf:about="t2">
              <ruleml:Data xsi:type="xs:dateTime">1999-12-09T00:00:00.0Z</ruleml:Data>
            </ruleml:Time>
          </lrmlmm:atTimeInstant>
        </lrmlmm:TemporalCharacteristic>
      </lrmlmm:TemporalCharacteristic>
    </lrmlmm:appliesTemporalCharacteristics>
  </rdf:Description>

```

Conclusions

- We have demonstrated the possibility to integrate text, rule in the next step we want to integrate also ontologies
- Several issues need to be extended:
 - Granularity
 - Meta-rules
 - Extra-isomorphism rules
 - Ontology link and extra-metadata
 - Multiple interpretation by different authors
 - Validity of XML and RDF
 - Error-checking panel
 - Mark-up of the rules from txt sources
- Future works:
 - Translation of LegalRules in Drools Language, Carneades, SPINdle

Thank you for your attention!

monica.palmirani@unibo.it



The Language Independent
Markup Editor

I <http://lime.cirfid.unibo.it/>

<http://sinatra.cirfid.unibo.it/rawe/>

<http://sinatra.cirfid.unibo.it/ruleviewer/>

<https://tools.oasis-open.org/version-control/browse/wsvn/legalruleml/trunk/?rev=76&sc=1>

