
OASIS LegalRuleML

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OASIS  LegalXML

LegalRuleML TC



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Outline

- Introduction to LegalRuleML
 - Motivations, Goals, Principles
 - Design principles
 - LegalRuleML Syntax
- Meta-Model of LegalRuleML (Tara Athan)
- Use Case: “Section 29 Consumer Code of Australia” (Guido Governatori)
- Use Case: Patent Law (Adrian Paschke)

Motivations

- **Legal texts** are the privileged sources for norms, guidelines and rules that often feed different concrete Web applications.
 - **Legislative documents, Contracts, Judgements**
 - **Guidelines** (Soft Law) in eGovernment, eJustice, eLegislation, eHealth, banks, assurances, credit card organizations, Cloud Computing, eCommerce, aviation and security domain etc.
- The ability to have proper and expressive conceptual, machine readable models of the various and multifaceted aspects of norms, guidelines, and general legal knowledge is a key factor for the development and deployment of successful applications.

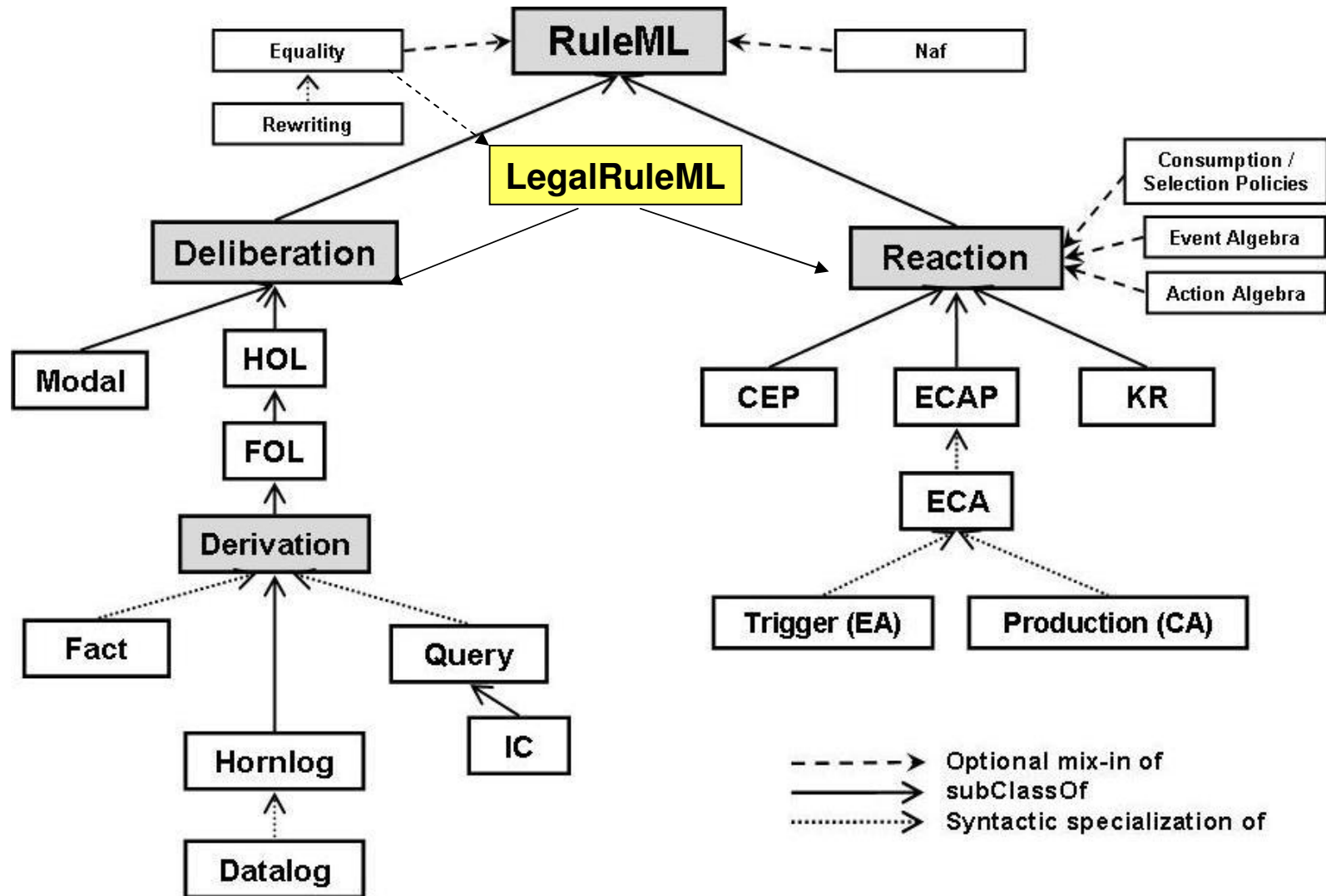
Goal

- The LegalRuleML TC, set up inside of OASIS at Jan 12, 2012 (www.oasis-open.org) with 25 members, aims to produce a rule language for the legal domain:
 - Based on the legal sources (text, pictures, etc.) of norms
 - Oriented to legal people
 - Compact in the syntax annotation
 - Neutral respect any logic
 - Flexible and extensible

State of the art and background

- RuleML
 - RuleML doesn't manage temporal metadata, penalty-reparation, temporal defeasibility
- LKIF-rule [Gordon 2008]
 - LKIF-rule doesn't implement the temporal metadata, specific deontic operators, temporal defeasibility, penalty-reparations
- RIF
 - RIF does not provide direct support for adequate representation of legal rules and legal reasoning. The current RIF dialects are not expressive enough, since they do not support e.g. logic-based negation, non-monotonic reasoning, events and temporal metadata etc.

RuleML Family of Sublanguages



Requirements

- Support for modelling different types of rules:
 - Constitutive rules (e.g. definitions)
 - Prescriptive rules (e.g. obligation, permission, etc.)
 - Other type of statements:
 - Penalty
 - Reparation
 - Override
 - Facts
- Implement isomorphism [Bench-Capon and Coenen, 1992]
- Implement defeasibility [Gordon, 1995, Prakken and Sartor, 1996, Sartor, 2005]
- Model legal procedural rules

Design Principles (1/2)

Multiple Semantic Annotations:

- ❑ A legal rule may have multiple semantic annotations where each annotation can represent a different legal interpretation.
- ❑ Each such annotation can appear in a separate annotation block as internal or external metadata.

Tracking the LegalRuleML Creators:

- ❑ As part of the provenance information, a LegalRuleML document or any of its fragments can be associated with its creators.

Linking Rules and Provisions:

- LegalRuleML includes a mechanism, based on IRI, that allows N:M relationships among the rules and the textual provisions
 - avoiding redundancy in the IRI definition and errors in the associations
 - LegalRuleML is independent respect any Legal Document XML standard, IRI naming convention

Design Principles (2/2)

Temporal Management:

- Provisions, references, rules, applications of rules and physical entities change in time, and their histories interact in complicated ways. LegalRuleML must represent these temporal issues in unambiguous fashion

Formal Ontology Reference:

- LegalRuleML is independent from any legal ontology and logic framework. It includes a mechanism, based on IRIs, for pointing to reusable classes of a specified external ontology.

LegalRuleML is based on RuleML:

- LegalRuleML reuses and extends concepts and syntax of RuleML wherever possible, and also adds novel annotations. RuleML includes also Reaction RuleML.

Mapping:

- Investigate the mapping of LegalRuleML metadata to RDF triples for favouring Linked Data reuse.

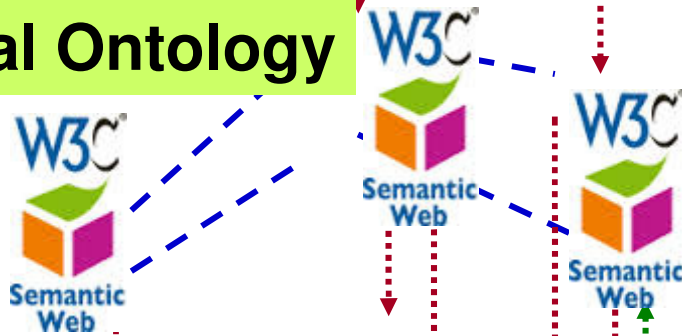
Open Document, Open Rules, Open Data

Legal document in XML

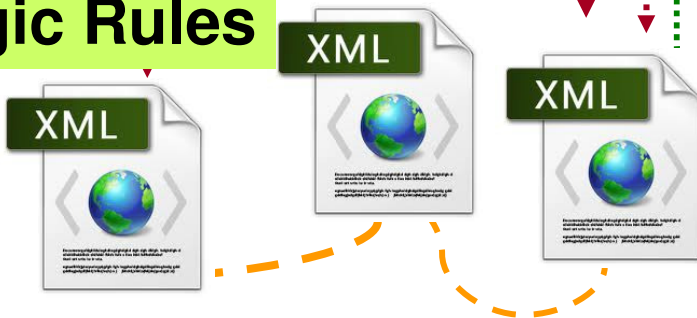


*Combine rules with other dataset
Interoperability and interchange
Retrieve rules and documents*

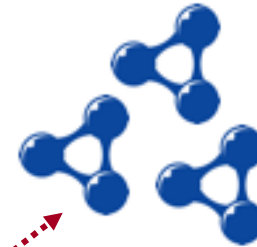
Legal Ontology



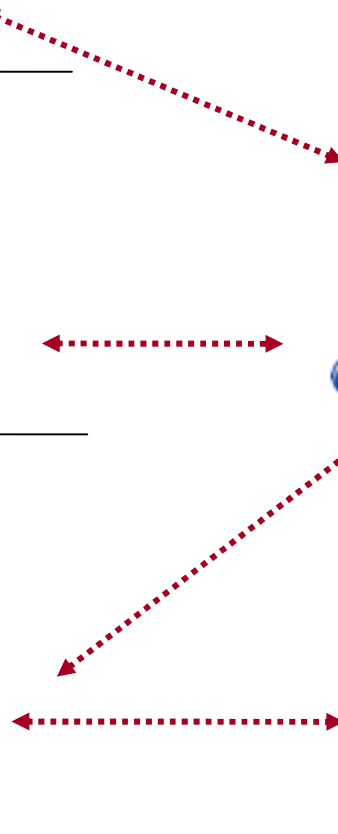
Logic Rules



Linked Open Data



ENGINE



LegalRulML Approach

Metadata of Context

112 STAT. 2860 PUBLIC LAW 105-304—OCT. 28, 1998

112 STAT. 2860 PUBLIC LAW 105-304— **2013**

**Digital Millennium Copyright Act
NEW VERSION**

Public Law 105-304
105th Congress

An Act

Oct. 28, 1998 To amend the Orga. [H.R. 2281] for of

Digital Millennium Copyright Act. 17 USC 101 note.

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
Sec. 501. Short title.
Sec. 502. Protection of certain original designs.
Sec. 503. Conforming amendments.
Sec. 504. Joint study of the effect of this title.
Sec. 505. Effective date.

Rules as interpretation of the text

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

Metadata of Context

Metadata of Context

Metadata of Context

```
<lrml:Penalty key="rule2-v1">  
  <lrml:if> ...</lrml:if>  
  
  ....  
  <lrml:then>...  
</lrml:then>  
</lrml:Penalty>...
```

Metadata of Context T2

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

Outcome of the LegalRuleML TC

- Two formats: compact and normal

- XSD

- RelaxNG

- Metamodel in RDFs

- Example

- Glossary

- Documentation

<http://sinatra.cirsfid.unibo.it/XSDDocViewer/>

LegalRuleML main blocks

Metadata

Legal Sources

References

Agents

Authority

Time Instants

Temporal Characteristics

Jurisdiction

Role

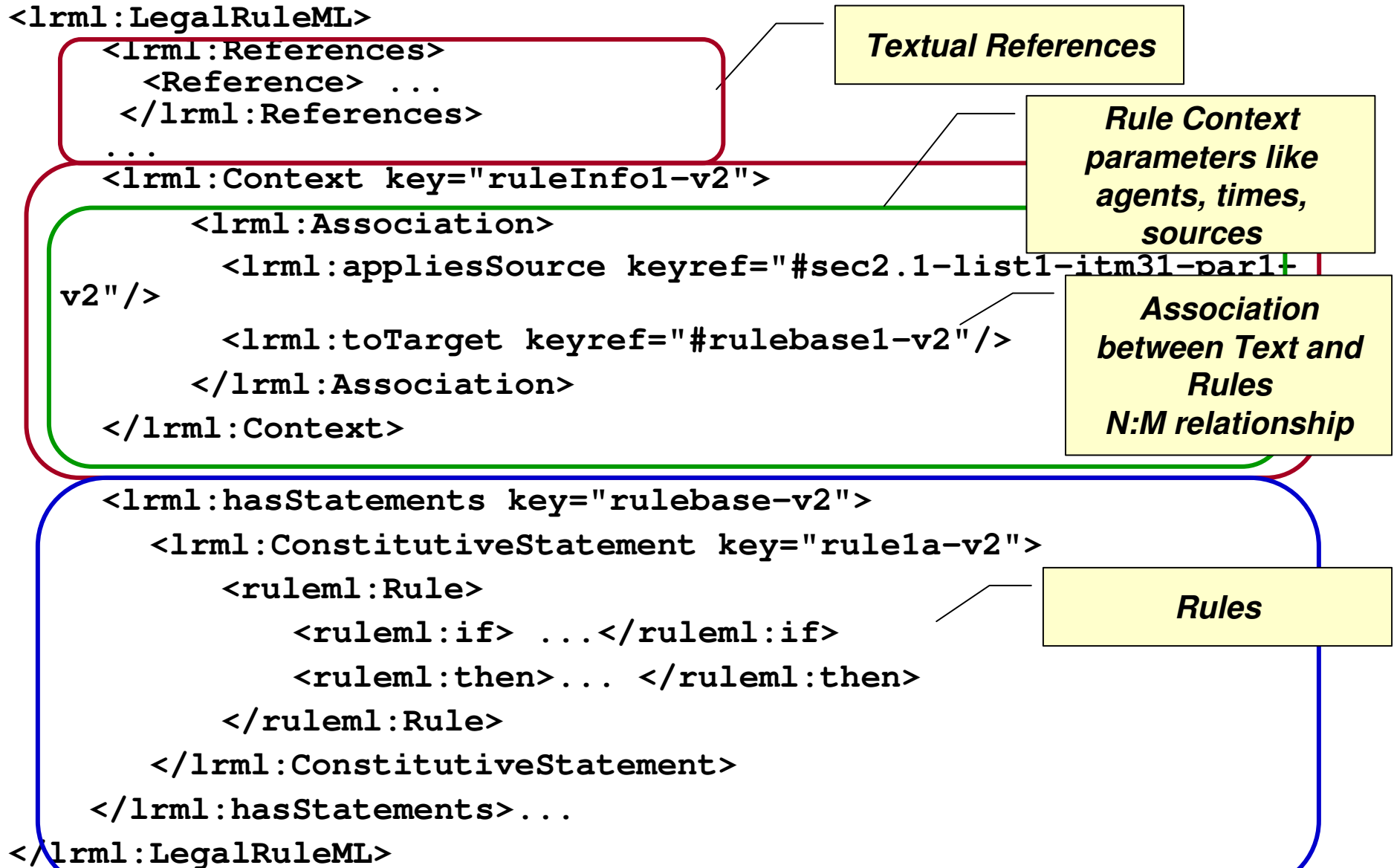
Context

Context different author

Context different time and jurisdiction
association of metadata with rules

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

Document Structure: Metadata, Contexts, Rulebases



Normal and Compact version

- Meta-model is built on the RDF principles
- Nodes and Edges define the relationships among <subject, predicate, object>

<lrml:hasStatement>

NORMAL

<lrml:ConstitutiveStatement key="cs1">

<lrml:hasTemplate>

<ruleml:Rule key=":ruletemplate1" closure="universal">

<lrml:ConstitutiveStatement key="cs1">

COMPACT

<ruleml:Rule key=":ruletemplate1" closure="universal">

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Metadata

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Temporal Characteristics

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Role

Context

association of metadata with rules

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

Legal Statements and References (2/2)

```
<lrml:LegalSources>
```

URI

```
<lrml:LegalSource key="ref1"
```

```
  sameAs="http://www.law.cornell.edu/uscode/text/17/504#psection-1"/>
```

```
</lrml:LegalSources>
```

```
<lrml:References>
```

Non-URI

```
<lrml:Reference refersTo="ref2"
```

```
  refID="/us/USCode/eng@/main#title17-sec504-clsc-pnt1" refIDSystemName="AkomaNtoso2.0-2012-10"/>
```

```
</lrml:References>
```

Agents and Authorities

```
<lrml:Agents>
```

```
<lrml:Agent key="aut1"
```

```
sameAs="&unibo;/person.owl#m.palmirani"/>
```

```
<lrml:Agent key="aut2"
```

```
sameAs="&unibo;/person.owl#g.governatori"/>
```

```
</lrml:Agents>
```

Agent - an entity that acts or has the capability to act.

```
<lrml:Authorities>
```

```
<lrml:Authority key="congress"
```

```
sameAs="&unibo;/org.owl#congress">
```

```
<lrml:type iri="&lrmlv;Legislature"/>
```

```
</lrml:Authority>
```

Authority - any body with the power to create, endorse, or enforce legal norms.

Temporal Events and Temporal Situations

```
<lrml:TimeInstants>
```

```
  <ruleml:Time key="#t1">
```

```
    <ruleml:Data xsi:type="xs:date">1978-01-01</ruleml:Data>
```

```
  </ruleml:Time>
```

```
</lrml:TimeInstants>
```

*Event that define the
validity of the rules*

```
<lrml:TemporalCharacteristic key="tblock1">
```

```
  <lrml:forRuleStatus iri="&lrmlv;#Efficacious"/>
```

```
  <lrml:hasStatusDevelopment iri="&lrmlv;#Starts"/>
```

```
  <lrml:atTimeInstant keyref="#t1"/>
```

```
  <lrml:hasStatusDevelopment iri="&lrmlv;#End"/>
```

```
  <lrml:atTimeInstant keyref="#t2"/>
```

```
</lrml:TemporalCharacteristic>
```

*Type of event:
In force
Efficacy*

LegalRuleML main blocks

Metadata

- Legal Sources
- References
- Agents
- Authority
- Time Instants
- Temporal Characteristics
- Jurisdiction
- Role

Context

association of metadata with rules

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

Association Structure

```
<lrml:Association>  
  <lrml:appliesSource keyref="#ref1"/>  
  <lrml:toTarget keyref="#rule1"/>  
  <lrml:toTarget keyref="#atom2"/>  
  <lrml:toTarget keyref="#body3"/>  
  <lrml:toTarget keyref="#head4"/>  
</lrml:Association>
```

- The `Association` construct implements the association between metadata and rules
- N-arity relationship without redundancy
- Fine granularity

applies relationship: Jurisdiction and Role

```
<lrml:Association>
```

```
<lrml:appliesJurisdiction keyref="&jurisdictions;us"/>
```

```
<lrml:appliesRole>
```

```
<lrml:Role iri="&lrmlv;#Author">
```

```
<lrml:filledBy keyref="#aut1"/>
```

```
</lrml:Role>
```

```
</lrml:appliesRole>
```

```
<lrml:toTarget keyref="#rule1"/>
```

```
</lrml:Association>
```

Context

```
<lrml:Context key="ruleInfo1" hasCreationDate="#t8">
  <lrml:appliesTemporalCharacteristics
    keyref="#tblock1"/>
  <lrml:appliesStrength iri="&lrmlv;defeasible"/>
  <lrml:appliesRole>
    <lrml:Role iri="&lrmlv;#Author">
      <lrml:filledBy keyref="#aut1"/>
    </lrml:Role>
  </lrml:appliesRole>
  <lrml:appliesAuthority keyref="#congress"/>
  <lrml:appliesJurisdiction keyref="&jurisdictions;us"/>
  <lrml:appliesSource keyref="#sec504-clsc-pnt1"/>
  <lrml:toStatement keyref="#rule1"/>
</lrml:Context>
```


LegalRuleML main blocks

Metadata

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Temporal Characteristics

Jurisdiction

Role

Context

association of metadata with rules

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

Deontic operators

- Obligation, Right, Permission, Prohibition, etc.

<lrml:Prohibition key="prh2">

<lrml:Obligation key="ob1">

<lrml:Permission key="per1">

<lrml:Right key="rgh1">

<lrml:Compliance key="cmp1">

<lrml:Violation key="vlt1">

- Penalty, Reparation, Behaviors

Deontic operators

<lrml:Right>

<ruleml:slot>

Bearer - an entity that to which the deontic specification is primarily directed.

<lrml:Bearer iri="&deontic-ontology;#oblbsub1"/>

<ruleml:Var>X</ruleml:Ind>

</ruleml:slot>

<ruleml:slot>

AuxiliaryParty - a entity in addition to the bearer of a deontic specification.

<lrml:AuxiliaryParty iri="&deontic-ontology;#oblAdd1"/>

<ruleml:Var>Y</ruleml:Ind>

</ruleml:slot>

<ruleml:Atom>

<ruleml:Rel iri="#copyright"/>

<ruleml:Var>X</ruleml:Var>

<ruleml:Var>book</ruleml:Ind>

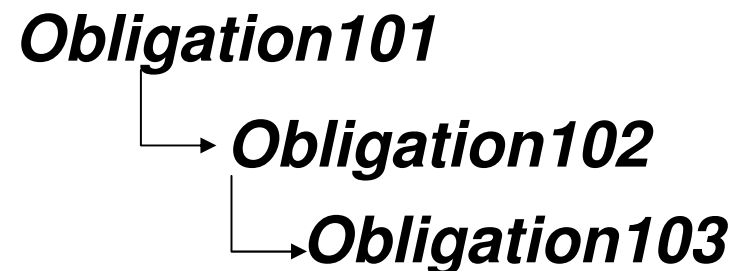
</ruleml:Atom>

</lrml:Right>

Penalty

Set of obligations/rights

```
<lrml:PenaltyStatement key="pen1">  
  <lrml:SuborderList key="behav1">  
    <lrml:Obligation key="oblig101">  
  </lrml:Obligation>  
    <lrml:Obligation key="oblig102">.....  
  </lrml:Obligation> ( $\neg A \Rightarrow B$ )  
    <lrml:Obligation key="oblig103">..... ( $\neg B \Rightarrow C$ )  
  </lrml:Obligation> ( $\neg C \Rightarrow D$ )  
  </lrml:SuborderList>  
</lrml:PenaltyStatement>
```



Reparation



```
<lrml:ReparationStatement key="rep1">-  
  <lrml:Reparation key="assoc1">  
    <lrml:appliesPenalty keyref="#pen1"/>  
    <lrml:toPrescriptiveStatement keyref="#ps1"/>  
  </lrml:Reparation>  
</lrml:ReparationStatement>
```

Defeasibility

body always head	body \rightarrow head	<i>strict</i>
body sometimes head	body \Rightarrow head	<i>defeasible</i>
body not complement head	body $>$ head	<i>defeater</i>

$R2 > R1$

```
<lrml:OverridesStatement>  
  <lrml:Overrides under="#ps1" over="#ps2"/>  
</lrml:OverridesStatement>
```

Defeasibility qualification

1.1

in the Context block

```
<lrml:Context key="ruleInfo1">  
  <lrml:appliesStrength>  
    <lrml:Defeasible/>  
  </lrml:appliesStrength>  
  <lrml:toStatement keyref="#cs1"/>  
</lrml:Context>
```

1.2

```
<lrml:appliesStrength  
  iri="&defeasible-  
ontology;#defeasible"/>
```

2

inline in the Rule


```
<lrml:hasStrength>  
  <lrml:Defeasible key="str1" iri="&defeasible-ontology;#defeasible1"/>  
</lrml:hasStrength>
```

Facts

```
<lrml:hasStatement>  
  <lrml:FactualStatement key="fact1">  
    <lrml:hasTemplate>  
      <ruleml:Atom key=":atom1 1">  
        <ruleml:Rel iri="#rel5"/>  
        <ruleml:Ind iri="#JohnDoe"/>  
      </ruleml:Atom>  
    </lrml:hasTemplate>  
  </lrml:FactualStatement>  
</lrml:hasStatement>
```


Where to find material of the tutorial

- Examples SVN: <https://tools.oasis-open.org/version-control/browse/wsvn/legalruleml/trunk/?rev=77&sc=1>
- Documentation of the LegalRuleML TC: https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=legalruleml
- Irml navigable technical documentation: <http://sinatra.cirsfid.unibo.it/XSDocViewer/>



Thank you for your attention!
and joint to LegalRuleML TC
Questions?

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