

Temporal Dimensions in Rules Modelling

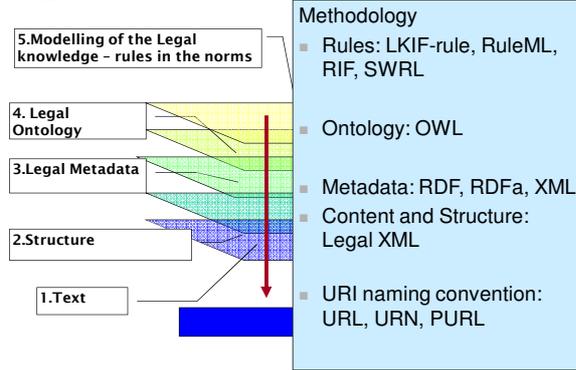
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Aim

- extend LKIF-rules with the temporal dimension with the aim of fulfilling the requirements to be expressive, concise, not redundant, detecting times at rules level and at sentences level, to have versioning of rules and finally to satisfy the isomorphism principle.

Separation of document levels in SW



Some Highlights

- a) existing rule XML standards allow the definition of temporal predicates, but they do not have a temporal model natively embedded.
- b) often the temporal model, mostly based on events, is not specific for the legal domain, where at least three axes are required: time of in force, time of efficacy and time of application of the norms
- c) the temporal model proposed in this work allows to make assertions related to each part of the rule: antecedent, consequent, entire rule. This granularity means better expressiveness, compactness and performance;
- e) the proposed model is designed for reducing the redundancy of references to textual sources, definitions of temporal events and intervals, and connections with the ontology concepts (TBox).

The temporal model

- We use a temporal model based on three axes: **enter into force, efficacy, applicability**
- $r:(\alpha \text{ at } t_1 \rightarrow \beta \text{ at } t_2) \text{ at } t_3$
- The times labelling the antecedent of a rule, the consequent of the rule and the overall rule are interpreted respectively as the time of *efficacy*, *applicability* and *time of force of the represented provision*.
- *Time of efficacy* = period of the referents of a disposition.
- *Time of applicability* = period during which the intended effect of the disposition is applied.
- *Time of force* = period during which a disposition belongs to the normative system.

Temporal dimension elements (1/3)

- We modified LKIF. 3 elements are added: a block meta that includes sub-blocks sources, events, and timeInfo.
- The block **sources** defines the link between the rules and a textual fragment using URI.
- In the following example the sentence S1 is referred to the fragment in the text section 25, subsection1, point a) of the Terrorism Act, 2006 of UK:
- `<source element="s1" uri="http://act/11/2006#sec25_1_a"/>`

Temporal dimension elements (2/3)

- The block **events** tracks all the temporal events involved in the rules: external and internal times.

```
<events>
<!-- events of the Order 2007 UK-->
<event id="e1" element="2007-07-25T01:01:00.0Z"/>
<!-- Terrorism Act of 2006 -->
<event id="e2" element="2006-03-30T01:01:00.0Z"/>
<event id="e3" element="2006-07-17T01:01:00.0Z"/>
<event id="e4" element="2006-07-25T01:01:00.0Z"/>
</events>
```

Temporal dimension elements (3/3)

- The block **timesInfo** is a container of metadata concerning the temporal dimensions and assigns for each sub-block times the semantics of each interval or instant of time.

```
<timesInfo>
<!-- Order 2007 UK-->
<times id="t1">
  <time start="#e1" timeType="efficacy"/>
  <time start="#e1" timeType="inforce"/>
</times>
</timesInfo>
```

Duration

- It is possible to model well defined intervals using the attributes start and end, or to define a simple instant setting start equal to end and finally to use the undefined interval expressed by a duration. In the following example time t2 is the application date of a rule and the interval is defined with a starting date (event e1) and with a duration2.

```
<times id="t2">
<time start="#e1" duration="P01Y"
  timeType="application"/>
</times>
```

Timetype and URI

- In this way we define the events in the metadata and we assign the semantics and the behavior of these events in the timesInfo block.
- With the mechanism of the ID (using URI for permitting an externalization of these metadata in other physical files) we connect the temporal dimension information directly with rule, head and sentence elements.

Temporal Dimension in Rule Modelling

- The timeBlock attribute embedded into sentences: `<s timeBlock="t1">` defines the "enter into force" and the "efficacy" temporal parameters of either the textual provisions or the conditions.
- The timeBlock of the rule `<rule timeBlock="t2">` indicates when the rule is valid.
- Finally the timeBlock of the head `<head timeBlock="t2">` determines when the consequent is applicable.

Example 1

```
<rule id="order2007" ruleType="strict" timesBlock="t2">
  <!-- Disapplication sect. 25 of the Terrorism act 2006 -->
  <head timesBlock="t2">
    <s pred="mod:suspension" id="id1a">
      <v value="sec25_2006">x</v>is suspended</s>
    </head>
  <body>
    <s pred="mod:enterInForce" id="id3b"
      timesBlock="t1">
      <v id="sec2_2007">x</v> enters into in force</s>
    </body>
</rule>
```

Example 2

```
<rule id="sec25_2006" ruleType="strict" timesBlock="t3">
<!--Sect.25 Terr. Act/2006 modifies Sch.8 Terr. Act/2000 -->

<head timesBlock="t3">
  <s pred="mod:substituted" id="id4a">
    <v value="sche8_2000">x</v> is modified as if for "28
      days"there were substituted "14 days"</s>
  </head>
<body>
  <s pred="mod:intoOperation" id="id4b" timesBlock="t3"><v
    value="sec25_2006">y</v> into operation.</s>
</body>
</rule>
```

Conclusions

- Still some gaps between the five levels of information that we need to model for describing a legal document especially in the management of the time
- the relationship between rules and text exhibits an N:M cardinality, so the LKIF- rules syntax was improved in the sources metadata blocks
- the interaction between text, rules and concepts concerning the temporal dimension are mediated by the usage of an ontology about legal temporal definitions. This mechanism permits each legal system to define its appropriate set of temporal dimensions
- legal documents change over the time so in the LKIF-rule a mechanism for managing the dynamicity over the time as well as into rules in a separate level is necessary.
- Our future work will go in the direction to use non-monotonic logic and the temporal arguments for managing retroactive rules, rules conditioned by undefined events, modifications *ex-tunc* and *temporal modifications* (suspension, inapplicability, annulment) fostering those information and using a reasoner engine.

Thank you for your attention!

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Giuseppe Contissa

Conclusions 2 (old)

- Manage **text, metadata, ontology and rules** updated and consistent
- Temporal model** is necessary as native instrument into the rule standard (RuleML?) for favouring:
 - Expressiveness & Granularity
 - Performance (vs. predicate on time)
 - Elegance & Readiness
- Event, interval, duration, **undefined event, concurrent events**
 - (rules on the time definition - metarules)
- Semantic of the legal events:**
 - in force, efficacy, application, validity, etc.
- Type of events:**
 - internal of the legal system – new regulation
 - external of the legal system – enter into European Community
- Granularity:**
 - Body, header, atoms

Connection within the Rule and the Legal Ontology level

```
<s pred="savings paying_agent">
  <v>X</v> shall communicate the information concerning the
  payment to Revenue Agency under 1-1b
</s>
```



LKIF-CORE instance

Link between rule and XML text

```
<?xml version="1.0" encoding="utf-8"?>
<?oxygen RNGSchema="LKIF2.rnc" type="compact"?>
<?xml-stylesheet type="text/css" href="LKIF2.css"?>
<lkif xmlns:savings="savingsTax_ita.owl">
  <sources>
    <source element="#ita_savings" uri="/it/act/2005-04-18/84/eng@/main.xml"/>
    <source element="#s1_ita" uri="/it/act/2005-04-18/84/eng@/main.xml#art1"/>
    <source element="#s1_1a_ita" uri="/it/act/2005-04-18/84/eng@/main.xml#art1-com1"/>
    <source element="#s1_1a_01_ita" uri="/it/act/2005-04-18/84/eng@/main.xml#art1-com1"/>
    <source element="#s1_1a_02_ita" uri="/it/act/2005-04-18/84/eng@/main.xml#art1-com1"/>
    <source element="#s1_1a_03_ita" uri="/it/act/2005-04-18/84/eng@/main.xml#art1-com1"/>
  </sources>
```

Art. 1.
Subjects held to the communication

1. Banks, investment firms, Poste italiane S.p.a., security investment fund management companies, financial companies and trust companies, resident in Italy, shall communicate to the Revenue Agency the information concerning the said interest or the interest, for which the immediate payment is secured for the immediate benefit of individuals, that are beneficial owners, resident in another Member State; for this purpose the individuals shall be considered beneficial owners of interest if they received the payment as final recipient. The above mentioned communication shall, also, be made by any other subject, also individuals, resident in the State, who, for professional or commercial purposes, pay or secure the payment of interest to individuals referred to in the first period. The same obligations shall be applied to the permanent organizations in Italy of non-residents.

Temporal model in XML text

- Time of in force, efficacy, application
- Lifecycle of the document over the time
- Point-in-time – Consolidation
[Tim Arnold-Moore ICAIL-1997]
- Temporal query:
 - the version chain of a cert legal resource (*horizontal*)
 - the whole legal system fixed in a due time (*vertical*)
 - the legal system fixed in a cert time y with the perspective of the observer fixed in a cert time x
 - **relationships between document and rules in any version for any granularity (n:m relationship)**

Temporal model in LKIF-Rule

```

<events>
  <event id="e1" element="2003-01-01T01:01:00.0Z"/>
  <event id="e2" element="2005-12-01T01:01:00.0Z"/>
  <event id="e3" element="2007-12-01T01:01:00.0Z"/>
</events>

<timesInfo>
  <times id="t1">
    <time start="#e1" timeType="inforce"/>
  </times>
  <times id="t2">
    <time start="#e2" duration="P06Y" timeType="application"/>
  </times>
  <times id="t3">
    <time start="#e2" duration="P06Y" timeType="efficacy"/>
    <time start="#e3" timeType="inforce"/>
  </times>
</timesInfo>
    
```

JURIX 2010, Palmirani, Governatori, Contissa

Temporal model in LKIF-Rule

```

<rules>
  <rule id="a-ita" timesBlock="t2">
    <head timesBlock="t3">
      <s id="s1">shall-communicate-the
concerning-the-payment-to-Revenue-Agen
transposition of the EU
directive
    </s>
    </head>
    <body timesBlock="t1">
      <and assumable="true">
        <s id="s2">subject-listed-in-1-1 ?x </s>
        <s id="s3">resident-in-italy ?x </s>
        <s id="s4"> pays-or-secures-interest ?x ?y </s>
        <s id="s5">individual ?y </s>
        <s id="s6">beneficial-owner ?y </s>
        <s id="s7" timesBlock="t3">resident-in-another-
member-state ?y </s>
        <s id="s8"> operates-as
to-pay
?x </s>
      </and>
    </body>
  </rule>
    
```

Application range – [2005, 2012] in Italy after the transposition of the EU directive

Enter inforce [2003, ∞ [

Enter inforce – [2007, ∞ [Retroactive effect

Relationship N:M between Text and Rules

The eXistrel

Simple search Search by date interval Search by date range

Results 1 to 10 out of 10

Country	Title	Type	Document number	Delivery date	Enter into force date	Publication date	Version	LKIF related documents
it	On taxation of savings income in the form of interest payments	act	2003-48-ce	2003-06-03	2003-07-11	2003-06-26	original	Show rules
it	On taxation of savings income in the form of interest payments	act	2003-48-ce	2003-06-03	2003-07-11	2003-06-26	2003-07-11	🔍
it	On taxation of savings income in the form of interest payments	act	2003-48-ce	2003-06-03	2003-07-11	2003-06-26	2004-05-21	🔍
it	On taxation of savings income in the form of interest payments	act	2003-48-ce	2003-06-03	2003-07-11	2003-06-26	2004-09-24	🔍