RuleML Intro Examples and More Syntax Details

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"The discount for a customer buying a product is **5.0 percent** if the customer is **premium** and the product is **regular**.

\[
\text{discount}(?\text{customer}, ?\text{product}, "5.0 \text{ percent}") \leftarrow \text{premium}(?\text{customer}) \land \text{regular}(?\text{product})
\]

**tup** is an ordered tuple.
Non-Positional RuleML Via the Name-Giving Metarole _r (I)

The minimal 'metarole' (_r) representation of the non-positional, RDF-like Jess fact

(automobile (make Ford) (model Explorer) (year 1999))

in RuleML 0.82 with user roles named (n) by XML attributes:

```xml
<fact>
  <_head>
    <atom>
      <_opr><rel>automobile</rel></_opr>
      <_r n="make"><ind>Ford</ind></_r>
      <_r n="model"><ind>Explorer</ind></_r>
      <_r n="year"><ind>1999</ind></_r>
    </atom>
  </_head>
</fact>
```
Non-Positional RuleML Via the Name-Giving Metarole \_r (II)

This 'non-positional RuleML' notation corresponds to the 'positionalized' ruleml-datalog notation

```xml
<fact>
  <_head>
    <atom>
      <_opr><rel>automobile</rel></_opr>
      <ind>Ford</ind>
      <ind>Explorer</ind>
      <ind>1999</ind>
    </atom>
  </_head>
</fact>
```

if the 'roles' of the **make**, **model**, and **year** positions are remembered somewhere else (signature declaration)
From Limited Natural Language to Horn Logic

English-subset Business Rules:

"The discount for a customer buying a product is 5.0 percent if the customer is premium and the product is regular."

"The discount for a customer buying a product is 7.5 percent if the customer is premium and the product is luxury."

Prolog-like formalization (syntax generated from XML):

discount(_customer, _product, 5.0 percent) :- premium(_customer), regular(_product).
discount(_customer, _product, 7.5 percent) :- premium(_customer), luxury(_product).
premium(_customer) :- spending(_customer, min 5000 euro, previous year).
luxury(Porsche).
regular(Honda).
spending(Peter Miller, min 5000 euro, previous year).
Structure of the RuleML DTD Hierarchy

- Our system of DTDs (current version: 0.8) uses a modularization approach similar to XHTML in order to accommodate the various rule subcommunities.
- The evolving hierarchy of RuleML DTDs forms a partial order with ruleml as the greatest element (a ruleml-rooted DAG) -- many ‘smallest’ elements.
- Each DTD node in the hierarchy (conformance “lattice”) corresponds to a specific RuleML sublanguage, syntactically and semantically:
  - ‘Union’ (join) of sublanguages reached via outgoing links: to smaller or equal nodes below
  - ‘Intersection’ (meet) of sublanguages via incoming links: from greater or equal nodes above
Each DTD/XSD is fairly short – a few pages -- e.g., Situated Courteous (from SweetRules v1)

```xml
<!-- SCLP RuleML DTD, Monolith Un commented version v13 of 2001-12 -->
<!ENTITY % URI "CDATA">
<!ENTITY % bool "yes|no"/>
<!ELEMENT rulebase ( (_rbaselab, (imp | fact | mutex | sens | effe)* ) | (imp | fact | mutex | sens | effe)+, _rbaselab?) >
<!ATTLIST rulebase direction (forward | backward | bidirectional) "bidirectional">
<!ELEMENT _rbaselab (ind | cterm)>
<!ELEMENT imp ( ( _head, ((_body, _rlab?) | (_rlab, _body))? ) | (_body, ((_head, _rlab?) | (_rlab, _head))) | (_rlab, ((_head, _body?) |(_body, _head))) )>
<!ELEMENT _rlab (ind | cterm)>
<!ELEMENT fact ( (_rlab, _head) | (_head, _rlab?) )>
<!ELEMENT _head (clit | atom | andh)>
<!ELEMENT _body (fclit | atom | clit | flit | andb | orb | and)>
<!ELEMENT andb ((fclit | atom | clit | flit | andb | orb)*)>
<!ELEMENT orb ((fclit | atom | clit | flit | andb | orb), (fclit | atom | clit | flit | andb | orb)+)>
<!ELEMENT andh ((clit | atom | andh), (clit | atom | andh)+)>
<!ELEMENT and ((atom | and)*)>
<!ELEMENT clit ( (_opr, (ind | var | cterm)*) | ((ind | var | cterm)+, _opr))>
<!ATTLIST clit cneg (%bool;) #IMPLIED>
<!ELEMENT fclit ( (_opr, (ind | var | cterm)*) | ((ind | var | cterm)+, _opr))>
<!ATTLIST fclit cneg (%bool;) #IMPLIED>
<!ELEMENT flit ( (_opr, (ind | var | cterm)*) | ((ind | var | cterm)+, _opr))>
<!ATTLIST flit fneg (%bool;) #IMPLIED>
<!ELEMENT atom ( (_opr, (ind | var | cterm)*) | ((ind | var | cterm)+, _opr))>
<!ELEMENT _opr (rel)>
<!ELEMENT rel (#PCDATA)>
<!ATTLIST rel href %URI; #IMPLIED>
<!ELEMENT var (#PCDATA)>
<!ELEMENT ind (#PCDATA)>
<!ATTLIST ind href %URI; #IMPLIED>
<!ELEMENT cterm ( (_opc, (ind | var | cterm)*) | ((ind | var | cterm)+, _opc))>
<!ELEMENT _opc (ctor)>
<!ELEMENT ctor (#PCDATA)>
<!ATTLIST ctor href %URI; #IMPLIED>
```
Situated Courteous DTD, cont’d

<!-- syntax for courteous and situated follows --->

<!ELEMENT mutex (_oppo, _mgiv?) | (_mgiv, _oppo)>  
<!ELEMENT _oppo (ando)>  
<!ELEMENT _mgiv (fclit | andb | orb)>  
<!ELEMENT ando (clit, clit)>  

<!ENTITY % bind "bound|free">  
<!ELEMENT sens (_opr, ((_aproc, _modli?) | (_modli, _aproc))) | (_aproc, ((_opr, _modli?) | (_modli, _opr))) | (_modli, ((_aproc, _opr) | (_opr, _aproc)))>  
<!ELEMENT effe (_opr, _aproc) | (_aproc, _opr)>  
<!ELEMENT _aproc (jproc | uproc)>  
<!ELEMENT uproc (#PCDATA)>  
<!ATTLIST uproc href %URI; #IMPLIED>  
<!ELEMENT jproc ((clas, ((meth, path?) | (path, meth))) | (meth, ((clas, path?) | (path, clas))) | (path, ((meth, clas) | (clas, meth))))>  
<!ELEMENT path (#PCDATA)>  
<!ATTLIST path href %URI; #IMPLIED>  
<!ELEMENT clas (#PCDATA)>  
<!ATTLIST clas href %URI; #IMPLIED>  
<!ELEMENT meth (#PCDATA)>  
<!ATTLIST meth href %URI; #IMPLIED>  
<!ELEMENT _modli ((bmode)*)>  
<!ELEMENT bmode EMPTY>  
<!ATTLIST bmode val (%bind; "free")>
More: Pointers

- RuleML DTD 0.8, a system of DTDs, is available at [http://www.dfki.de/ruleml/indtd0.8.html](http://www.dfki.de/ruleml/indtd0.8.html); sample rulebases at [http://www.dfki.de/ruleml/0.8/exa](http://www.dfki.de/ruleml/0.8/exa), use cases at [http://www.dfki.de/ruleml/library](http://www.dfki.de/ruleml/library)