



## Hungarian Pilot Case

Estrella Review Meeting  
Brussels  
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## Agenda

- Legal domain selection (scope)
- Informal model
- Translating legal documents to Metalex/CEN
- Knowledge base implementation
- Knowledge base and document model connection
- Domain ontology
- Inference and application test
- Exchange of model implementation formats



## Legal domain selection (scope)



### Legal source

- Citizens, legal entities, companies (taxpayers) actions, rights and responsibilities are affected by legal rules, especially by the tax related law. Generally they are not legally experienced, yet they need to be able to participate in transactions that are affected by a body of legal rules and knowledge.
- The legal domain chosen for the Hungarian pilot is Act LXXIV. of 1992. on Value Added Tax.



- VAT is a tax on consumer expenditure. It is collected on business transactions, imports and acquisitions. Tax generally has to be paid when the client falls inside the scope of a tax law and he isn't exempted from paying it. Our model helps the user to decide whether he or his activity is subject to VAT, and to understand the main terms and provisions of the act.
- The most popular questions arising are: *Do I have to pay any tax? How much? When?*
- The model answers these questions related to a special case described in the VAT Act, the distance selling.



Modelled part: distance selling across EU Member-State borders

- Distance selling occurs when a taxable person in one EC Member State supplies and delivers goods to a non-taxable person in another EC Member State.
- The most common type of distance selling occurs through mail order transactions.
- A non-taxable customer may be a private individual, public body, charity or any business which is too small to register or whose activities are totally exempt.
- Distance sales are usually taxed in the member state of origin until the distance selling threshold of the destination member state was exceeded, after that the taxpayer will be required to register with the member state in question.



## Key actors

- The key actors involved in Hungarian pilot and their main activities:
  - Legal experts (APEH): to write the informal rules based on the text of the legal source and to explain the goals and the relations between the main concepts of the VAT Act
  - Knowledge engineers (CUB): to develop LKIF and Alex Gold format of legal model based on informal rules; to develop legal expert application using legal model; to develop translators from LKIF to Alex Gold and from Alex Gold to LKIF
  - Legal staff (APEH): to test and evaluate legal model by using legal expert application in their advisory work



## Questions to be answered

- The expert application of Hungarian pilot case can answer the question whether the vendor has to pay VAT in the case of distance selling within EU. Furthermore if the answer is 'yes', then answers the following questions:
  - Where has to be paid the VAT by the vendor?
  - What amount of VAT has to be paid by the vendor?
  - Is recommended for the vendor to register in the member state of the person acquiring the goods?



## Informal model



### Goals

- The questions to be answered when running the expert application:

Goal 1: Has the vendor pay VAT (in the case of distance selling within EU)?  
Goal 2: Where has to be payed the VAT by the vendor?  
Goal 3: What amount of VAT has to be payed by the vendor?  
Goal 4: Is recommended to pay VAT in the state of the person acquiring the goods?



## Rules

- Described in natural language, based on and referring to the corresponding parts of legal text.
- *Conclusion IF Condition* form, eg.:

the VAT has to be paid in the MS of the person acquiring the goods *if*  
the vendor has to pay VAT, *and*  
the vendor is registered in the in the MS of the person acquiring the  
goods, *or*  
the total amount of the distance selling made by the vendor exceed  
threshold for these cases in the Member State of  
destination.



## User input

- Some information cannot be determined using only the rules of legal knowledge because they depend on the concrete situation.
- This missing information should be entered as user input (in LKIF these extra data can be represented as facts besides the rules).

Has the vendor a Community tax number?  
Is the vendor a taxable person in any Member State?  
Is the vendor registered in the Member State of the person  
acquiring the goods?  
Is the person acquiring the goods eligible for individual tax  
exemption?



## Translating legal documents to Metalex/CEN



### Legal document formats in Hungary

#### Existing formats:

- Official gazette
- HTML (government website)
- Vendor specific formats

#### Advantages of HTML:

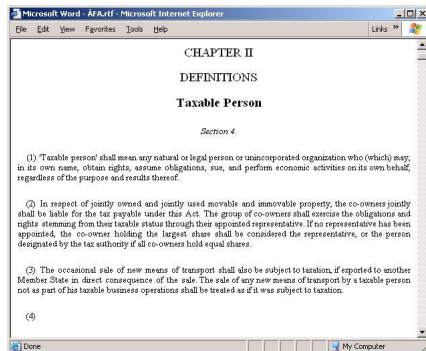
- Easy to get latest version
- HTML tags provide structural information

#### Disadvantages of HTML:

- Loose structure
- Inconsistent usage of tags and CSS classes



## Act LXXIV of 1992 on Value Added Tax



<p class=MsoNormal align=center style=margin-top:12.0pt;margin-right:0cm;margin-bottom:12.0pt;margin-left:0cm;text-align:center;text-indent:10.2pt><span style=font-size:14.0pt>CHAPTER II</span><span style=font-size:10.0pt> </span></p>

<p class=MsoNormal align=center style=margin-top:12.0pt;margin-right:0cm;margin-bottom:12.0pt;margin-left:0cm;text-align:center;text-indent:10.2pt><span style=font-size:14.0pt>DEFINITIONS</span><span style=font-size:10.0pt> </span></p>

<p class=MsoNormal align=center style=margin-top:12.0pt;margin-right:0cm;margin-bottom:12.0pt;margin-left:0cm;text-align:center;text-indent:10.2pt><b><span style=font-size:14.0pt>Taxable Person</span></b><span style=font-size:10.0pt> </span></b></p>

<p class=MsoNormal align=center style=margin-top:18.0pt;margin-right:0cm;margin-bottom:9.0pt;margin-left:0cm;text-align:center;text-indent:10.2pt><i><span style=font-size:10.0pt>Section 4.</span></i></p>

<p class=MsoNormal style=margin-top:18.0pt;margin-right:0cm;margin-bottom:9.0pt;margin-left:0cm;text-align:justify;text-indent:10.2pt><span style=font-size:10.0pt>(1)</span> 'Taxable person' shall mean any natural or legal person or unincorporated organization who (which) may, in its own name, obtain rights, assume obligations, sue, and perform economic activities on its own behalf, regardless of the purpose and results thereof. </span></p>

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## Translation

### Requirements:

- Automatic result generation
- Accuracy
- Flexibility
- Multiple output format

### Conception:

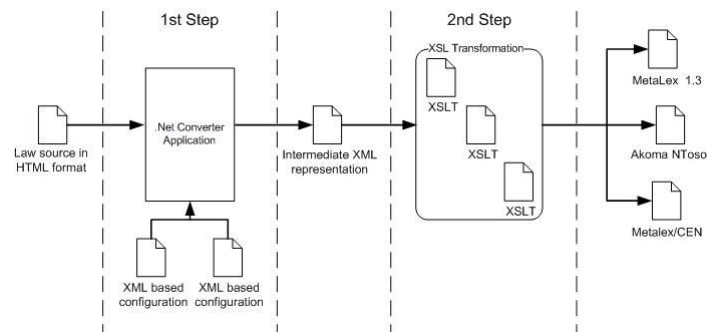
- Modularized architecture
- Configurations to each source style
- Creating intermediate XML
- Generate output by XSL transformation

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## Translation - Architecture



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## Example

### Intermediate XML

```
<Container id="p1_p2" name="Part" level="1">
  <Title name="Title" level="3"> DEFINITIONS </Title>
  <Index>II</Index>
  <Category>CHAPTER</Category>
  <Container id="p1_p2_a1" name="Article" level="2">
    <Title name="Title" level="2"> Taxable Person </Title>
    <Index>4.</Index>
    <Category>Section</Category>
    <Block id="p1_p2_a1_s1" name="SubPart" level="3">
      <Index>(1)</Index>
      <Text>Taxable person' shall mean any natural or legal person
or unincorporated organization who (which) may, in its own
name, obtain rights, assume obligations, sue
      </Text>
    </Block>
  </Container>
</Container>
```

### MetaLex/CEN

```
<container name="PartWrapper">
  <hcontainer name="Part" id="p1_p2">
    <htitle name="Title"> DEFINITIONS </htitle>
    <container name="IndexDesignation">
      <container name="Category">
        <block name="TextVersion" xml:lang="en">CHAPTER</block>
      </container>
      <block name="Index">II</block>
    </container>
    <hcontainer name="Article" id="p1_p2_a1">
      <htitle name="Title"> Taxable Person </htitle>
      <container name="IndexDesignation">
        <container name="Category">
          <block name="TextVersion" xml:lang="en">Section</block>
        </container>
        <block name="Index">4.</block>
      </container>
      <container name="Body">
        <hcontainer name="SubPart" id="p1_p2_a1_s1">
          <htitle name="Title"/>
          <container name="IndexDesignation">
            <block name="Index">(1)</block>
          </container>
          <container name="Body">
            <block name="TextVersion" xml:lang="en">Taxable person' shall
mean any natural or legal person or unincorporated organization who
(which) may, in its own name, obtain rights, assume obligations, sue
            </block>
          </container>
        </hcontainer>
      </container>
    </hcontainer>
  </container>
```

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## Knowledge base implementation



## LKIF modelling of the Hungarian pilot case



## 1. Extraction of domain elements

The following are extracted from informal rules:

### 1. Domain entities

- actors - vendor, acquirer, transferer
- objects - the goods transported, countries, etc.
- actions - supply of goods

### 2. Relations among them

- auxiliary (technical) relations binding the actors to the central action

*(vendorOf Selling Vendor)*

- Relations describing the domain

*(memberStateOf Vendor Country)*

### 3. Their properties

*(isDistanceSelling Selling)*



## 2. Translation of domain elements to LKIF

All the above can easily be translated to a corresponding LKIF element:

1. Domain entities are represented by constants
2. Domain relations by (binary) predicates
3. Properties also by (unary) predicates

+ Non-Boolean properties can be treated by binary predicates and constants denoting possible values



### 3. Domain rules

Each informal rule describes an „if-then” connection between domain elements: these can be translated in a straightforward way

- Domain rules: „classical” if-then rules describing relations of the domain, e.g.:

*The vendor is liable for paying VAT if*

- *the selling is distance selling,*
- *vendor is a taxable person in an EU member state*
- *vendor has a community tax number*

- Fact rules: „conclusion-only” rules describing circumstances of the case, e.g.:

*The vendor of 'selling no 00123' is 'Seller' Ltd.*



Representation formats of LKIF - 1:

#### s-expressions

```
;; vendor_has_to_pay_vat
(rule $vendor_has_to_pay_vat
  (if
    (and
      (vendor ?selling ?vendor)
      (is_distance_selling ?selling)
      (is_taxable_person_in_an_eu_member ?vendor)
      (has_community_tax_number ?vendor)
    )
    (has_to_pay_vat_for ?selling ?vendor)
  )
)
```

Diagram annotations:

- rule id**: points to `$vendor_has_to_pay_vat`
- antecedents**: points to the `(and ...)` block
- consequence**: points to `(has_to_pay_vat_for ?selling ?vendor)`



## Representation formats of LKIF - 2: compact XML

```
<rule id='?vendor_has_to_pay_vat'>
  <body>
    <s>vendor ?selling ?vendor</s>
    <s>is_distance_selling ?selling</s>
    <s>is_taxable_person_in_an_eu_member ?vendor</s>
    <s>has_community_tax_number ?vendor</s>
  </body>
  <head>
    <s>has_to_pay_vat_for ?selling ?vendor</s>
  </head>
</rule>
```

Diagram illustrating the compact XML representation of a rule, with annotations:

- rule id**: Points to the `id` attribute of the `<rule>` element.
- antecedents**: Points to the `<body>` element, which contains the antecedent conditions.
- consequence**: Points to the `<head>` element, which contains the consequent condition.



Alex Gold model



## Allex Gold

- The Allex Gold expert system software - developed by Multilogic Ltd., Hungary - can be used for modelling expert knowledge with its frame-based and rule-based syntax and create interactive expert applications which can be used simply with a web browser client storing the knowledge base on a web server.
- Main knowledge base items:
  - frames
  - rules
  - goals



## Frames

- The concepts and objects of a modelling domain - eg. legal knowledge - are described by so-called frames. Frames are identified by their unique names. Each frame is characterized by its set of properties, called attributes.
- During a successful reasoning exactly one value can be assigned to each attribute which later cannot be changed (not counting the case of backtracking).
- Each attribute is described by a set of metaslots, which define its type, and how its value can be determined.
- Eg.:

```
Name: vendor
Attributes:
    is_liable_for_the_tax_payable
        type = logical
        source = [rules]
        description = 'the vendor is liable for the tax payable'
    has_a_Community_tax_number
        type = text
        source = [user]
        menu = [yes,no]
        question = 'Has the vendor a Community tax number?'
        description = 'the vendor has a Community tax number'
```



## Rules

- Relations and dependencies among frames and their attributes can be expressed by rules of the form “if-condition-then-conclusion” .
- The conclusion of a rule is always an assertion about the value of an attribute, but it may be accompanied by some side-effects called actions.
- The inference system applies rules when during the evaluation of a frame attribute the ‘rules’ element of the source metaslot is reached.
- Eg. the main rule

tax shall be paid by the person supplying them if  
the supply of goods is distance selling and  
the person is taxable person in any Member State and  
the person has european tax number

is translated to:

```
if  supply_of_goods^distance_selling
   and vendor^is_a_taxable_person_in_any_Member_State is yes
   and vendor^has_a_Community_tax_number is yes
then vendor^is_liable_for_the_tax_payable
   and display_text(['The vendor IS liable for the tax payable.'])
```



## Goals

- The knowledge base has to contain at least one goal. The task of the consultation is to evaluate the defined goals one after another with backward chaining inference mechanism.
- Eg. the main goal of the knowledge base is the following :

vendor^is\_liable\_for\_the\_tax\_payable



## Domain ontology



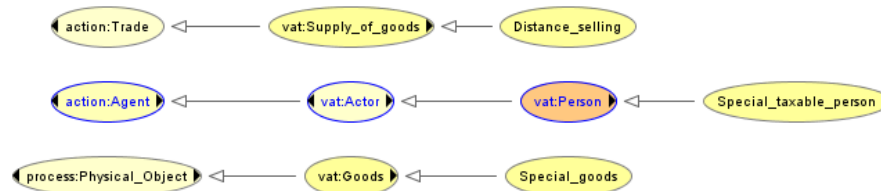
### Ontology - motivation

- The LKIF format in Estrella provides tools to describe terminological knowledge, legal rules and normative statements.
- Estrella LKIF-Core defines terminological knowledge of basic legal concepts in OWL
- In the Hungarian Pilot Case we extended the Core ontology with Value Added Tax and Distance Selling terminology using OWL
- Possible application:
  - describes LKIF-Rule concepts
  - references to conceptual explanations during rule-based inference
  - Estrella CMS: cross-references with Metalex/CEN
  - provides Semantic Web compatibility to third parties





## Ontology - architecture

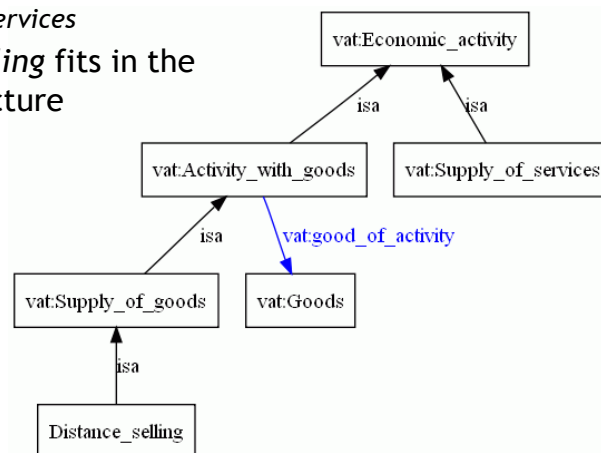


- Layered architecture
  - LKIF-core used as top-level (“action:” and “process:” prefixes)
  - “vat:” prefix: Hungarian Value Added Tax concepts
  - without prefix: Distance Selling terminology
- Special categories specific to *Distance selling* are defined by rules
  - e.g. “Special goods”, “Special taxable person”
  - OWL definitions may describe this knowledge, but they are not defeasible, so LKIF Rules are used



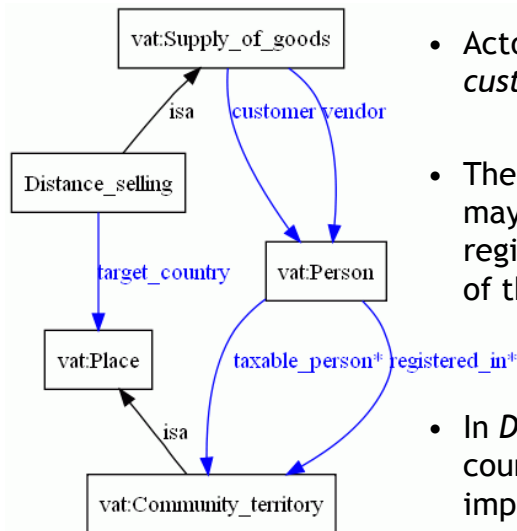
## Ontology - main concepts 1

- Main economic activities in Hungarian VAT:
  - *Supply of goods* - objects of the trade are goods
  - *Supply of services*
- *Distance selling* fits in the VAT architecture





## Ontology - main concepts 2



- Actors of the trade are the *customer* and *vendor*
- The legal person (*vat:Person*) may be taxable and also registered in several countries of the Community
- In *Distance selling* the target country of the trade is important



## Knowledge base and document model connection



## References to document source from LKIF model

- If a reference to a Metalex/CEN document element has to be added to a rule base, it can be done through the 'src' attribute of the 's' elements. These attributes may contain an arbitrary URI, hence the application of them would look as:

```
<s src="http://www.multilogic.hu/estrella/metalex/act_on_vat.xml#p1_p3_a2">  
  placeOfPayingVATFor ?SupplyOfGoods ?SourceCountry  
</s>
```



## References to document source from Alex Gold model

- We can reference to a whole Metalex/CEN document or any identified part of it from any free text type knowledge base element:
  - question metaslot
  - help metaslot
  - description metaslot
  - display\_text action
  - frame explanation
  - rule explanation
- Eg. in a help metaslot:

```
help = '<ref uri-type="external"  
uri="http://www.multilogic.hu/estrella/metalex/act_on_vat.xml#  
p1_p3_a2">Section 14/A of Act LXXIV of 1992 on Value Added  
Tax</ref>of Act LXXIV of 1992 on Value Added Tax'
```



## Inference and application test



## Testing of LKIF models: Inference using Carneades

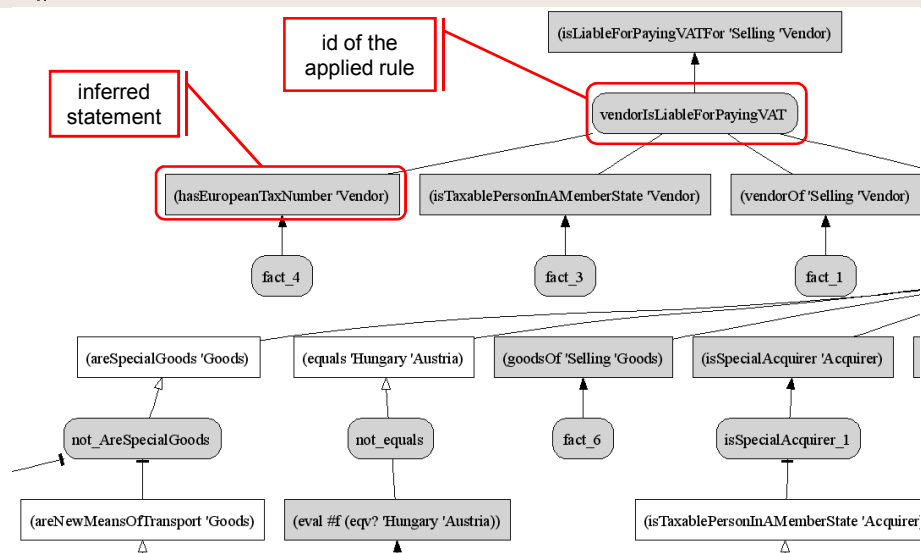


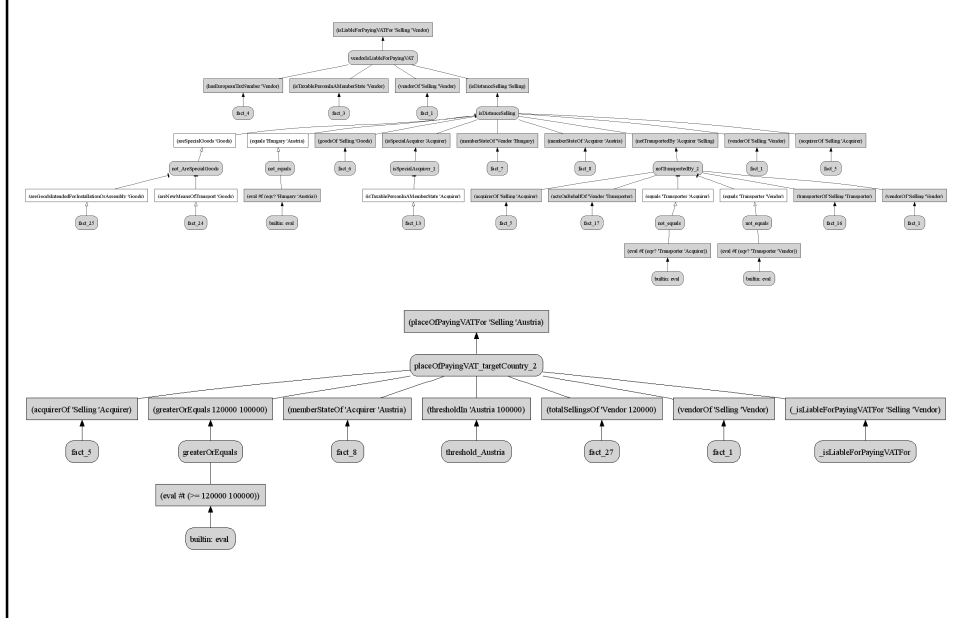
## Model loading/handling

- The Carneades engine can load models of the above two formats
- If a statement can be proven (given rules and facts), the supporting argument graph is returned by the engine



## Example (fraction) argument graph





## Inference with Alex Gold model



## Consultations

- We can run consultation sessions i.e. a dialogue with the knowledge base (instead of a real expert person) to solve legal problems (defined in the goals of the application) either within the development environment or simply with a web browser client.
- In the development environment we can trace the consultation, i.e. in a separate window we can interactively follow the steps of inference.



## Consultation dialogue

- A consultation session is executed in the consultation window that is implemented by a browser component (it needs a web server), the functions can be selected by using hyperlinks. The inference process running in background is interrupted with questions if the built-in knowledge of the expert system is not enough to solve the goal and the missing information has to be given by the user. The first question of the Distance Selling expert application is the following:

Distance Selling

Previous Answers | QUESTION EXPLANATION | Restart | HELP

Select the Member State of the vendor

- Austria
- Belgium
- Czech Republic
- Denmark
- Estonia
- Finland
- France
- Germany
- Great Britain
- Greece
- Hungary
- Ireland
- Italy
- Latvia
- Lithuania
- Luxembourg
- Malta
- Netherlands
- Poland
- Portugal
- Slovakia
- Slovenia
- Spain
- Sweden

[Continue >](#)



## A possible scenario of the consultation - 1

Select the Member State of the vendor! **Austria**

Select the Member State of the person acquiring the goods! **Hungary**

Does the person acquiring the goods carry out only the supply of goods or services that are not deductible? **yes**

**The person acquiring the goods is special taxable person.**

**The person acquiring the goods is special.**

Who transports the goods? **vendor**

Are the supplied goods new means of transport? **no**

Are the supplied goods intended for installation or assembly? **no**

**The supply of goods is distance selling. The Member State of the person acquiring the goods: Hungary**

Is the vendor a taxable person in any Member State? **yes**

Has the vendor a Community tax number? **yes**

**The vendor IS liable for the tax payable.**

cont.



## A possible scenario of the consultation - 2

Is the vendor registered in the Member State of the person acquiring the goods? **no**

Enter the total amount - not including value added tax - of the distance sales affected by the vendor in the current year (in euro)! **10.000**

Enter the total amount - not including value added tax - of the distance sales affected by the vendor in the previous year (in euro)! **15.000**

**The VAT has to be paid in the Member State of vendor.**

**The VAT amount in the Member State of the vendor: 2.000**

Enter the total amount - not including value added tax - of the distance sales affected by the person acquiring the goods in the current year (in euro)! **9.000**

**The VAT amount in the Member State of the person acquiring the goods: 1.800**

**The VAT amount in the Member State of the person acquiring the goods is less than the VAT amount in the Member State of the vendor, so it is recommended to register in the**

**Member State of the person acquiring the goods.**





## Consultation end

Distance Selling

PREVIOUS ANSWERS | RESULT EXPLANATION | RESTART | HELP

### Consultation end

Consultation end. The whole content of the consultation - questions, answers, information messages - can be seen on a separate page:

[CONTENT OF CONSULTATION](#)

You can restart the consultation with modifying any previous answers. So you can examine the modifications' effect on the result of consultation.

[RESTART WITH MODIFIED ANSWERS](#)

The person acquiring the goods is special taxable person.

The person acquiring the goods is special.

The supply of goods is distance selling. The Member State of the person acquiring the goods: Hungary

The vendor IS lable for the tax payable.

The VAT has to be paid in the Member State of the vendor.

The VAT amount in the Member State of the vendor: 2000.0

The VAT amount in the Member State of the person acquiring the goods: 1800.0

The VAT amount in the Member State of the person acquiring the goods is less then the VAT amount in the Member State of the vendor, so it is recommended to register in the Member State of the person acquiring the goods.



## Result explanation

Distance Selling

BACK TO THE PREVIOUS PAGE | PREVIOUS

### Explanation

the vendor is lable for the tax payable=true  
because

Section 40  
(1) Subject to the exeptions set out in Subsection (2)-(10) and (12), the tax in connection with supplies of goods or services shall be paid by the taxable person supplying them.

### Partial results:

supply of goods is distance selling=true  
the vendor is a taxable person in any Member State=yes  
the vendor has a Community tax number=yes

The person acquiring the goods is special taxable person.

The person acquiring the goods is special.

The supply of goods is distance selling. The Member State of the person acquiring the goods: Hungary

The vendor IS lable for the tax payable.

The VAT has to be paid in the Member State of the vendor.

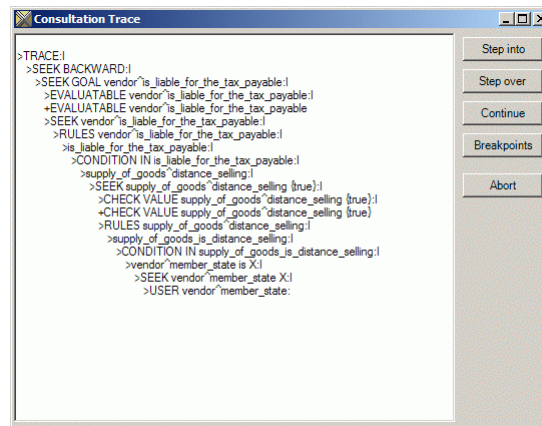
The VAT amount in the Member State of the vendor: 2000.0

The VAT amount in the Member State of the person acquiring the goods: 1800.0

The VAT amount in the Member State of the person acquiring the goods is less then the VAT amount in the Member State of the vendor, so it is recommended to register in the Member State of the person acquiring the goods.



## Consultation trace



## Exchange of model implementation formats



## Translation between LKIF and Alex Gold



### Main differences between the two languages

<u>LKIF</u>	<u>Alex Gold</u>
- Domain constants, no types	+ Hierarchy of frames (objects-classes) <code>Frame(Attribute<sub>1</sub>,...Attribute<sub>n</sub>)</code>
+ Predicates of arbitrary arity and argument type	- No inter-frame relations, only frame attributes (Boolean, enum, number)
+ Arbitrary statement can be inferred about	- Value of frame attributes are the sole subjects of inference
• Defeasibility <code>operators unless, assuming</code>	? Default values of attributes
• Inference rule priority	? Static rule priorities



## The common intersection

### LKIF   Allex Gold

- Constants
- Frames
- Unary predicates, (numeric/string properties)
- Attributes of frames
- Strict (non-defeasible) rules
- Allex Gold rules

This is the set in which a straightforward translation algorithm can be given back and forth.



## Translator implementations - Workarounds

### LKIF → Allex Gold

- Higher-arity predicates  
can be represented by a set of frames
- Defeasibility (assuming, unless)  
the extremes can be simulated in translation time:  
„always accept the default” or „never accept the default”
- Inferable rule priorities  
? can be handled by further meta-level frames and rules

### Allex Gold → LKIF

- Frame hierarchy  
class membership and the taxonomy can be represented by unary predicates and rules about them



## State of the translator

### LKIF → Alex Gold

- Full handling of arbitrary-arity predicates representing domain relations
- LKIF rules

To come:

- Defeasibility
- Rule priorities (?)

### Alex Gold → LKIF

- Translation of frame hierarchy
- Boolean and enum attributes
- Alex Gold rules



Example translation  
LKIF → Alex Gold



## The example (mini) knowledge base

Main rule:

*The vendor is liable for paying VAT (for selling) if*

- *the selling is distance selling,*
- *vendor is a taxable person in an EU member state*
- *vendor has a community tax number*

Domain entities:

- *vendor*
- *selling*

Facts:

- *vendor is a taxable person in an EU member state*
- *vendor has a community tax number*
- *selling is distance selling*



## The below KB is translated

```
<lkif>
  <rule id="vendorIsLiableForPayingVAT">
    <body>
      <s>vendorOf ?Selling ?Vendor</s>
      <s>isDistanceSelling ?Selling</s>
      <s>isTaxablePersonInAMemberState ?Vendor</s>
      <s>hasEuropeanTaxNumber ?Vendor</s>
    </body>
    <head>
      <s>isLiableForPayingVATFor ?Selling ?Vendor</s>
    </head>
  </rule>
  <rule id="fact_1"><s>vendorOf selling vendor</s></rule>
  <rule id="fact_2"><s>isDistanceSelling selling</s></rule>
  <rule id="fact_3"><s>isTaxablePersonInAMemberState vendor</s></rule>
  <rule id="fact_4"><s>hasEuropeanTaxNumber vendor</s></rule>
</lkif>
```

main rule

auxiliary statement

facts



## The constant 'vendor' becomes a frame

```
<Frame>
  <Name><TextVersion lang="en">vendor</TextVersion></Name>
  <Parents><Parent weight="0">object</Parent></Parents>
  <Attributes>
    <Attribute>
      <Name><TextVersion
lang="en">isTaxablePersonInAMemberState</TextVersion></Name>
      <Type>logical</Type>
      <Sources><Source>default</Source></Sources>
      <Default><TextVersion lang="en">{true}</TextVersion></Default>
    </Attribute>
    <Attribute>
      <Name><TextVersion lang="en">hasEuropeanTaxNumber</TextVersion></Name>
      <Type>logical</Type>
      <Sources><Source>default</Source></Sources>
      <Default><TextVersion lang="en">{true}</TextVersion></Default>
    </Attribute>
  </Attributes>
</Frame>
```

name of the  
constant

attributes  
↑  
unary LKIF  
predicates,

and their  
values

- With its known properties ('isTaxablePersonInAMemberState', 'hasEuropeanTaxNumber') stored in attributes



## The binary predicate 'isLiableForPayingVATFor' becomes a set of frames like:

(each possible grounding is stored in a frame)

```
<Frame>
  <Name><TextVersion
lang="en">isLiableForPayingVATFor_vendor_selling</TextVersion></Name>
  <Parents><Parent weight="0">isLiableForPayingVATFor</Parent></Parents>
  <Attributes>
    <Attribute>
      <Name><TextVersion lang="en">arg_0</TextVersion></Name>
      <Type>text</Type>
      <Sources><Source>default</Source></Sources>
      <Default><TextVersion lang="en">vendor</TextVersion></Default>
    </Attribute>
    <Attribute>
      <Name><TextVersion lang="en">arg_1</TextVersion></Name>
      <Type>text</Type>
      <Sources><Source>default</Source></Sources>
      <Default><TextVersion lang="en">selling</TextVersion></Default>
    </Attribute>
    <Attribute>
      <Name><TextVersion lang="en">value</TextVersion>
      </Name>
      <Type>logical</Type>
      <Sources><Source>rules</Source></Sources>
    </Attribute>
  </Attributes>
</Frame>
```

Name,  
denoting a  
concrete  
instantiation

Attributes,

denoting  
argument  
values

The value of the  
instantiation,

which is subject to  
inference



## Example translation Alex Gold → LKIF



### The equivalent „native” Alex Gols KB - 1 the frame representing the vendor

```
<Frame>
  <Name><TextVersion lang="en">vendor</TextVersion></Name>
  <Parents/>
  <Attributes>
    <Attribute>
      <Name><TextVersion lang="en">isTaxablePersonInAMemberState</TextVersion></Name>
      <Type>logical</Type>
      <Inheritance>local</Inheritance>
      <Sources><Source>default</Source></Sources>
      <Default><TextVersion lang="en">{true}</TextVersion></Default>
    </Attribute>
    <Attribute>
      <Name><TextVersion lang="en">hasCommunityTaxNumber</TextVersion></Name>
      <Type>logical</Type>
      <Inheritance>local</Inheritance>
      <Sources><Source>default</Source></Sources>
      <Default><TextVersion lang="en">{true}</TextVersion></Default>
    </Attribute>
    <Attribute>
      <Name><TextVersion lang="en">isLiableForPayingVAT</TextVersion></Name>
      <Type>logical</Type>
      <Inheritance>local</Inheritance>
      <Sources><Source>rules</Source></Sources>
    </Attribute>
  </Attributes>
</Frame>
```





## The equivalent „native” Alex Gols KB - 2 the main rule

```
<Rules>
  <Rule weight="0">
    <Label><TextVersion lang="en">liabilityForPayingVAT</TextVersion></Label>

    <Conditions>
      <Condition>vendor.isTaxablePersonInAMemberState is {true}</Condition>
      <Condition>vendor.hasCommunityTaxNumber is {true}</Condition>
      <Condition>selling.isDistanceSelling is {true}</Condition>
    </Conditions>

    <Conclusion>vendor.isLiableForPayingVAT is {true}</Conclusion>

    <Actions/>
  </Rule>
</Rules>
```



## Is translated into

```
<lkif>
  <rule id="ownClass_selling">
    <s>isA_selling selling</s>
  </rule>
  <rule id="defaultValueOf_selling::isDistanceSelling_{true}">
    <s>isDistanceSelling selling</s>
  </rule>
  <rule id="ownClass_vendor">
    <s>isA_vendor vendor</s>
  </rule>
  <rule id="defaultValueOf_vendor::isTaxablePersonInAMemberState_{true}">
    <s>isTaxablePersonInAMemberState vendor</s>
  </rule>
  <rule id="defaultValueOf_vendor::hasCommunityTaxNumber_{true}">
    <s>hasCommunityTaxNumber vendor</s>
  </rule>

  <rule id="liabilityForPayingVAT">
    <body>
      <s>isTaxablePersonInAMemberState vendor</s>
      <s>hasCommunityTaxNumber vendor</s>
      <s>isDistanceSelling selling</s>
    </body>
    <head>
      <s>isLiableForPayingVAT vendor</s>
    </head>
  </rule>
</lkif>
```

„technical”  
rules  
describing the  
frame  
hierarchy  
(useles in the  
current case)

The main rule  
we have seen  
already