Data Network Architectures Group

DRM Use License Negotiation using ODRL v2.0

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Outline

- Licensing
- REL and Negotiation
- Negotiation Protocols
- Conclusions

Rights Expression Languages

- In Coyle's Report on REL for the Library of Congress, RELs are categorised as:
  - expression of *copyright*
  - expression of *contract* or *licensing agreements*
  - control over *access* and/or *use*

Copyright and Licensing

- At ACM CCS 2003, Jean Camp argued that DRM is not about copyright management
- At the ACM DRM Workshop 2005, we have previously argued that:
  - DRM is not about the enforcement of copyright, but rather
  - the enforcement of an electronic licensing agreement
- Licensing is a type of contractual agreement
  - Negotiation can be defined as the process by which a contract is formed
  - the use of negotiations as a mechanism to allow for fair use

Electronic Negotiation

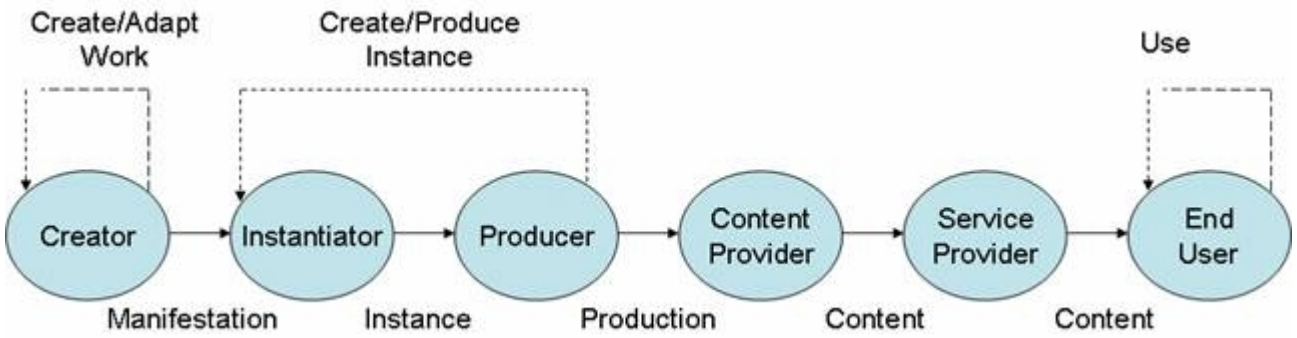
- General Requirements:
  - Protocol to conduct negotiations
  - Language to express negotiation proposals
  - AI agents to carry out negotiations
  - Language to define rules for negotiations (for agents etc.)

Related Work

- Electronic negotiations often associated with AI strategies
  - Few strategy independent protocols or representation of negotiations
  - Largely focussed on e-commerce applications
- Negotiation protocols exist outside AI strategies:
  - SSL has a negotiation component at the protocol level
- Who is negotiating?
  - Two humans
  - A human and a computer agent
    - Most likely to be a human user, and an agent for the rights holders
  - Two agents

Who are the Negotiation Parties

- Between two parties in a DRM value chain (such as the DMP value chain below)
- The customer in the negotiations does not have to be the end user



Factors to be Considered

- Negotiation protocols and strategies constitute a large body of work, in economics and social sciences
- These fields have identified a number of factors, broadly applicable to DRM domain
  - Number of parties
  - Parties negotiating on behalf of a group
  - Repetitiveness of the process; and its effect on reputation
  - Number of terms being negotiated
  - 3rd party involvement

DRM Negotiation Requirements

- The Digital Media Project (DMP) invited proposals for negotiation protocols
- DMP Requirements
  - End users can express their agreement or disagreement
  - Support user input into parameter changes
  - Support automatic negotiations
  - Able to render human readable license after every step
  - Able to set certain terms as non negotiable
  - Allow different security parameters
  - Can be anonymous

ODRL v2.0

- Currently under development
- We use ODRL v2.0 as the language to express negotiations
  - Removes the need to translate between negotiations and final license
  - Allows for easier translation of license to human readable form (at any stage of the negotiation)

Negotiation Protocols

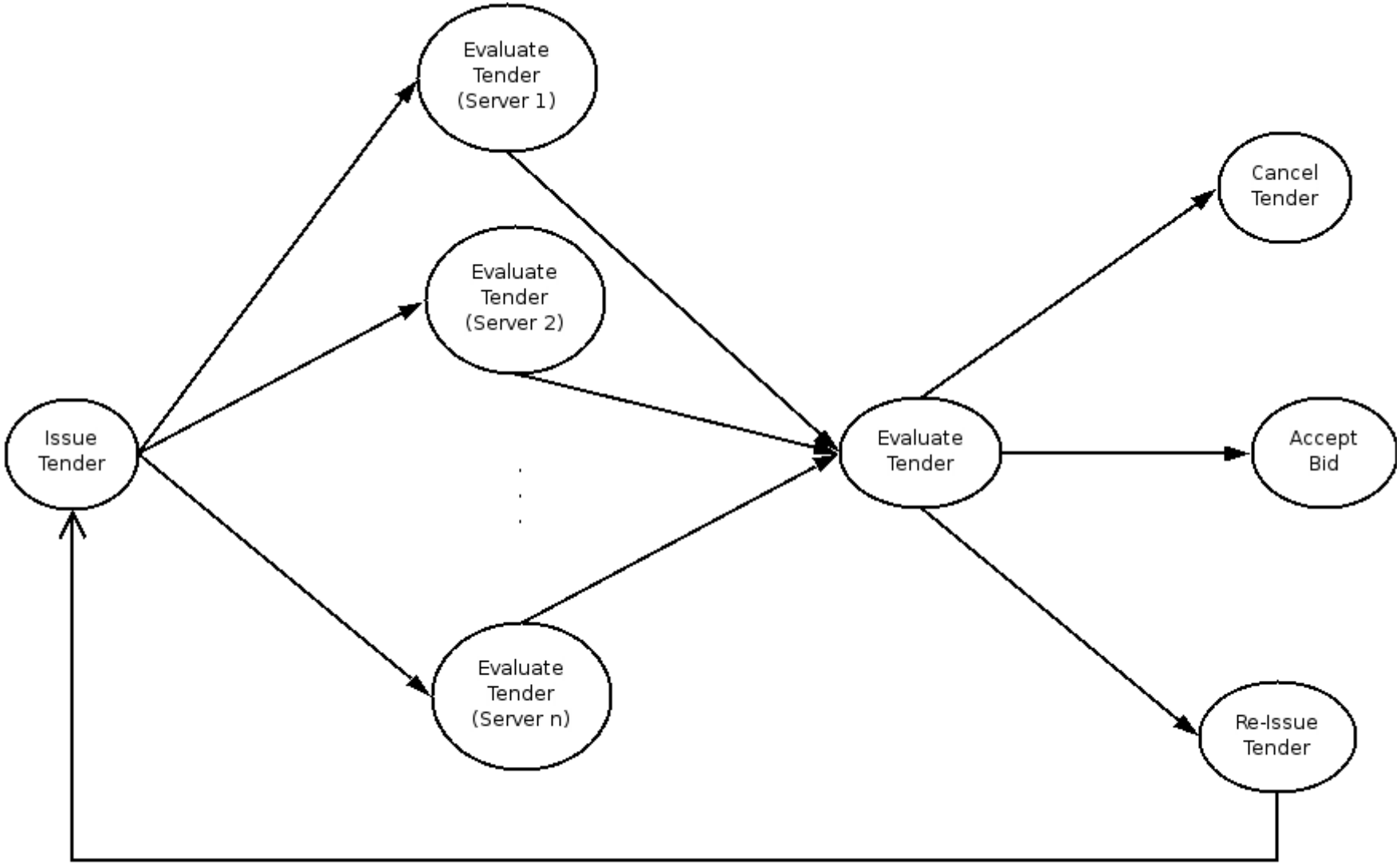
- Su et al. classified negotiation protocols into three types
  - **Bidding**
    The buyer specifies the service or product that (s)he needs and asks bids from potential suppliers. The buyer then selects one or more of the suppliers to provide the service or product.
  - **Auction**
    The auction can be viewed as the opposite of bidding where the supplier of the product or service promises to perform the service or deliver the goods to the customer with the highest bid. There are a variety of auction types.
  - **Bargaining**
    Bargaining is the most flexible type of negotiation allowing all the parties involved to dynamically change the terms and conditions to suit their needs.

Bidding

- Impact for consumer DRM is low
- Could have great impact for enterprise DRM
- Example:

  An advertising agency could be looking for classical music to accompany their television advertisements. For this purpose, they create a tender inviting musicians, groups etc. to supply the music under certain terms. Prospective groups can then formulate their offers, possibly offering different terms (for example a larger catalogue of music) and their prices. The advertising agency can then consider the offers and make their choice accordingly.

Bidding Flowchart



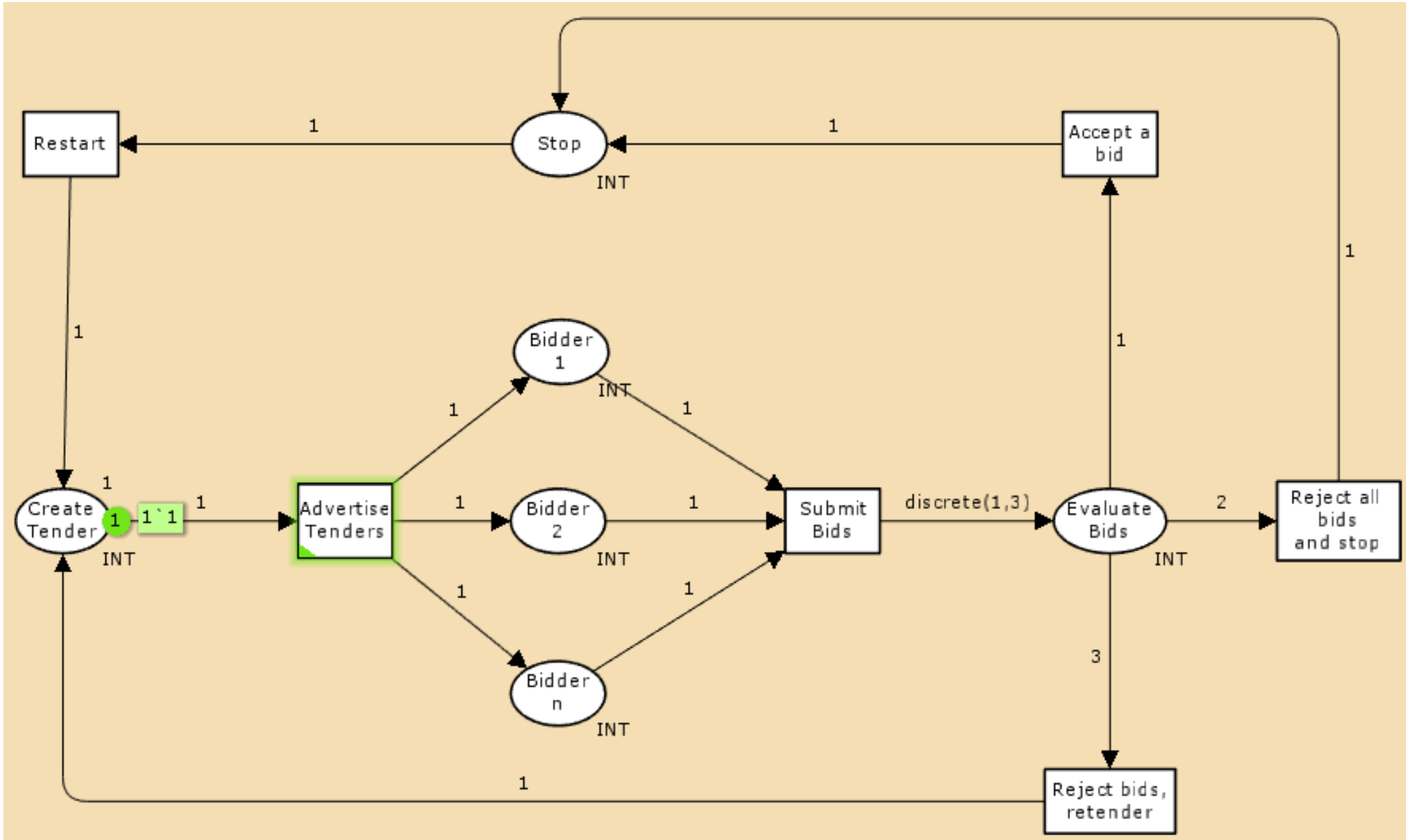
Bidding Protocol

- Very simple, because bidding is neither interactive nor instantaneous
- Three parts:
  - Announcement
  - Submission of offers
  - Notification of outcome

Modelling

- We have modelled the protocol using coloured Petri nets
- Allows us to examine the mathematical properties of the protocol
  - Whether all the states can be reached (*reachability*)
  - Whether the protocol has a dead state, which cannot be escaped (*liveness*)
  - Whether each state in the protocol has a maximum limit (*boundedness*)
- We modelled our protocols using Petri nets, and we show that these properties are achieved

Bidding Petri Net



Auction

- Auctions have only one variable – price paid by the consumer
- Current system can be seen as a modified auction, with the price fixed
- Auctions can easily be accommodated with existing auction systems like eBay
- We do not explore auctions any further

Bargaining

- Most interesting form of negotiations
- Works in an offer/counter-offer scenario until either an acceptable position is reached or a party does not want to continue
- In our paper, we present:
  - A complete bargaining protocol
  - Complete examples using ODRL v2.0

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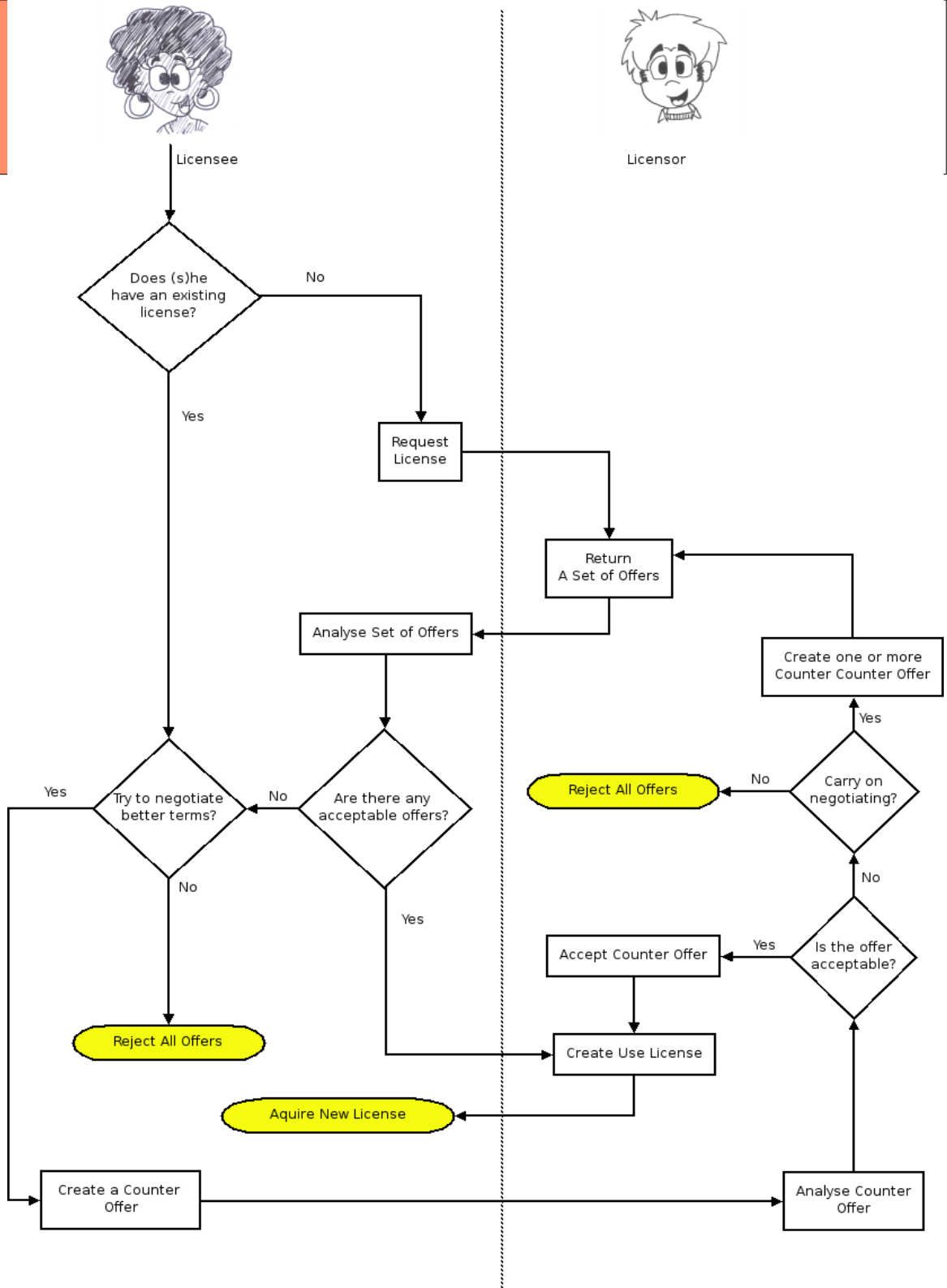
Bargaining Flow Chart



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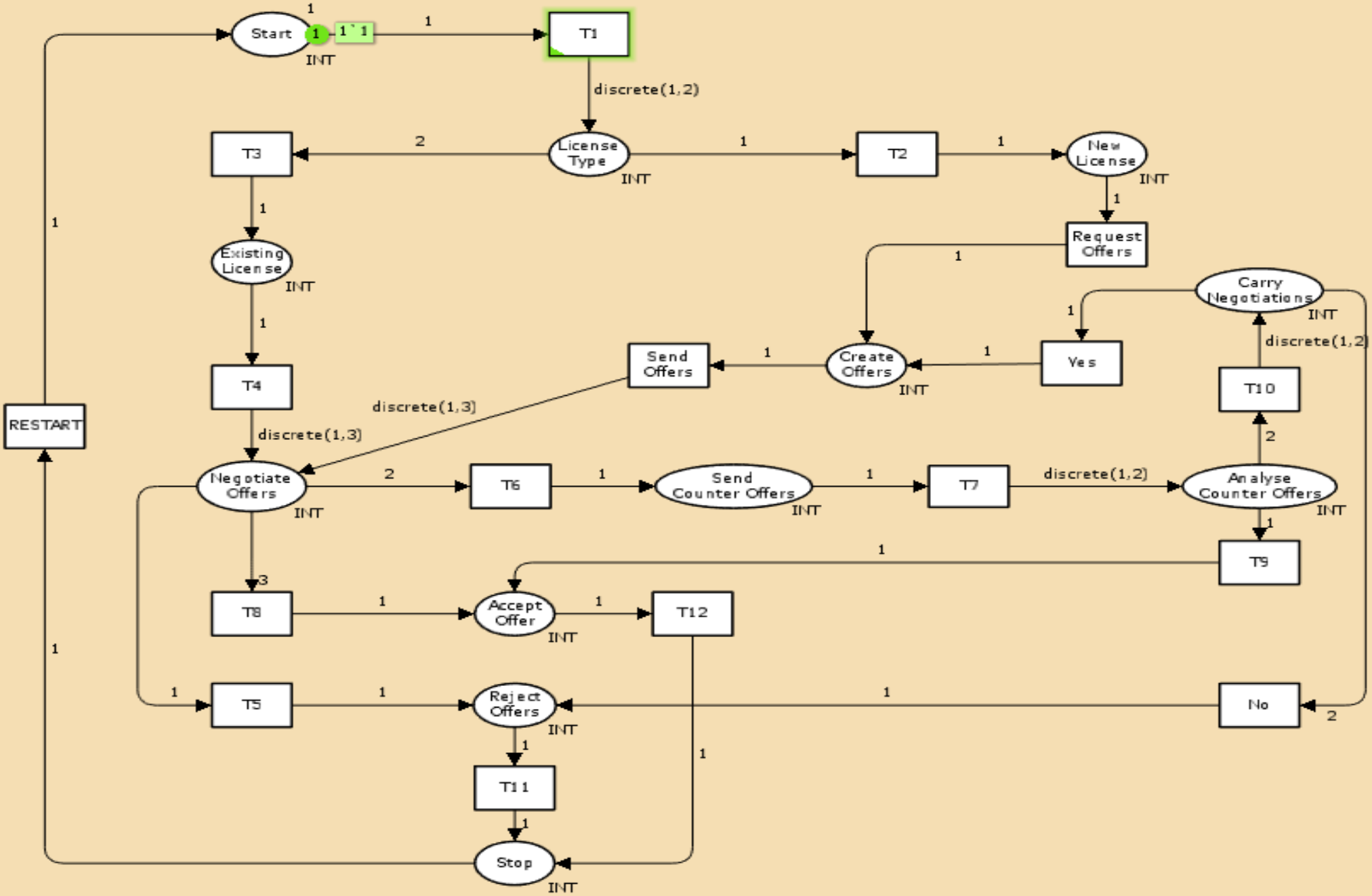
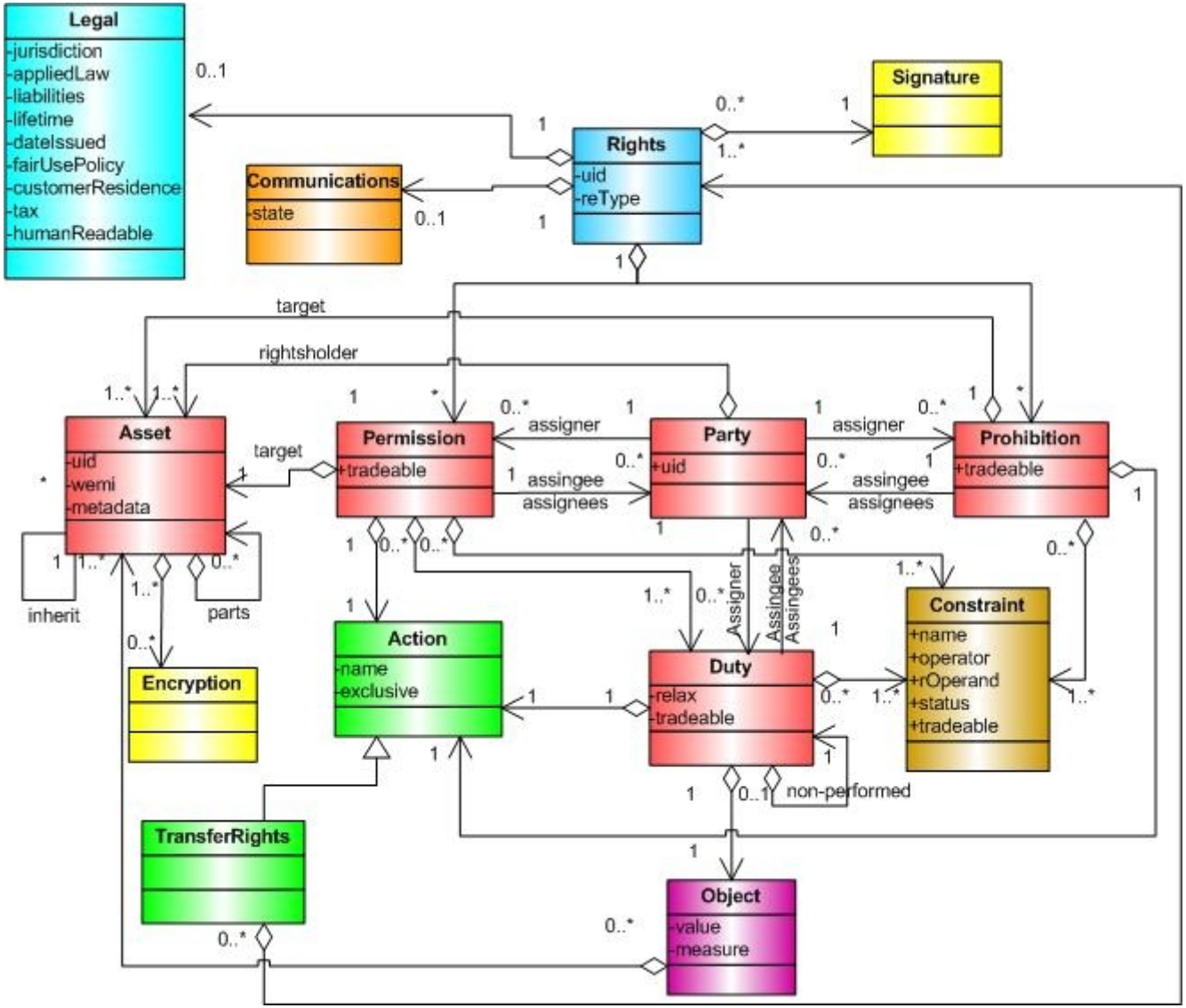
Bargaining Petri Net



ODRL v2 (before yesterday)



A Quick Example of Bargaining

- John wishes to acquire a license for a digital work
  - Would like both read and write rights

The Request

```
<o-v2:license o-v2:reType="Request">

  <o-v2:uid>request://123.123/1.1</o-v2:uid>
  <o-v2:party o-v2:role="requestor">
    <o-v2:uid>jabber://john@gmail.com</o-v2:uid>
  </o-v2:party>
  <o-v2:legal>
    <o-v2:lifetime>PT30M</o-v2:lifetime>
    <o-v2:dateIssued>
      2007-08-23T09:00:00.000+02:00
    </o-v2:dateIssued>
  </o-v2:legal>
  <o-v2:communication o-v2:state="initial">
    <o-v2:targetAsset>
      <o-v2:uid>data://123.456/2/23/23</o-v2:uid>
    </o-v2:targetAsset>
  </o-v2:communication>
</o-v2:license>
```

The Response (part a)

```
<?xml version="1.0" encoding="UTF-8"?>
<o-v2:license o-v2:reType="Offer">
  <o-v2:uid>offer://111.222/123/456/23/23/1111</o-v2:uid>
  <o-v2:party o-v2:role="assigner">
    <o-v2:uid>ls://111.222</o-v2:uid>
  </o-v2:party>
  <o-v2:party o-v2:role="assignee">
    <o-v2:uid>jabber://john@gmail.com</o-v2:uid>
  </o-v2:party>
  <o-v2:legal>
    <o-v2:jurisdiction>Brussels, Belgium</o-v2:jurisdiction>
    <o-v2:appliedLaw>Belgium</o-v2:appliedLaw>
    <o-v2:lifetime>PT6M</o-v2:lifetime>
    <o-v2:dateIssued>
      2007-08-23T09:02:00.000+02:00
    </o-v2:dateIssued>
  </o-v2:legal>
```

The Response (part b)

```
<o-v2:permission>
  <o-v2:targetAsset>
    <o-v2:uid>data://123.456/2/23/23</o-v2:uid>
  </o-v2:targetAsset>
  <o-v2:action>
    <o-v2:name>read</o-v2:name>
  </o-v2:action>
  <o-v2:duty o-v2:relax="true">
    <o-v2:action>
      <o-v2:name>Pre-Pay</o-v2:name>
    </o-v2:action>
    <o-v2:object>
      <o-v2:measure>EUR</o-v2:measure>
      <o-v2:value>5.00</o-v2:value>
    </o-v2:object>
  </o-v2:duty>
</o-v2:permission>
</o-v2:license>
```

A Rejection

```
<?xml version="1.0" encoding="UTF-8"?>
<o-v2:license o-v2:reType="Communication">
  <o-v2:uid>response://123.123/1.2</o-v2:uid>
  <o-v2:party o-v2:role="assigner">
    <o-v2:uid>ls://111.222</o-v2:uid>
  </o-v2:party>
  <o-v2:party o-v2:role="assignee">
    <o-v2:uid>jabber://john@gmail.com</o-v2:uid>
  </o-v2:party>
  <o-v2:legal>
    <o-v2:jurisdiction>Brussels, Belgium</o-v2:jurisdiction>
    <o-v2:appliedLaw>Belgium</o-v2:appliedLaw>
    <o-v2:lifetime>PT30M</o-v2:lifetime>
    <o-v2:dateIssued>
      2007-08-23T09:05:00.000+02:00
    </o-v2:dateIssued>
  </o-v2:legal>
  <o-v2:communication o-v2:state="reject">
    <o-v2:referenceCommunication>
      offer://111.222/123/456/23/23/1111
    </o-v2:referenceCommunication>
  </o-v2:communication>
</o-v2:license>
```

A Counter Offer (part of)

```
<o-v2:permission>
  <o-v2:targetAsset>
    <o-v2:uid>data://123.456/2/23/23</o-v2:uid>
  </o-v2:targetAsset>
  <o-v2:action>
    <o-v2:name>read</o-v2:name>
  </o-v2:action>
  <o-v2:duty o-v2:relax="true">
    <o-v2:action>
      <o-v2:name>Pre-Pay</o-v2:name>
    </o-v2:action>
    <o-v2:object>
      <o-v2:measure>EUR</o-v2:measure>
      <o-v2:value>5.00</o-v2:value>
    </o-v2:object>
  </o-v2:duty>
</o-v2:permission>
<o-v2:permission>
  <o-v2:targetAsset>
    <o-v2:uid>data://123.456/2/23/23</o-v2:uid>
  </o-v2:targetAsset>
  <o-v2:action>
    <o-v2:name>write</o-v2:name>
  </o-v2:action>
</o-v2:permission>
```

A Counter Counter Offer (part of)

```
<o-v2:permission>
  <o-v2:targetAsset>
    <o-v2:uid>data://123.456/2/23/23</o-v2:uid>
  </o-v2:targetAsset>
  <o-v2:action>
    <o-v2:name>write</o-v2:name>
  </o-v2:action>
  <o-v2:duty o-v2:relax="true">
    <o-v2:action>
      <o-v2:name>Pre-Pay</o-v2:name>
    </o-v2:action>
    <o-v2:object>
    <o-v2:measure>EUR</o-v2:measure>
      <o-v2:value>5.00</o-v2:value>
    </o-v2:object>
  </o-v2:duty>
</o-v2:permission>
```

Acceptance

```
<?xml version="1.0" encoding="UTF-8"?>
<o-v2:license o-v2:reType="Communication">
  <o-v2:uid>response://123.123/1.4</o-v2:uid>
  <o-v2:party o-v2:role="assigner">
    <o-v2:uid>ls://111.222</o-v2:uid>
  </o-v2:party>
  <o-v2:party o-v2:role="assignee">
    <o-v2:uid>jabber://john@gmail.com</o-v2:uid>
  </o-v2:party>
  <o-v2:legal>
    <o-v2:jurisdiction>Brussels, Belgium</o-v2:jurisdiction>
    <o-v2:appliedLaw>Belgium</o-v2:appliedLaw>
    <o-v2:lifetime>PT30M</o-v2:lifetime>
    <o-v2:dateIssued>
      2007-08-23T09:09:00.000+02:00
    </o-v2:dateIssued>
  </o-v2:legal>
  <o-v2:communication o-v2:state="accept">
    <o-v2:referenceCommunication>
      offer://111.222/123/456/23/23/1111.3
    </o-v2:referenceCommunication>
  </o-v2:communication>
</o-v2:license>
```

Final Agreement

```
<?xml version="1.0" encoding="UTF-8"?>
<o-v2:license o-v2:reType="Agreement">
  <o-v2:uid>license://111.222/123/456/23/23/1111</o-v2:uid>
  <o-v2:party o-v2:role="assigner"> ...
  <o-v2:party o-v2:role="assignee"> ...
  <o-v2:legal> ...
  <o-v2:communication o-v2:state="acknowledge">
    <o-v2:referenceCommunication>
      request://123.123/1.4
    </o-v2:referenceCommunication>
  </o-v2:communication>

  <o-v2:permission>
    <o-v2:targetAsset> ...
    <o-v2:action>
      <o-v2:name>read</o-v2:name>
    </o-v2:action>
    <o-v2:duty o-v2:relax="true"> ...
  </o-v2:permission>

  <o-v2:permission>
    <o-v2:targetAsset> ...
    <o-v2:action>
      <o-v2:name>write</o-v2:name>
    </o-v2:action>
    <o-v2:duty o-v2:relax="true"> ...
  </o-v2:permission>
</o-v2:license>
```

Main advantage of REL

- There is no translation
  - What you see is what you get
- Easier to convert to natural language contracts (at any stage of the process)
- Relatively low overheads

Satisfying DMP Requirements (1)

- End-Users can express their agreement or disagreements with proposed License terms
  - ODRL v2.0 has “agreement” and “rejection” terms as part as the communication elements
- The protocol shall support changes to any parameter of the License
  - Since we use ODRL v2.0 as the language for negotiation, any part of a license can be negotiated
- The protocol shall enable the setting of certain parameters as non subject of negotiation
  - Elements in ODRL v2.0 have an optional “tradable” attribute

Satisfying DMP Requirements (2)

- The protocol shall support automatic negotiation of license terms
  - Protocol was designed with this purpose in mind.
- The protocol shall allow the determination of the degree of confidentiality (no eavesdrop) of the protocol
  - Protocol can be easily encompassed in secure communication channels like SSL sessions
- The protocol shall not require revealing the real identities until the protocol has been successfully concluded
  - Anonymity is not required but could be useful for better negotiation results

Some other Work

- The third category of RELs, as discussed by Coyle was:
  - control over *access* and/or *use*
- At ACM DRM 2007, we are presenting a paper that presents a REL as an access control language
  - We have previously contributed an earlier version of this paper to the ODRL group
  - This model also incorporates licensing components of REL presented here

Conclusions

- Licensing is a contractual process
  - Negotiation is a vital part of the contractual process
- Negotiation offers more flexibility for all the involved parties
  - Can be used to deliver fair use, accessibility etc
- Some degree of language support is necessary
  - Using a REL removes the complexities of translations
- We presented various types of negotiation, and protocols on how to apply them to DRM

Thanks

- Email: aarnab@cs.uct.ac.za
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- Project Funders

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