



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



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The Intelligible Contract



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Smart Contracts

- **Smart Contracts** are small software procedures run on **BlockChains** to ensure their correct execution
- Smart Contracts can **execute automatically simple legal terms** (**[Legal] Contract**) between parties
- **Not all *legal contracts*** can be modelled with **Smart Contracts**
- Smart Contracts cannot supply **the complex features of traditional legal contracts** like **recession, retroactive modifications, exceptions, etc.**
- In addition, one of **the most important features** of traditional digital contracts is the **legal prose**, that **must be preserved** to make the **contract intelligible by humans**

Smart Contract and [*Legal*] Contract

- A Smart Contract can be considered a specific expression, i.e., an **interpretation** and **translation** (codification) of the legal prose of a contract
- The legal prose is the written expression of a **mutual assent** of the parties about the contractual terms.
 - Will of the parties: “meeting of the minds”
 - Mutual assent: **when** and **where is concluded**
 - Transparency/Intelligibility/Trust and duties to inform
 - Forms (e.g., written)
 - Clear and legal scope
 - Defined object
- The **Intelligibility** of a legal contract is a mandatory requirement in order to have a full awareness of the content and a valid mutual assent and then enforceability

Smart contract and *[Legal] Contract*

What are the regulations about smart contracts and their enforceability under a legal point of view?

- UNCITRAL – United Nations Commission on International Trade Law
- eIDAS EU Regulation
- Uniform Electronic Transactions Act (UETA) and Global and National Commerce Act (E-SIGN) – Arizona, Nevada, Ohio, Tennessee
- National Laws (e.g., Italy, Lichtenstein, Estonia, Switzerland, France, Germany, etc.)

Open questions

- Territoriality and jurisdiction
- Liability (e.g., developers, platform, parties, etc.)
- Enforceability (e.g., identification of the parties, digital signature, custody requirements)
- Data protection

Ricardian Contracts

- **Ricardian Contracts** try to fill the gap between the legal prose and executable code
- The developer describes a triple $\langle P, C, M \rangle$ where:
 - **P** describes the **denotational semantic** of contracts (the legal prose);
 - **C** describes the **operational semantic** of contracts (the code executable by machines)
 - **M** is a **mapping**, in the form of key values, parameters, between the **operations expressed in C** and the **legal prose expressed in P**.

Smart Contract Templates

- **Smart Contract Templates** are an implementation of **Ricardian Contracts** whose **operational code** is **standardised** and whose **behaviour is controlled by parameters** contained in an electronic representation of the contract.
- **Smart Contract Templates** facilitate the management of the **life-cycle of contracts** by taking care of **four aspects**:
 1. **Legal drafting tools** allow developers and legal expert to create smart contracts templates together
 2. legal prose is serialised by means of **standard and flexible vocabularies**
 3. the mark-up of documents link items of contracts to **standard ontologies**
 4. features **link the legal prose to operational code**

What is missing

- **Ricardian Contracts and Smart Contracts Templates expose mandatory features to bridge the gap between legal prose of contracts and automatically-executable contracts**

BUT... this is not enough

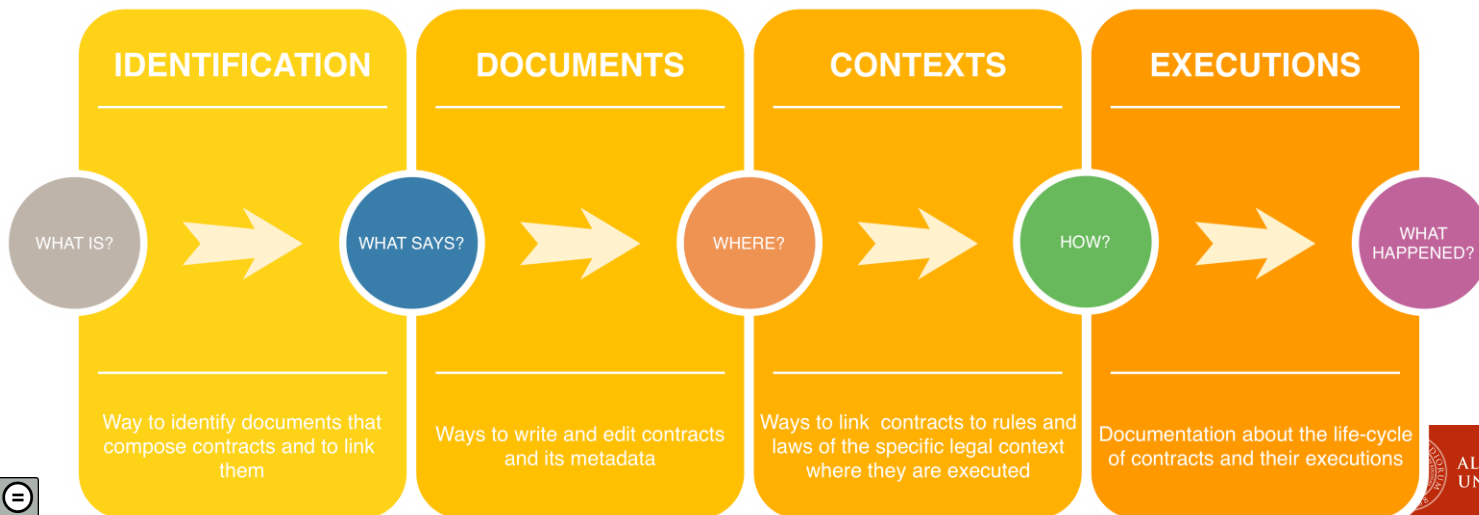
- they do **not** provide important features for the intelligibility of contracts, more specifically:
 - No **links between contracts and other legal and non legal resources** (e.g., **normative references in contracts**)
 - No **description of the legal context of contracts** (e.g., **jurisdiction of the facts**)
 - No information concerning **the operational context of contracts** (e.g., **type of Blockchain**)
 - No **report of the automatic execution of contracts.**

The Intelligible Contract

- **To fulfil the gaps** of Smart Contracts, Ricardian Contracts and Smart Contracts Templates, **we introduce *Intelligible Contracts***.
- **Intelligible Contracts** are **[*legal*] contracts** written in **natural language** that can be **mapped, entirely or partially, to operational code** living on Blockchains.
- **Intelligible Contracts extend** Ricardian Contracts and Smart Contract Templates by supplying **specifications for the intelligibility of digital contracts**.

Features of Intelligible Contracts

- More specifically, **Intelligible Contracts** supply **specification for linking**:
 - **all resources** that **compose contracts** or **define their legal contexts**
 - **agents** that are **involved in the life-cycle of contracts**
 - **the digital resources** that **describe how to execute the operational code**
 - **digital resources** that **report what happens during the executions** of contracts.



Scenario

Data Processing Agreement (Template)

This data processing agreement is adapted from the [ProtonMail DPA](#), which can be found on [this page](#). Organizations may use the following document as part of their [GDPR compliance](#).

[Download a PDF version of this template here.](#)

Data Processing Agreement — Your Company

This Data Processing Agreement ("Agreement") forms part of the Contract for Services ("Principal Agreement") between

(the "Company") and

```
<preface>
<p><docTitle>BlaBlaCar
Privacy and Data Protection Policy</docTitle></p>
</preface>
<mainBody>
...
<section>
<paragraph>
<content>
<heading>8. What are your <concept refersTo="#right">rights</concept> in
respect of your personal data?</heading>
<ol>
<li>8.1.<def>You are entitled to receive a copy of your personal data that is in our
possession</def> (your <concept refersTo="#rightToAccess">right of data
access</concept>).</li>
<li>8.2 You may request the <def>deletion of personal data</def> or the
<def>correction of inaccurate personal data</def> (your <concept
refersTo="#rightToErasure">right to erasure</concept> and <concept
refersTo="#rightToRectification">rectification</concept>). Please note that we may keep
certain information concerning you, as required by law, or when we have a legal basis to
do so (e.g., our legitimate interest to keep the platform safe and secure for other
users).</li>
<li>8.3 <def>You have the right to object at any time (i) to the processing of your
personal data for the purpose of direct marketing, or (ii) to the processing of your
personal data for other purposes on grounds relating to your particular situation</def>
(<concept refersTo="#rightToObject">your right to object to processing</concept>). Please
note that in the latter case, this right only applies if the processing of your personal
data is based on our legitimate interest.</li>
<li>8.4 <def>You have the right to restrict the processing of your personal data</def>
(<concept refersTo="#rightToRestrictProcessing">your right to restriction of
processing</concept>). Please note that this only applies if (i) you contested the
accuracy of your personal data and we are verifying the accuracy of the personal data,
(ii) you exercised your right to object and we are still considering, as foreseen by the
applicable law, whether our legitimate grounds to process your personal data in that case
override your interests, rights and freedoms; or (iii) your personal data has been
```



Logic Rules in natural Language

Formal Logic Rules

LegalRuleML

Smart Contract

```
-- Zenon on 0.8.1
-- setup
random# = E
order# = E
G = E * P
-- typical
function
local k
return { private = key,
        public = key * G }
end
-- generate the certification request
certreq = keygen(random,order)
-- certreq private is preserved in a safe place
-- certreq public is sent to the CA along with a declaration
declaration = { requester = str("Alice"),
               statement = str("I am stuck in Wonderland") }
-- Requester sends to CA -->
... once upon a time ...
--> CA receives from Requester
-- keypair for CA (known to everyone as the Mad Hatter)
CA = keygen(random,order)
-- from here the CA has received the request
certkey = keygen(random,order)
-- certkey private is sent to requester
-- certkey public is broadcasted
-- public key reconstruction data
```

What are your rights in respect of your personal data?

Your right of data access

8.1. You are entitled to receive a copy of your personal data that is in our possession (your right of data access).

Your right to erasure and rectification

8.2. You may request the deletion of personal data or the correction of inaccurate personal data (your right to erasure and rectification). Please note that we may keep certain information concerning you, as required by law, or when we have a legal basis to do so (e.g., our legitimate interest to keep the platform safe and secure for other users).

Your right to object to processing

8.3. You have the right to object at any time (i) to the processing of your personal data for the purpose of direct marketing, or (ii) to the processing of your personal data for other purposes on grounds relating to your particular situation (your right to object to processing). Please note that in the latter case, this right only applies if the processing of your personal data is based on our legitimate interest.

Your right to restriction to processing

8.4. You have the right to restrict the processing of your personal data (your right to restriction of processing). Please note that this only applies if (i) you contested the accuracy of your personal data and we are verifying the accuracy of the personal data, (ii) you exercised your right to object and we are still considering, as foreseen by the applicable law, whether our legitimate grounds to process your personal data in that case override your interests, rights and freedoms; or (iii) your personal data has been processed by us in an unlawful way but you either oppose the erasure of the personal data or want us to keep your personal data in order to establish, exercise or defend a legal claim.



Human-readable
(at least *Lawyer-readable*)

Machine-readable

Reasoning and
Machine-executable

Human-readable
Explainable



Components of Intelligible Contracts

- **Intelligible Contracts** are composed of **four parts**:
 - **identification and referencing component**: a **Uniform Resource Identifier** and a **hash**
 - **document component**: UID+Document
 - **context component**: a **legal context** and an **operational context**. The operational context contains execution parameters, references to operational environment, operational agents and operational code
 - **execution reports**: UID + the report of the execution of the contract

UID (URI+HASH_IPFS)

Document+
(UID + Document)

Context+
*(UID +Legal Context+
Operational Context)*

Execution_Report+
(UID+Document)

Formal definition of Intelligible Contracts

Intelligible Contract ::=

UID **and**
Document+ **and**,
Context+ **and**,
Execution Report+

UID (URI+HASH_IPFS)

UID ::= URI => HASH

Document+
(UID + Document)

Context ::=

UID **and**
Legal Context+ **and**
Operational Context+ **and**

Context+
(UID + Legal Context+
Operational Context)

Legal Context ::=

(Legal Document Ref **or**
Legal Document)+

Execution_Report+
(UID+Document)

Operational Context ::=

Operational Environment Ref+ **and**
Operational Agent Ref+ **and**
Operational Code Ref+

Execution Report ::=

UID,
Document+,

An implementation of Intelligent Contracts

- We propose an implementation of Intelligent Contracts that relies its functioning on three technologies:
 - The **Akoma Ntoso (LegalDocML) standard**, used to markup the legal prose of contracts, to identify documents, and to markup all other legal and plain documents related to the life-cycle of contracts;
 - The **InterPlanetary Linked Data**, used to link resources that belong to Intelligent Contracts by means of their **hashes** and their **Akoma Ntoso** identifiers;
 - The **LegalRuleML standard**, used to re-express the legal prose contained in legal document, highlighting business rules and connecting them to automatic legal reasoners and to operational code deployed on blockchains.

OASIS 



LegalRuleML

Intelligible Contract model

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Data Processing Agreement — Your Company

This Data Processing Agreement ("Agreement") forms part of the Contract for Services ("Principal Agreement") between _____ (the "Company") and _____

Akoma Ntoso

```

<pre>
<title>Data Processing Policy</docTitle></pre>
...
<section>
  <paragraph>
    <content>
      <heading>8. What are your <concept refersTo="#right">rights</concept> in respect of your personal data?</heading>
    </content>
    <list>
      <li>8.1 <def>You are entitled to receive a copy of your personal data that is in our possession</def> (your <concept refersTo="#rightToAccess">right</concept> of data access</concept>).</li>
      <li>8.2 You may request the <def>deletion of personal data</def> or the <def>correction of inaccurate personal data</def> (your <concept refersTo="#rightToErasure">right</concept> to erasure</concept> and <concept refersTo="#rightToRectification">right</concept> to rectification</concept>). Please note that we may keep certain information concerning you, as required by law, or when we have a legal basis to do so (e.g., our legitimate interest to keep the platform safe and secure for other users).</li>
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    </list>
  </paragraph>
</section>

```

Logic Rules in natural Language

Formal Logic Rules

LegalRuleML

Smart Contract

```

-- Zenroon 0.8.1
-- setup
random
order = EC
G = EC
-- typical
function k
  local key = IN 1 new(rng,modulo)
  return ( private = key * G )
end
-- generate the certification request
certreq = keygen (random,order)
-- certreq private is preserved in a safe place
-- certreq public is sent to the CA along with a declaration
declaration ( requester = str("Alice"),
              statement = str("I am stuck in Wonderland") )
-- Requests goes to CA ->
-- once upon a time ...
-> CA receives from Requester
keypair for CA (known to everyone as the Mad Hatter)
CA = keygen(random,order)
-- from here the CA has received the request
certkey = keygen(random,order)
-- certkey private is sent to requester
-- certkey public is broadcasted
-- public key reconstruction data

```

Execution and Context information report



Human-readable
(at least *Lawyer-readable*)

Machine-readable

Reasoning and
Machine-executable

Human-readable
Explainable



Intelligible Contract model

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(Template)

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</preface>
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respect of your personal data?</heading>
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<def>correction of inaccurate personal data</def> (your <concept
refersTo="#rightToErasure">right to erasure</concept> and <concept
refersTo="#rightToRectification">right to rectification</concept> that we keep
certain information concerning you, a requested law or legal basis to do so
your legitimate interest in the data in question for our (or other
users).</li>
<li>8.3 <def>You have the right to object at any time to the processing of your
personal data for the purpose of direct marketing, or (i) to the processing of your
personal data for other purposes grounds relating to your particular situation</def>
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(ii) you exercised your right to object and we are still considering, as foreseen by the
applicable law, whether our legitimate grounds to process your personal data in that case
override your interests, rights and freedoms; or (iii) your personal data has been
    
```

Akoma Ntoso



Logic Rules
in natural Language

Formal Logic Rules

Smart Contract

```

-- Zenonem 0.8.1
-- setup
random_order = keygen(random_order)
G = E
-- type
function keygen(key)
return { private = key,
        public = key * G }
end
-- generate the certification request
certreq = keygen(random_order)
certreq.private is preserved in a safe place
certreq.public is sent to the CA along with a declaration
declaration = { requester = str("Alice"),
               statement = str("I am stuck in Wonderland") }
Requester sends to CA -->
... once upon a time ...
-- CA receives from Requester
keypair for CA (known to everyone as the Mad Hatter)
CA = keygen(random_order)
-- from here the CA has received the request
certkey = keygen(random_order)
-- certkey.private is sent to requester
-- certkey.public is broadcasted
-- public key reconstruction data
    
```

Execution
and Context
information report

Interplanetary Linked Data



Lawyer-readable

Machine-readable

Reasoning and
Machine-executable

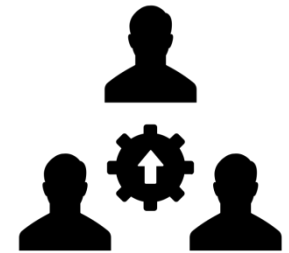


Use-Case GDPR and DPA

- Lawfulness
- Fairness
- Transparency
- Purpose limitation
- Data Minimization
- Accuracy
- Storage limitation
- Integrity
- Confidentiality
- Accountability

Data subject
Natural person

Controller
e.g. Company



To know **which data** is used by whom
for **what purposes** and
how they are **processed**



Privacy Policy
Term of use
Consent

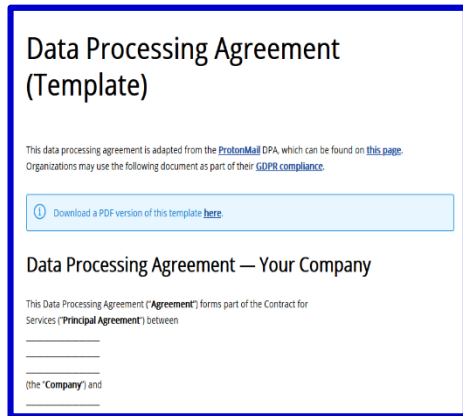
Processor
e.g. Company

Authority



Data Protection
Agreement

Use-Case GDPR and DPA



Privacy Policy
Term of use
Consent

Data Protection
Agreement

GDPR
EU Regulation
International Law

- **Data Processing Agreements** compliant to the **General Data Protection Regulation (GDPR)** of the EU regulation.
- **DPAs involve several legal and non-legal resources**
- **DPAs may be impacted by many jurisdictions, because they are often related to world-wide services (e.g., cloud computing services)**
- **a template of the legal prose of GDPR-compliant DPA is publicly available at: [https://gdpr.eu/ data-processing-agreement/](https://gdpr.eu/data-processing-agreement/)**

Intelligible Contract URI – FRBR Model

Evolution over the time

Work:

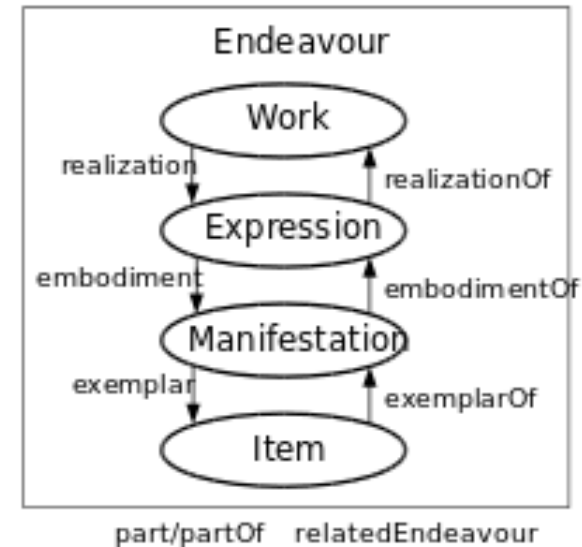
1. /akn/it/documentCollection/dpa/ company/2019-07-12/1

Expressions:

1. /akn/it/documentCollection/dpa/ company/2019-07-12/1/ita@2019-09-12
2. /akn/it/documentCollection/dpa/ company/2019-07-12/1/eng@2019-11-12/!main
3. /akn/it/documentCollection/dpa/ company/2019-07-12/1/eng@2019-11-12/!schedule_1

Manifestations:

1. /akn/it/documentCollection/contract/ company/2019-07-12/1/ita@2019-09-12/!main.akn
2. /akn/it/documentCollection/contract/ company/2019-07-12/1/eng@2019-11-12/!main.akn
3. /akn/it/documentCollection/contract/ company/2019-07-12/1/eng@2019-11-12/ !schedule_1.akn



UID
(URI+HASH_IPFS)

Document+
(UID + Document)

Context+ (UID +Legal
Context+ Operational Context)

Execution Report+
(UID+Document)

Document: Legal prose of DPA

Data Processing
(Template)

<recital>

<num>(C)</num>

<p>

The Parties ...*omissis*... in relation to data processing and with the <ref refersTo="#gdpr-expression" href="/akn/eu/act/regulation/eu/2016-04-05/679@2018-05-25"> Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 </ref> ...*omissis*... of the Directive 95/46/EC (General Data Protection Regulation).

</p>

</recital>



Manifestation IPLD



Tamper-proof



This data processing agreement is adapted from
Organizations may use the following document

Download a PDF version of this template

Data Processing Agree

This Data Processing Agreement ("Agreement"
Services ("Principal Agreement") between

(the "Company") and

UID
(URI+HASH_IPFS)

Document+
(UID + Document)

Context+ (UID +Legal
Context+ Operational Context)

Execution Report+
(UID+Document)

Auxiliary documents: Normative Reference

```
<recital>
```

```
<num>(C)</num>
```

```
<p>
```

The Parties ...omissis... in relation to data processing and with the **<ref href="/akn/eu/act/regulation/eu/2016-04-05/679@2018-05-25">** Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 **</ref>** ...omissis... of the Directive 95/46/EC (General Data Protection Regulation).

```
</p>
```

```
</recital>
```



Expression

```
<references source="#editor">  
  <TLCReference  
    GUID="gdpr-  
    expression" name="GDPR" showAs=  
    "General Data Protection Rule"  
    href="/akn/references/expression/eu/  
    /gdpr/ipfs/QmU...A3Nn">  
  </TLCReference>  
</references>
```

Manifestation

Tamper-proof



UID
(URI+HASH_IPFS)

Document+
(UID + Document)

Context+ (UID +Legal
Context+ Operational Context)

Execution Report+
(UID+Document)

Context: metadata and ontology

```
<TLCConcept eld="minor" showAs="minor"  
href="/akn/ontology/concept/gdrp/minor"  
refersTo="#minor-ontology" />  
<TLCReference  
GUID="minor-ontology" name="minor"  
showAs="minor-gdpr"  
href="/akn/references/expression/eu/gdpr/ipfs/srFm  
U...A3Nn">  
</TLCReference>
```

Metadata and
ontology

RDF



```
</references>  
...omissis...  
<meta>  
...omissis...  
<clause eId="cls_6">  
<heading>  
Users of the Service  
</heading>  
<content>  
<p>  
This Service is provided exclusively to individuals who  
are not <concept referstTo="#minor">minors</concept> and  
<concept refersTo="#livingInACountry">live in  
</concept> a <location refersTo="#eu">  
EU country </location> or in the  
<location refersTo="#us"> US </location>.  
</p>  
</content>  
</clause>  
...omissis...
```



Formal logic Legal Rules

```
<lrml:LegalReferences
refType="http://example.org/lrml#LegalSource">
<lrml:LegalReference
  refersTo="ref1"
  refID="/akn/eu/act/regulation/2016-04-27/2016-
679/eng@2018-05-25!/main#art_8__para_1"
  refIDSystemName="AkomaNtoso3.0-2017-06" />
</lrml:LegalReferences>
<lrml:LegalReference
  refersTo="ref2"
  refID="/akn/references/expression/eu/gdpr/ipfs/
QmU...A3Nn1"
  refIDSystemName="IPFS" />
</lrml:LegalReferences>
```

**Akoma Ntoso
manifestation UID**

```
<lrml:Statements >
<lrml:PrescriptiveStatement key="ps1">
  <ruleml:Rule key=":ruletemplate2"
closure="universal">
  <ruleml:if>
    <ruleml:Atom key=":atom1">
      <ruleml:Rel iri=":child" />
      <ruleml:Var >X</ruleml:Var>
    </ruleml:Atom>
  <ruleml:then>
    <lrml:Obligation iri=":obligation">
      <ruleml:Atom key=":atom6">
        <ruleml:Rel iri=":ObtainConsent" />
        <ruleml:Var >X</ruleml:Var>
        <ruleml:Var >Y</ruleml:Var>
        <ruleml:Var >S</ruleml:Var>
      </ruleml:Atom>
    </lrml:Obligation>
  </ruleml:then>
</ruleml:Rule>
</lrml:PrescriptiveStatement>
</lrml:Statements>
```

*Metadata with the
reference
to the legal text*



Manifestation IPLD



Tamper-proof



UID (URI+HASH_IPFS)

Document+
(UID + Document)

Context+
(UID +Legal Context+
Operational Context)

Execution_Reason+
(UID+Document)

Document of Components (AKN)

IPFS HASH

URI+IPFS

```
<recital>
  <num>(C)</num>
  <p>
    The Parties ...omissis... in relation to
    data processing and with the <ref
    refersTo="#gdpr-expression"
    href="/akn/eu/act/regulation/eu/2016-04-05/679@2018-05-25"> Regulation
    (EU) 2016/679 of the European
    Parliament and of the Council of 27
    April 2016 </ref> ...omissis... of the
    Directive 95/46/EC (General Data
    Protection Regulation).
  </p>
</recital>
```

```
<TLCConcept eld="minor" showAs="minor"
href="/akn/ontology/concept/gdpr/minor"
refersTo="#minor-ontology" />
<TLCReference
GUID="minor-ontology" name="minor"
showAs="minor-gdpr"
href="/akn/references/expression/eu/gdpr/ipfs/
srFmU...A3Nn">
</TLCReference>
```

URI+IPFS

```
<IrmI:Statements >
  <IrmI:PrescriptiveStatement key="ps1">
    <ruleml:Rule key="ruletemplate2"
    closure="universal">
      <ruleml:if>
        <ruleml:Atom key="atom1">
          <ruleml:Rel
          iri=":child" />
          <ruleml:Var
          >X</ruleml:Var>
          </ruleml:Atom>
          <ruleml:then>
            <IrmI:Obligation iri=":obligation">
              <ruleml:Atom
              key="atom6">
                <ruleml:Rel
                iri=":ObtainConsent" />
                <ruleml:Var
                >X</ruleml:Var>
                <ruleml:Var
                >Y</ruleml:Var>
                <ruleml:Var
                >S</ruleml:Var>
              </ruleml:Atom>
            </IrmI:Obligation>
          </ruleml:then>
        </ruleml:Rule>
      </IrmI:PrescriptiveStatement>
    </IrmI:Statements>
```

URI+IPFS

```
<references source="#editor">
  <TLCReference
  GUID="gdpr-expression" name="GDPR" showAs="General Data Protection Rule"
  href="/akn/references/expression/eu/gdpr/ipfs/QmU...A3Nn">
  </TLCReference>
</references>
```

URI+IPFS

- Component_1 URI+IPFS
- Component_2 URI+IPFS
- Component_3 URI+IPFS
- Component_4 URI+IPFS
- Component_5 URI+IPFS



0x3c9d00/cd02120ca52a2d/62c00a8taaat053/18cab5a2e1e98td2/8dct584/d

FROM ADDRESS	TO CONTRACT ADDRESS	GAS USED	VALUE
0x0c4E0286255622BcF5E1615e6724b5794F4976Ae	0x0dc3Fc30C05573374Ea2056bBcc4EB201EBE24AF	159355	2000000000000000

TX HASH
0xe4f38c6daad13203f0bc4ab02646c55413522c0488877a2d4686a44f3f2ddb2f

CONTRACT CALL

FROM ADDRESS	TO CONTRACT ADDRESS	GAS USED	VALUE
0x0c4E0286255622BcF5E1615e6724b5794F4976Ae	0xBe783142055018c4AB68863B58311Ea0a4f9007F	27023	0

TX HASH
0x65a48fc12ad419983b4a40f129c269b397517c5ac9c864d8e6a8f6625ae9cd3b

CONTRACT CREATION

FROM ADDRESS	CREATED CONTRACT ADDRESS	GAS USED	VALUE
0x0c4E0286255622BcF5E1615e6724b5794F4976Ae	0x0dc3Fc30C05573374Ea2056bBcc4EB201EBE24AF	2767753	0

TX HASH
0x16cd9f0a0a522e74569750feeff9ca28c749f9be645e428a53087eefcd1f46d5

CONTRACT CALL

FROM ADDRESS	TO CONTRACT ADDRESS	GAS USED	VALUE
0x0c4E0286255622BcF5E1615e6724b5794F4976Ae	0xBe783142055018c4AB68863B58311Ea0a4f9007F	42023	0

TX HASH
0x15f0de410210324f0895614400d00a81a179e19aa75159bab5f7455c28afd916

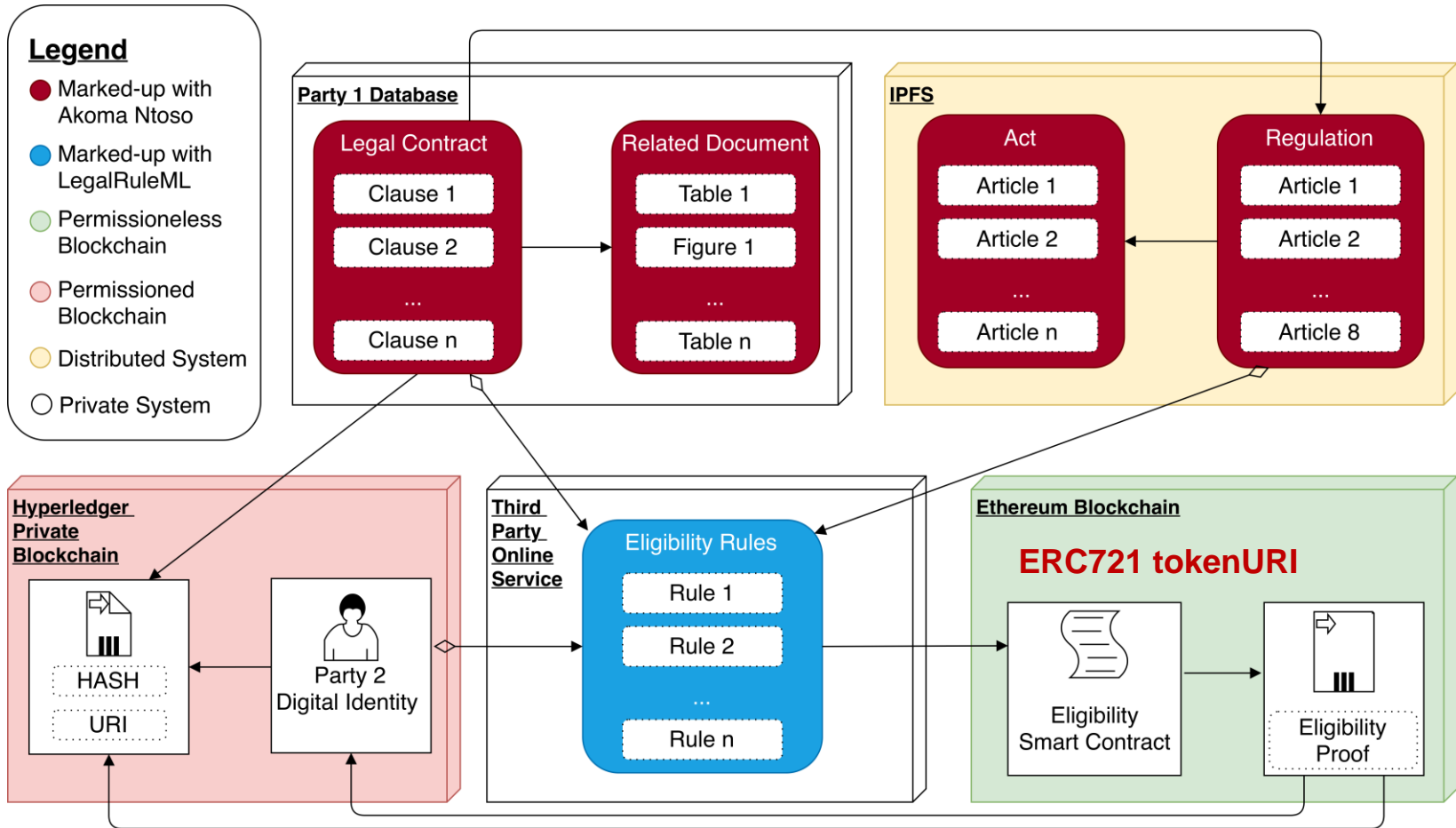
CONTRACT CREATION

FROM ADDRESS	CREATED CONTRACT ADDRESS	GAS USED	VALUE
0x0c4E0286255622BcF5E1615e6724b5794F4976Ae	0xBe783142055018c4AB68863B58311Ea0a4f9007F	261393	0

```
<!-- lifecycle -->  
<eventRef eId="gen_s_1_ep_1" date="01-10-2020" source="#process" type="generation"/>  
</lifecycle>  
<!-- references -->  
<TLCProcess GUID="process" href="/ipfs/processes/smartContract/0x0dc3Fc30C05573374Ea2056bBcc4EB201EBE24AF" showAs="The smart contract of the Catasto"/>  
<TLCProcess GUID="normativa italiana" href="/ipfs/processes/normative/systems/ita/normativa-italiana" showAs="The Italian normative system"/>  
<TLCOrganization GUID="fao" href="/ipfs/organizations/un/fao" showAs="The FAO"/>  
<TLCOrganization GUID="efsa" href="/ipfs/organizations/eu/efsa" showAs="The EFSA"/>  
</references>  
</meta>  
<mainBody>  
<section eId="sec_1">  
<num>1</num>
```



Architecture



Conclusions and Future Works

- **Intelligible Contracts fill several technical and legal gaps on using digital contracts in blockchains.**
- **Intelligible Contracts help:**
 - **to analyze lack of willingness** in parties
 - to analyze **liability** in case of **torts**
 - to **overcome limitations** caused by the **immutability of Blockchains** (by **supplying a versioning system** inherited with the adoption of **Akoma Ntoso** and its naming convention)
 - To explain the execution of the smart contract
- In the **future** we plan:
 - **to model and implement full real-world scenario** in order to analyze pros and contra of our approach.
 - **to investigate benefits or limitations** of Intelligible Contracts in relation to specific blockchain environments (i.e. **permissioned** vs. **permissionless**)
 - to further customize **Akoma Ntoso** for better modelling of **the concepts of contracts** according to private law theory
 - to address the **standardisation of operational code** that executes **Intelligible Contracts** on blockchains
 - to **validate the LegalRuleML** rules before to implement the Smart Contract



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