Aquaforest
A PSPDFKit Company

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PDF Days Europe 2022 | Berlin

Smart Legal Contracts and PDF

Does PDF have a role to play in the world of Digital Contracts, Blockchain and Crypto-Assets?

Neil Pitman, Aquaforest Limited

Agenda

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- 1. Contracts and PDF
- 2. Smart Contracts
- 3. Smart Legal Contracts
- 4. The Future: Smart Legal Contracts and PDF

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1. Contracts and PDF

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Contracts and Smart Contracts

Mesopotamia 4,000 Years Ago

London 1920

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Before Word Processing and Email

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Action	*How to mark up?*
	shows some of its fantastic possibilities.
Move text	**Upgrading your model contracts**. When you are about to improve the model contracts used across your organisation, this booklet may be helpful to learn from the lessons we learnt. Lots of things can go wrong if you just follow your intuition. Inside, we give you some guidelines.
Insert rider	RIDER 1
Cut (or copy) text	copy A **Contract assembly**. Our most eye-catching service is the Weagree Wizard, an extremely user-friendly software application for drafting contracts. It allows you to assemble contracts from a set of (your) contract building blocks. Its vigorous Q&A-functionality helps you make the right choices and inserts the right language in the right places.
Insert text (*i.e.*, use tagging 'A', 'B' etc. when insertion takes place on another page)	**Contract assembly**. Our most eye-catching service is the Weagree Wizard, ~~a nice computer program~~. Its vigorous Q&A-functionality helps you make the right choices and inserts the right language in the right places. paste A
Make alignment consistent	accellerated and powerful contract drafting accelerated contract drafting accelerated contract drafting accelerated drafting contract

resulting in a high quality contract

Renumber	2.1	This paragraph goes out and therefore the following should renumber.
	2.2	Because the previous paragraph goes out this one must renumber.
Bold	bold	As regards Weagree's model contract upgrading services, you might be somewhat suspicious: this booklet may serve as evidence of the quality of work Weagree offers.
Italic	italics	
Ignore marked changes	STET	This booklet shows ~~only a few of~~ the fantastic possibilities of the Weagree Wizard.
Attention marker	✓	We tell you that writing *and/or* is thoughtlessly ridiculous. Furthermore, the booklet introduces many other drafting notions and contains plenty of best practice rules, for example on the use of defined terms and definitions. Enjoy!

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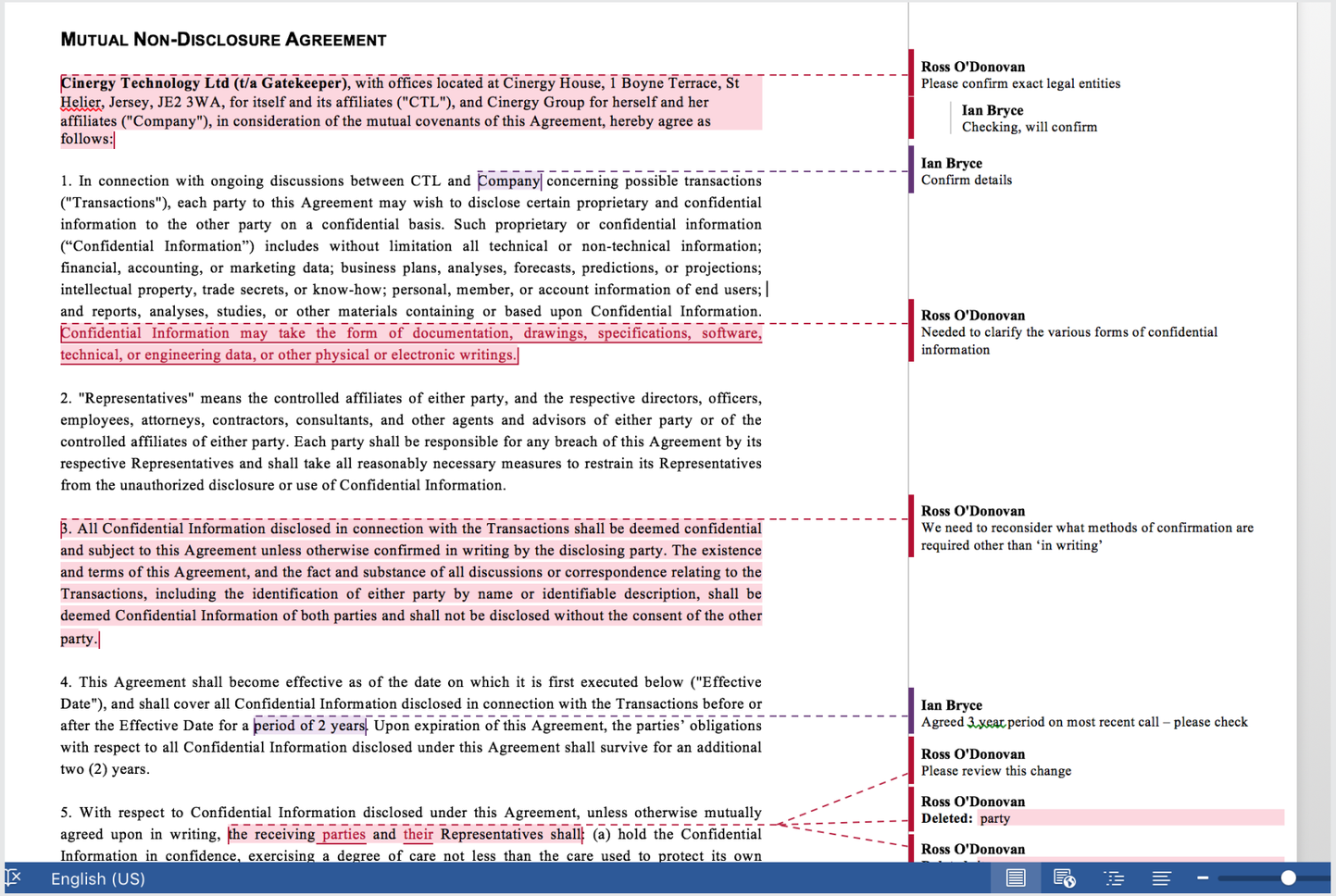
Word and PDF



MUTUAL NON-DISCLOSURE AGREEMENT

Cinergy Technology Ltd (t/a Gatekeeper), with offices located at Cinergy House, 1 Boyne Terrace, St Helier, Jersey, JE2 3WA, for itself and its affiliates ("CTL"), and Cinergy Group for herself and her affiliates ("Company"), in consideration of the mutual covenants of this Agreement, hereby agree as follows:

1. In connection with ongoing discussions between CTL and Company concerning possible transactions ("Transactions"), each party to this Agreement may wish to disclose certain proprietary and confidential information to the other party on a confidential basis. Such proprietary or confidential information ("Confidential Information") includes without limitation all technical or non-technical information; financial, accounting, or marketing data; business plans, analyses, forecasts, predictions, or projections; intellectual property, trade secrets, or know-how; personal, member, or account information of end users; and reports, analyses, studies, or other materials containing or based upon Confidential Information. Confidential Information may take the form of documentation, drawings, specifications, software, technical, or engineering data, or other physical or electronic writings.

2. "Representatives" means the controlled affiliates of either party, and the respective directors, officers, employees, attorneys, contractors, consultants, and other agents and advisors of either party or of the controlled affiliates of either party. Each party shall be responsible for any breach of this Agreement by its respective Representatives and shall take all reasonably necessary measures to restrain its Representatives from the unauthorized disclosure or use of Confidential Information.

3. All Confidential Information disclosed in connection with the Transactions shall be deemed confidential and subject to this Agreement unless otherwise confirmed in writing by the disclosing party. The existence and terms of this Agreement, and the fact and substance of all discussions or correspondence relating to the Transactions, including the identification of either party by name or identifiable description, shall be deemed Confidential Information of both parties and shall not be disclosed without the consent of the other party.

4. This Agreement shall become effective as of the date on which it is first executed below ("Effective Date"), and shall cover all Confidential Information disclosed in connection with the Transactions before or after the Effective Date for a period of 2 years. Upon expiration of this Agreement, the parties' obligations with respect to all Confidential Information disclosed under this Agreement shall survive for an additional two (2) years.

5. With respect to Confidential Information disclosed under this Agreement, unless otherwise mutually agreed upon in writing, the receiving parties and their Representatives shall: (a) hold the Confidential Information in confidence, exercising a degree of care not less than the care used to protect its own

Ross O'Donovan
Please confirm exact legal entities

Ian Bryce
Checking, will confirm

Ian Bryce
Confirm details

Ross O'Donovan
Needed to clarify the various forms of confidential information

Ross O'Donovan
We need to reconsider what methods of confirmation are required other than 'in writing'

Ian Bryce
Agreed 3 year period on most recent call – please check

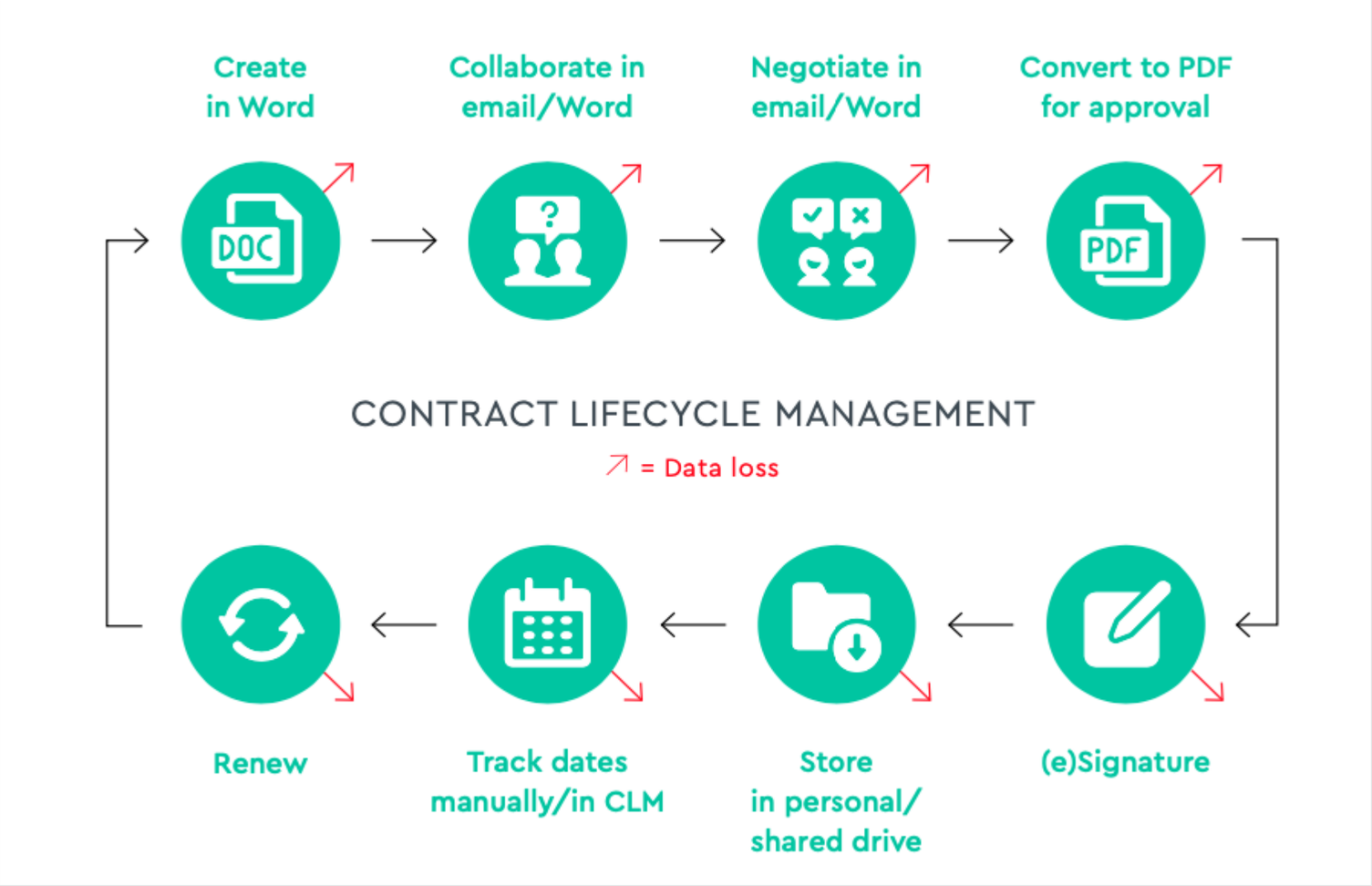
Ross O'Donovan
Please review this change

Ross O'Donovan
Deleted: party

Ross O'Donovan

English (US)

Today's Typical Contract Workflows



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Challenges and Solutions

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- Challenges
  - What is in the contracts?
  - Identifying legal obligations
  - Transaction / negotiation history
  - Renewal dates
- Solutions
  - Contract Analytics NLP/AI
  - Contract Lifecycle Management

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Contract Analysis

- A contract review tool analyses the documents and attempts to tag (and thus structure) the unstructured data within.

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Contract Lifecycle Management

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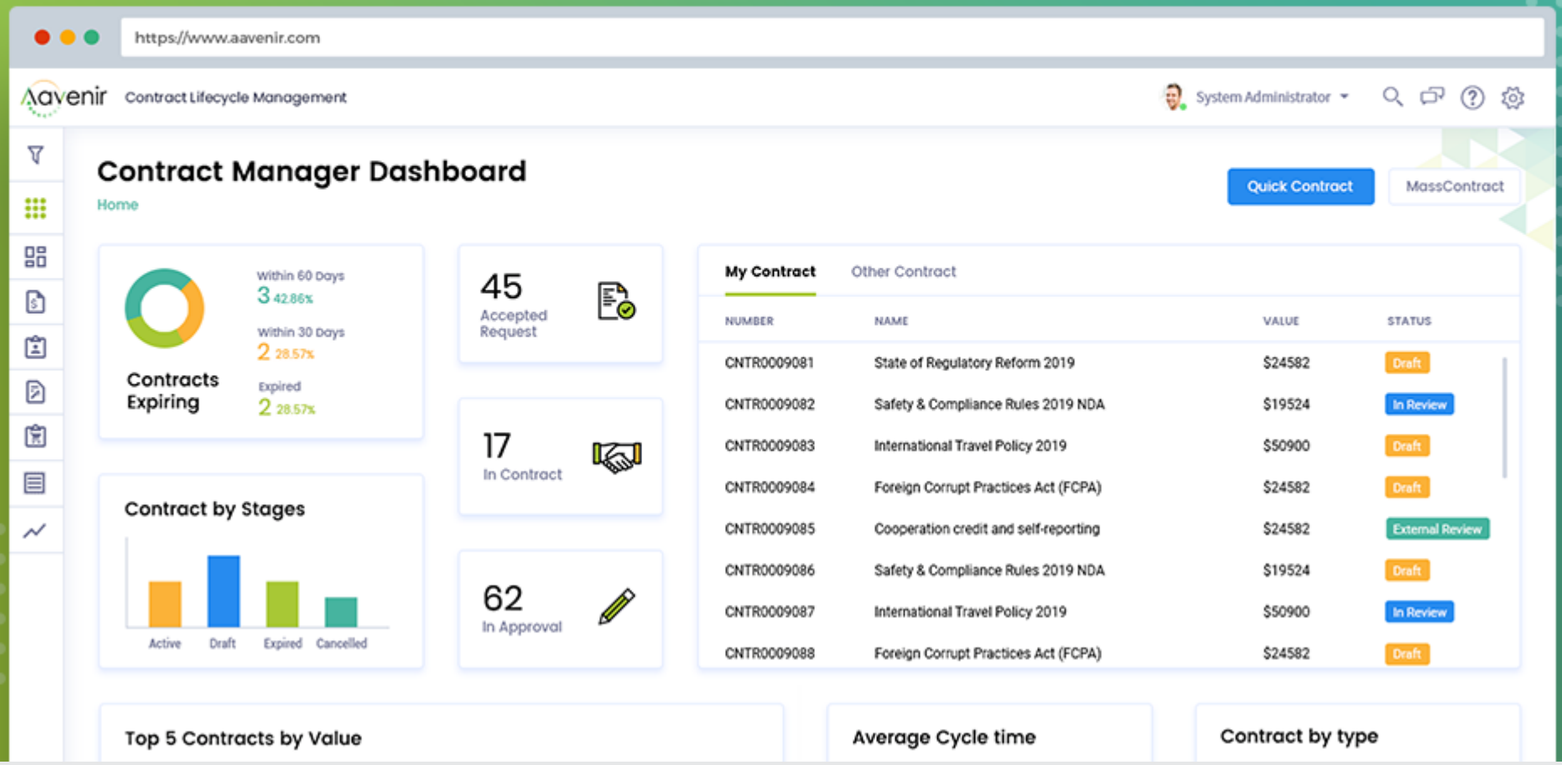
Dashboard



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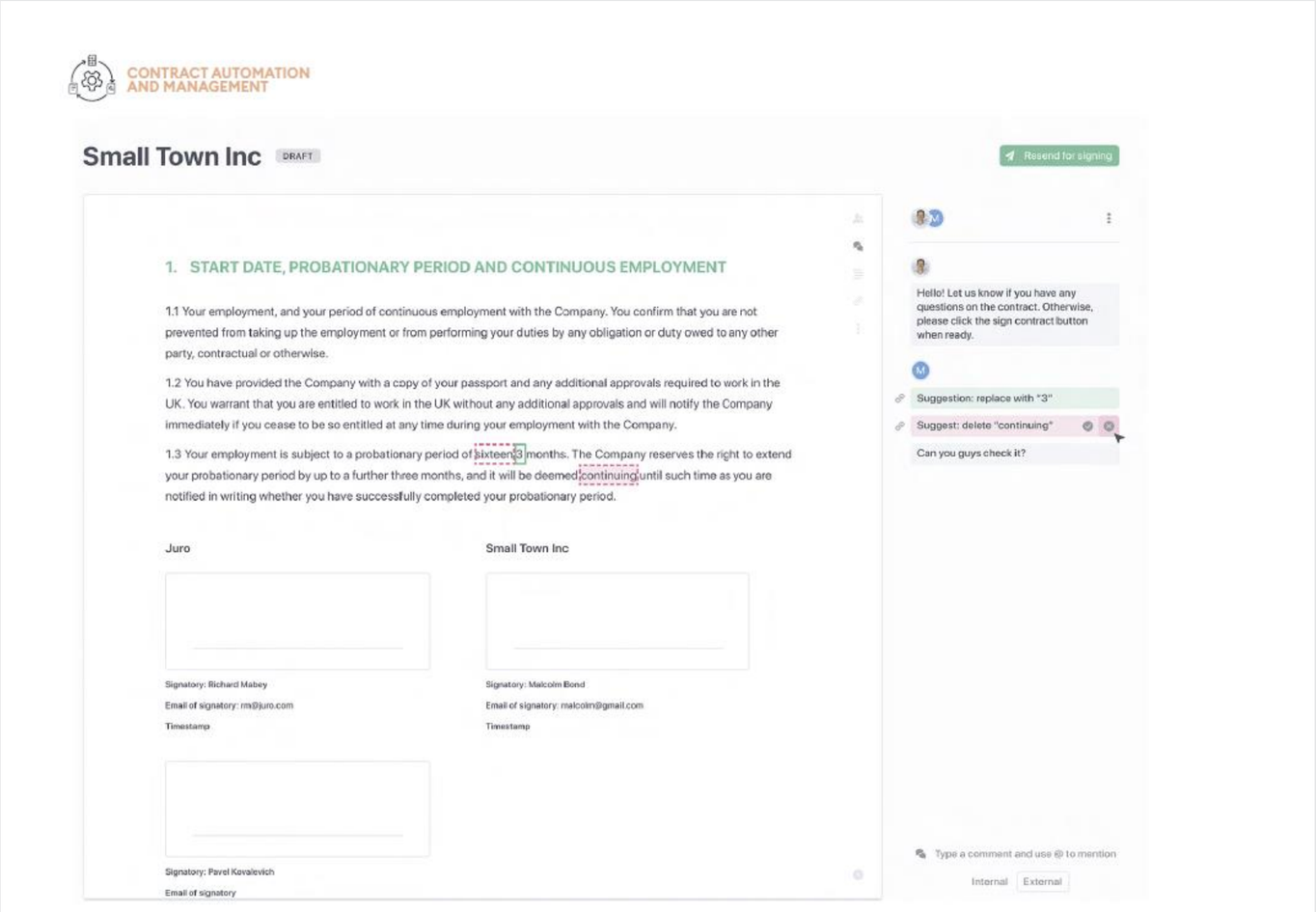
Browser-based Collaboration



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The Role of PDF in Contracts Today

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- Downstream, final form standard.
- Signed
- PDF/A
- Typically text only, no structured data.

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“Digital Paper” is no longer enough

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“We still approach contracts in much the same way as we have done for centuries. Decades old software such as PDF and Microsoft Word is used to create and store agreements in a digital format, but they are basically digital copies of paper documents. This fails to take advantage of technology that allows for dynamic data access and streamlined contracting.”

(Source: UK Lawtech)

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2. Smart Contracts

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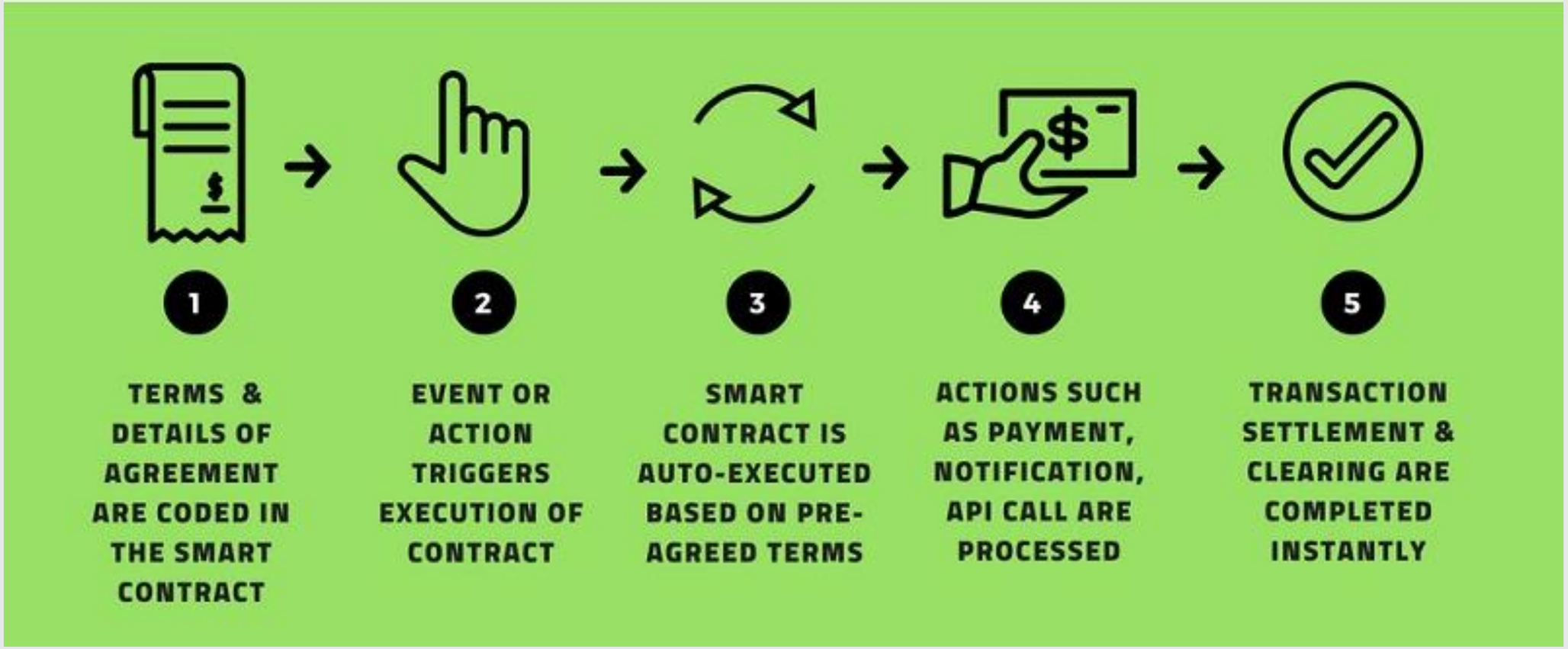

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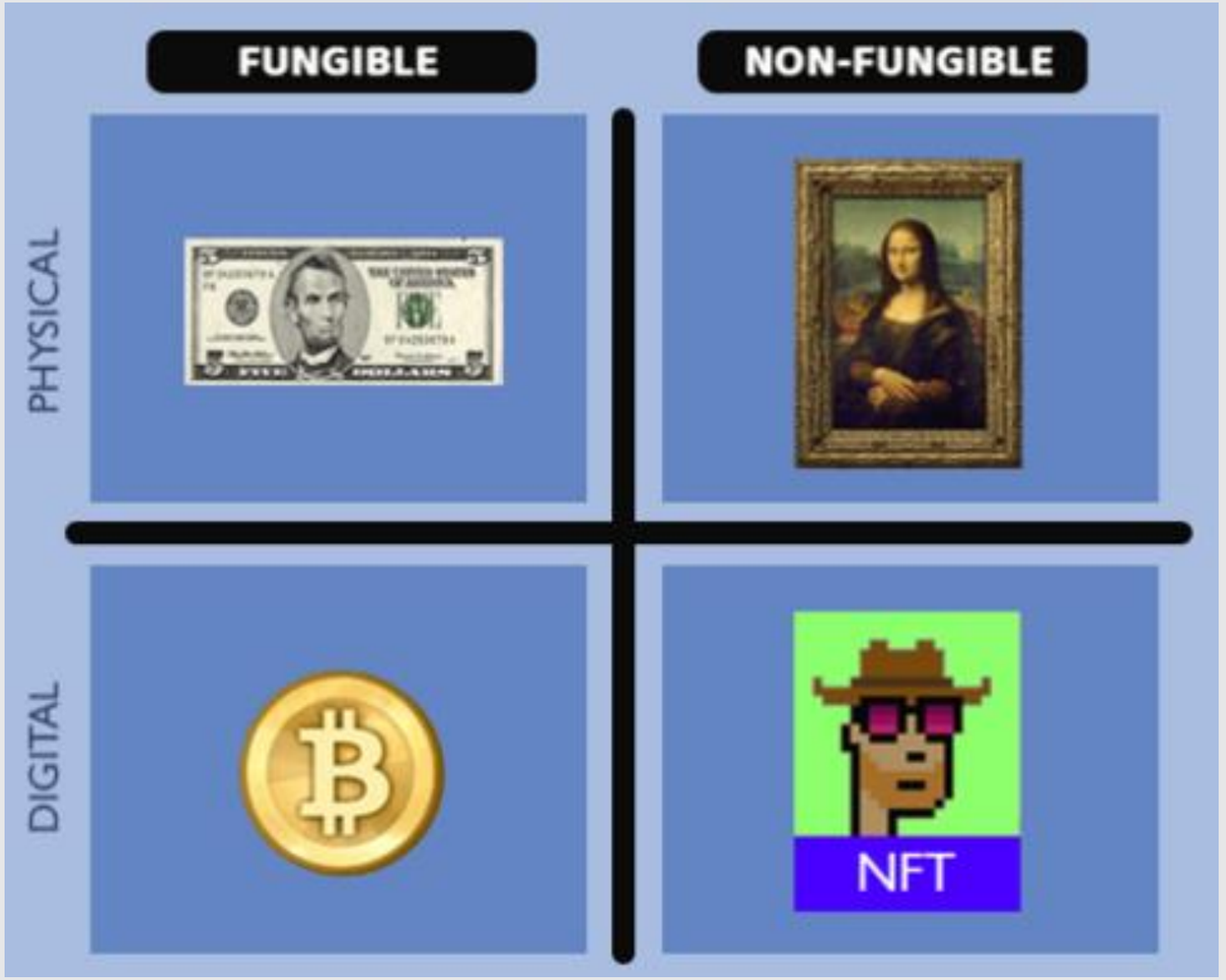
Non-Fungible Tokens (NFTs)



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$Millions for a JPEG?

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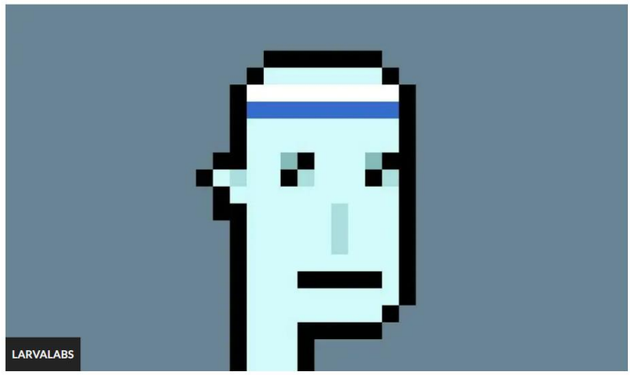
5. CryptoPunk #5822 — $23.7m

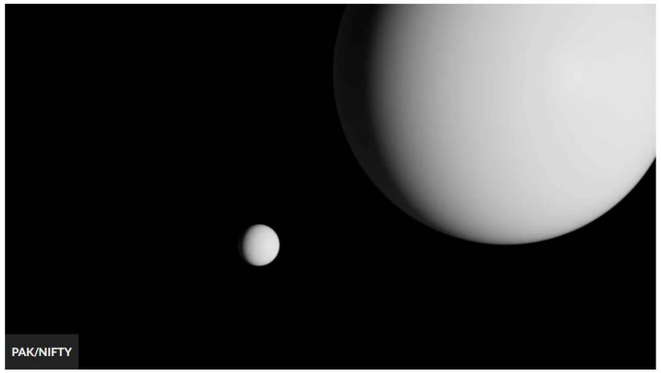
8. CryptoPunk #3100 — $7.67m



3. Clock — $52.7m

2. Everydays: the First 5000 Days — $69.3m

1. Pak's 'The Merge' — $91.8m



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Crypto-Assets

- Cryptoassets are cryptographically secured digital representations of value or contractual rights that use some type of distributed ledger technology (DLT) and can be transferred, stored or traded electronically.
- A cryptoasset is any digital asset that uses cryptographic technologies to maintain its operation as a currency or decentralized application.

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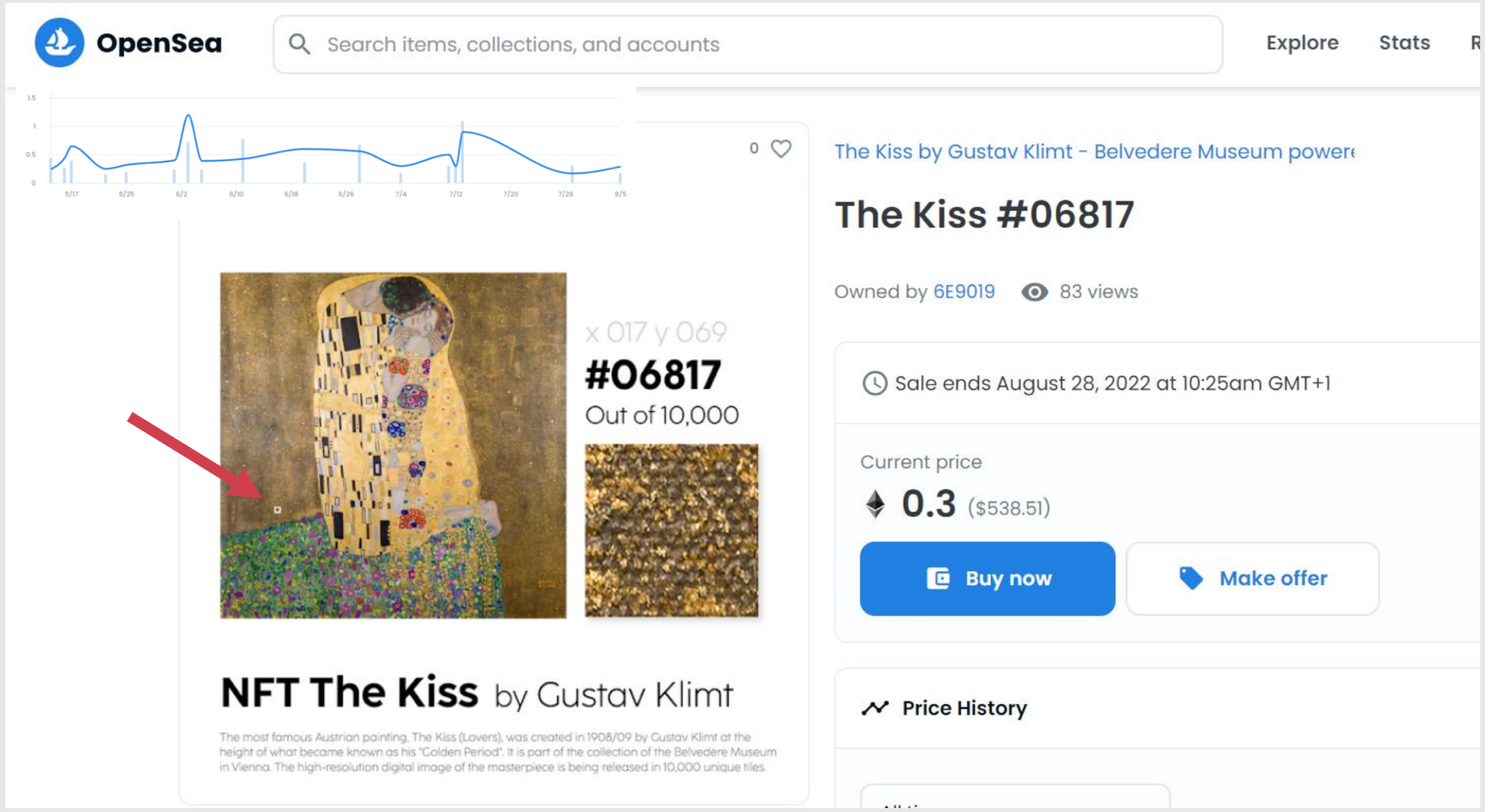
Belvedere Museum Example



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Wallet and Etherscan Example

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Transaction Details

Feature Tip: Add private address tag to any address under My Name Tag !

Overview | Logs (1) | State | Comments

Transaction Hash:	0xd91b76e0c10b27e703702d44db6f416fad1ef9e0a903cef2001c07312b049aab
Status:	Success
Block:	14620850 687191 Block Confirmations
Timestamp:	111 days 4 hrs ago (Apr-20-2022 08:32:27 AM +UTC) | Confirmed within 30 secs
Transaction Action:	Mint of Hydro Whales... (HWMC) To 0xed66c4fa40c76515ac646b372c87b76547e5fc18 1 of Token ID [811]
From:	0xed66c4fa40c76515ac646b372c87b76547e5fc18
Interacted With (To):	Contract 0xba72b008d53d3e65f6641e1d63376be2f9c1ad05
Tokens Transferred:	From Null Address: 0x00... To 0xed66c4fa40c76... For ERC-721 Token ID [811] Hydro Whales... (HWMC)
Value:	0.115 Ether ($196.92)
Transaction Fee:	0.002977460152960664 Ether ($5.10)
Gas Price:	0.000000035161730216 Ether (35.161730216 Gwei)
Ether Price:	$3,077.74 / ETH

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DLT and Blockchain

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Smart Contract Code

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Contract Source Code Verified (Exact Match)

Contract Name:	**HydroWhales**	Optimization Enabled:	**Yes** with **200** runs
Compiler Version	**v0.8.9+commit.e5eed63a**	Other Settings:	**default** evmVersion

Contract Source Code (Solidity Standard Json-Input format)

More Options

File 1 of 14 : HydroWhales.sol

```
1  // SPDX-License-Identifier: MIT
2
3  pragma solidity >=0.8.9 <0.9.0;
4
5  import 'erc721a/contracts/ERC721A.sol';
6  import '@openzeppelin/contracts/access/Ownable.sol';
7  import '@openzeppelin/contracts/utils/cryptography/MerkleProof.sol';
8  import '@openzeppelin/contracts/security/ReentrancyGuard.sol';
9
10 contract HydroWhales is ERC721A, Ownable, ReentrancyGuard {
11
12   using Strings for uint256;
13
14   bytes32 public merkleRoot;
15   mapping(address => bool) public whitelistClaimed;
16
17   string public uriPrefix = '';
18   string public uriSuffix = '.json';
19   string public hiddenMetadataUri;
20
21   uint256 public cost;
22   uint256 public maxSupply;
23   uint256 public maxMintAmountPerTx;
24
25   bool public paused = true;
```

File 6 of 14 : IERC721.sol

```
1  // SPDX-License-Identifier: MIT
2  // OpenZeppelin Contracts v4.4.1 (token/ERC721/IERC721.sol)
3
4  pragma solidity ^0.8.0;
5
6  import "../../utils/introspection/IERC165.sol";
7
8  /**
9   * @dev Required interface of an ERC721 compliant contract.
10  */
11 interface IERC721 is IERC165 {
12     /**
13      * @dev Emitted when `tokenId` token is transferred from `from` to `to`.
14      */
15     event Transfer(address indexed from, address indexed to, uint256 indexed tokenId);
16
17     /**
18      * @dev Emitted when `owner` enables `approved` to manage the `tokenId` token.
19      */
20     event Approval(address indexed owner, address indexed approved, uint256 indexed tokenId);
21
22     /**
23      * @dev Emitted when `owner` enables or disables (`approved`) `operator` to manage all of its assets.
24      */
25     event ApprovalForAll(address indexed owner, address indexed operator, bool approved);
```

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Interplanetary File System (IPFS)

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Details

Contract Address	0xba72...ad05
Token ID	811
Token Standard	ERC-721
Blockchain	Ethereum
Creator Earnings	7.5%

"name": "Hydro Whales Mining Club #811",
"description": “……”
"image": "ipfs://QmR3Te9VzPfApGD1kWVVBXfLvaM58juavQMzrzEhp7ABjG/811.png",
"dna": "8d655fb366a592ad2d17d1ebf1d4c8db93d0fd67",
"edition": "811",
.....

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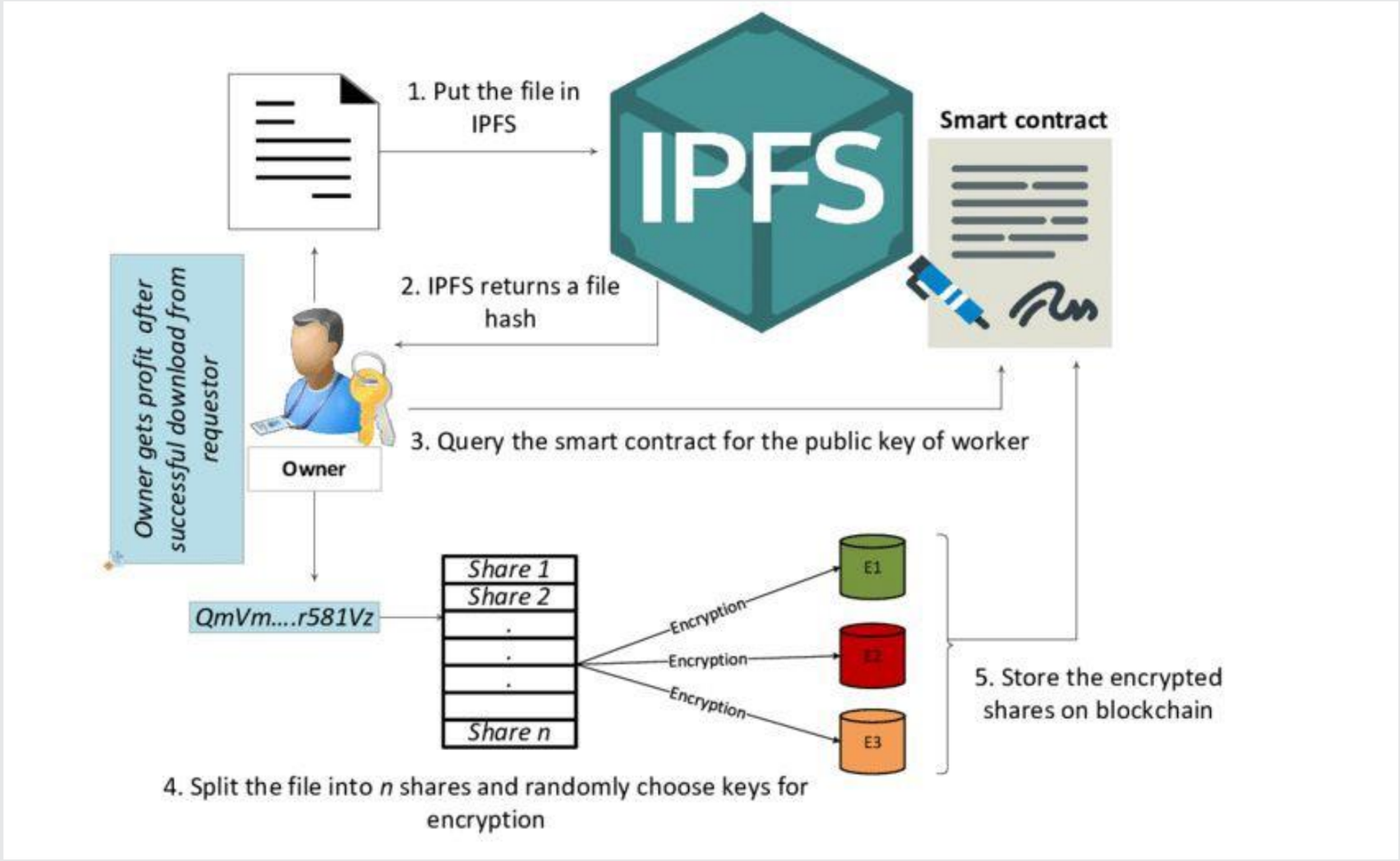
IPFS

- IPFS is a distributed system for storing and accessing files, websites, applications, and data.



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3. Smart Legal Contracts

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Smart Contracts vs Smart Legal Contracts

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- Smart Contract :
  - computer code that, upon the occurrence of a specified condition or conditions, runs on a distributed ledger (or blockchain).
- Smart Legal Contract
  - A legally binding, digital agreement in which part or all of the agreement is intended to execute as algorithmic instructions.

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Smart Legal Contract Layers

- Visual Representation
- Data
- Automation Logic

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Visual Representation Layer

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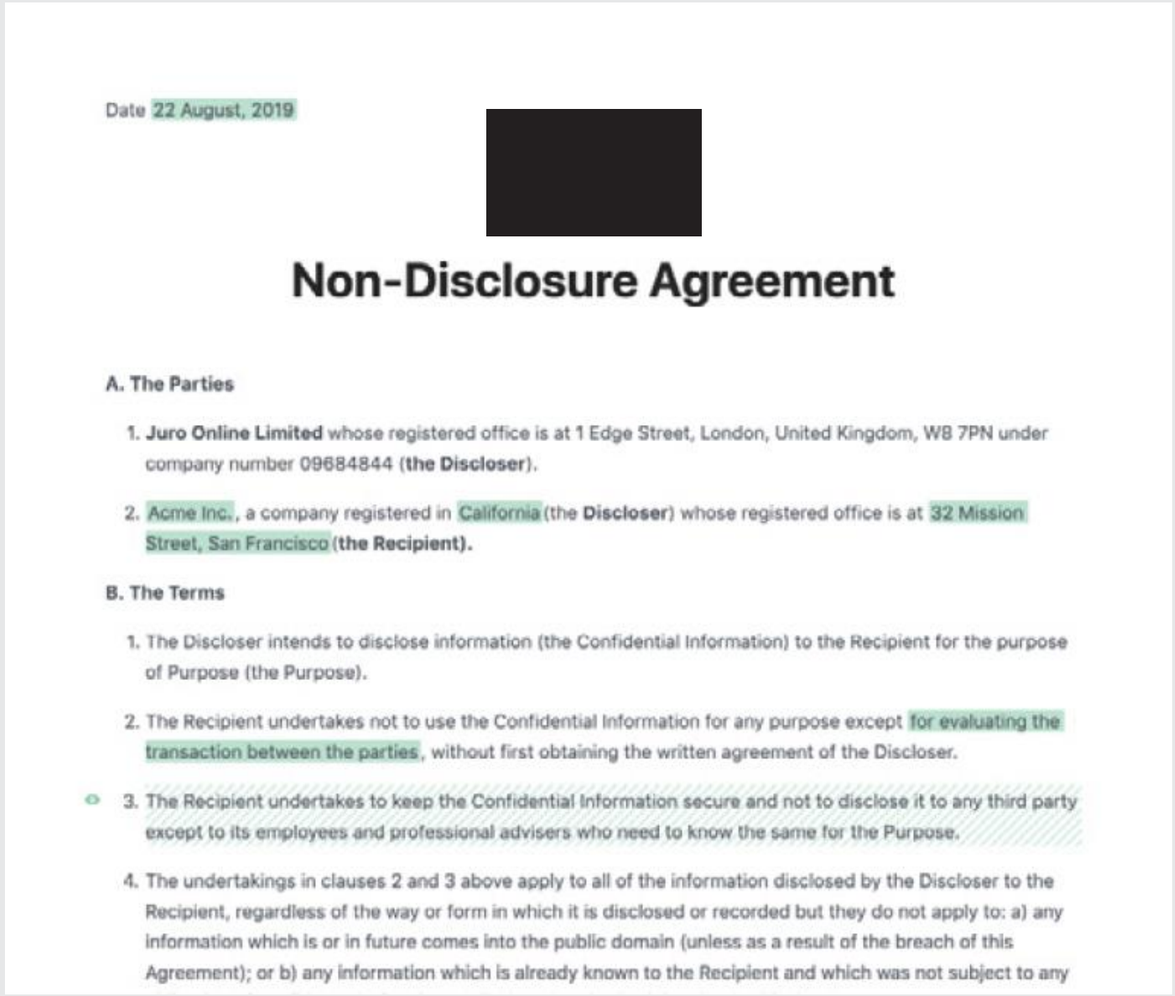
- Recognizable as a “Contract”
  - Clauses, signatures etc
- Visually Responsive
  - Desktop
  - Mobile
  - Tablet



Date 22 August, 2019

[redacted]

Non-Disclosure Agreement

A. The Parties

1. **Juro Online Limited** whose registered office is at 1 Edge Street, London, United Kingdom, W8 7PN under company number 09684844 (**the Discloser**).
2. Acme Inc., a company registered in California (the **Discloser**) whose registered office is at 32 Mission Street, San Francisco (**the Recipient**).

B. The Terms

1. The Discloser intends to disclose information (the Confidential Information) to the Recipient for the purpose of Purpose (the Purpose).
2. The Recipient undertakes not to use the Confidential Information for any purpose except for evaluating the transaction between the parties, without first obtaining the written agreement of the Discloser.
3. The Recipient undertakes to keep the Confidential Information secure and not to disclose it to any third party except to its employees and professional advisers who need to know the same for the Purpose.
4. The undertakings in clauses 2 and 3 above apply to all of the information disclosed by the Discloser to the Recipient, regardless of the way or form in which it is disclosed or recorded but they do not apply to: a) any information which is or in future comes into the public domain (unless as a result of the breach of this Agreement); or b) any information which is already known to the Recipient and which was not subject to any

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Data Layer

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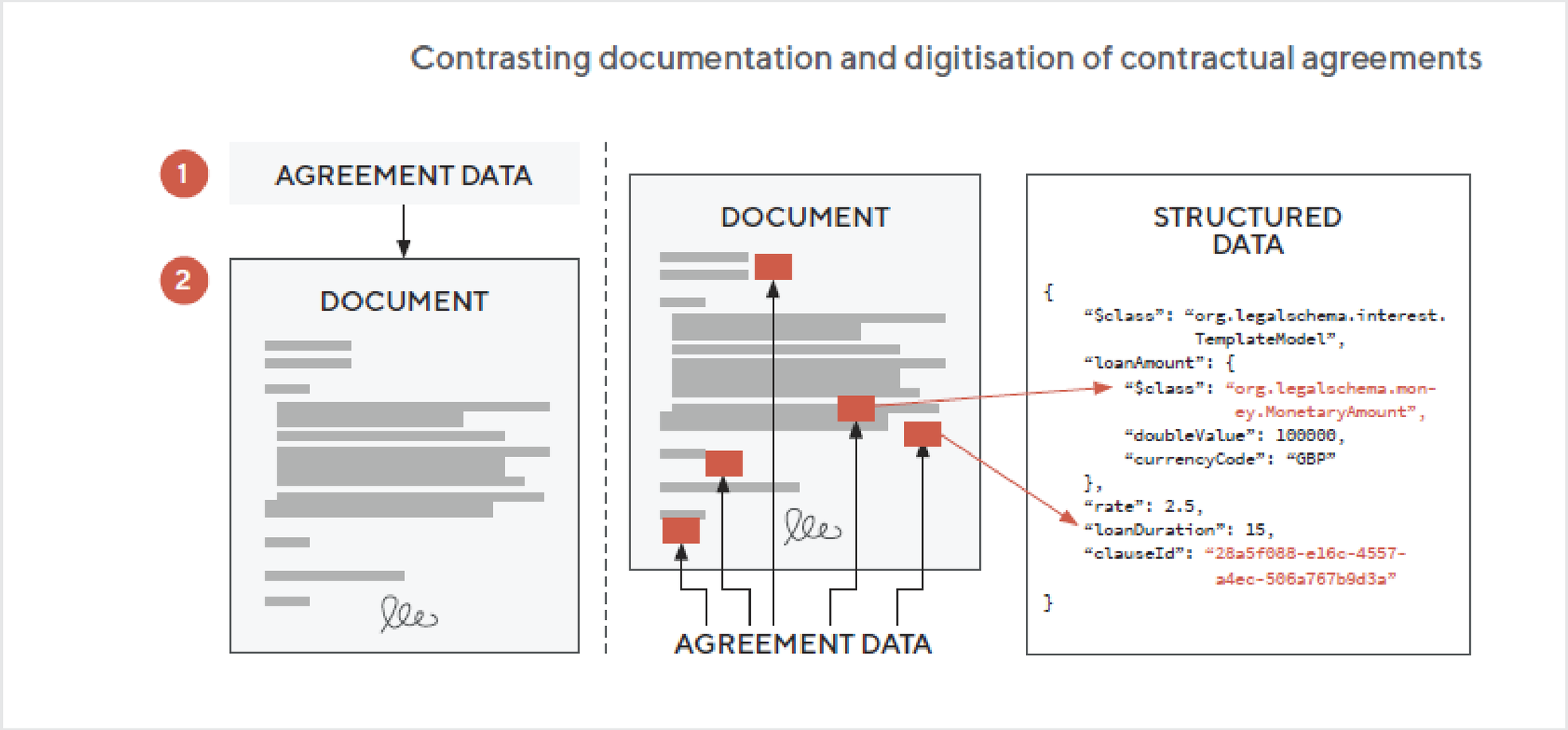

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Data Layer Schema

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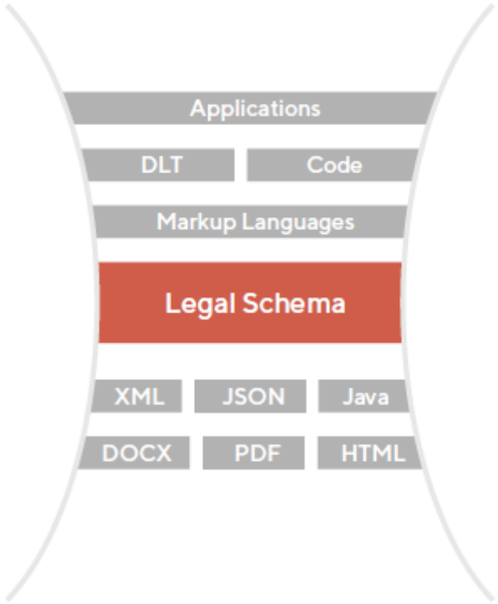
Position of the schema within a contract technology stack




```
{
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    “contractId”: “1f3a4329-6a99-4c2d-86b5-febe0815823a”,
    “buyer”: {
        “$class”: “org.legalschema.contract.Party”,
        “partyId”: “Alice”
    },
    “seller”: {
        “$class”: “org.legalschema.contract.Party”,
        “partyId”: “Bob”
    },
    “amount”: {
        “$class”: “org.legalschema.money.MonetaryAmount”,
        “value”: 100.00,
        “currencyCode”: “GBP”
    }
}
```

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Logic Layer

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Use Cases

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Digital Bill of Lading

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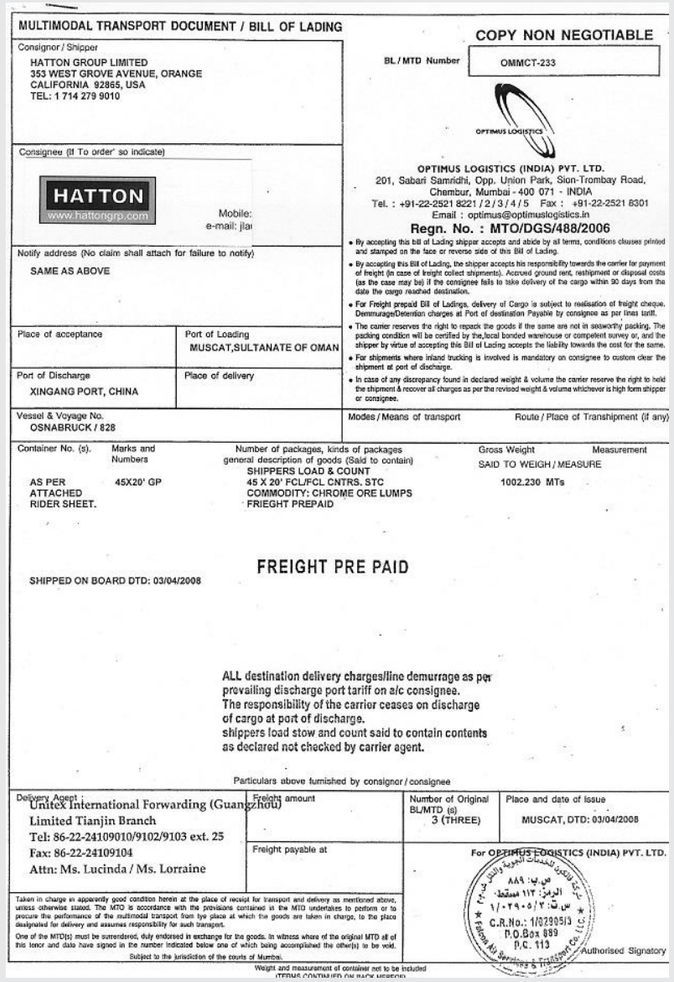


MULTIMODAL TRANSPORT DOCUMENT / BILL OF LADING

COPY NON NEGOTIABLE

Consignor / Shipper
HATTON GROUP LIMITED
353 WEST GROVE AVENUE, ORANGE
CALIFORNIA 92865, USA
TEL: 1 714 279 9010

BL / MTD Number: OMMCT-233

OPTIMUS LOGISTICS (INDIA) PVT. LTD.
201, Sabari Samridhi, Opp. Union Park, Sion-Trombay Road,
Chembur, Mumbai - 400 071 - INDIA
Tel. : +91-22-2521 8221 / 2 / 3 / 4 / 5 Fax : +91-22-2521 8301
Email : optimus@optimuslogistics.in
Regn. No. : MTO/DGS/488/2006

Consignee (If To order' so indicate)
HATTON
www.hattongrp.com
Mobile:
e-mail: jla

Notify address (No claim shall attach for failure to notify)
SAME AS ABOVE

Place of acceptance	Port of Loading
	MUSCAT,SULTANATE OF OMAN
Port of Discharge	Place of delivery
XINGANG PORT, CHINA	

Vessel & Voyage No.
OSNABRUCK / 828

Modes / Means of transport | Route / Place of Transhipment (if any)

Container No. (s).	Marks and Numbers	Number of packages, kinds of packages general description of goods (Said to contain)	Gross Weight	Measurement
AS PER ATTACHED RIDER SHEET.	45X20' GP	SHIPPERS LOAD & COUNT 45 X 20' FCL/FCL CNTRS. STC COMMODITY: CHROME ORE LUMPS FRIEGHT PREPAID	SAID TO WEIGH / MEASURE 1002.230 MTs	

FREIGHT PRE PAID

SHIPPED ON BOARD DTD: 03/04/2008

ALL destination delivery charges/line demurrage as per prevailing discharge port tariff on a/c consignee.
The responsibility of the carrier ceases on discharge of cargo at port of discharge.
shippers load stow and count said to contain contents as declared not checked by carrier agent.

Particulars above furnished by consignor / consignee

Delivery Agent: Unitex International Forwarding (Guangzhou) Limited Tianjin Branch
Tel: 86-22-24109010/9102/9103 ext. 25
Fax: 86-22-24109104
Attn: Ms. Lucinda / Ms. Lorraine

Freight amount

Freight payable at

Number of Original BL/MTD (s): 3 (THREE)

Place and date of issue: MUSCAT, DTD: 03/04/2008

For OPTIMUS LOGISTICS (INDIA) PVT. LTD.

C.R.No.: 1/0290513
P.O.Box 889
P.C. 113

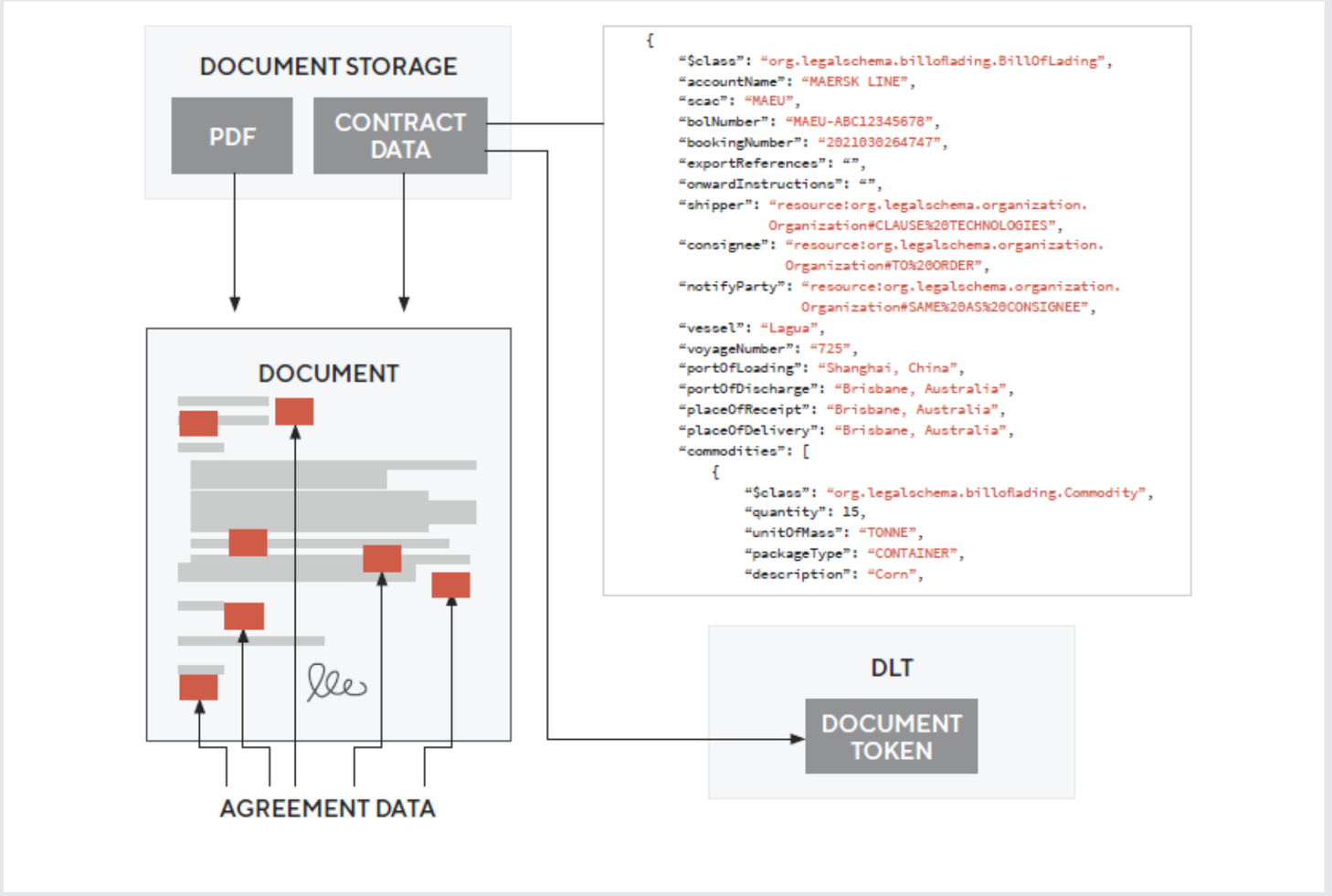
Authorised Signatory

Taken in charge in apparently good condition herein at the place of receipt for transport and delivery as mentioned above, unless otherwise stated. The MTO in accordance with the provisions contained in the MTO undertakes to perform or to procure the performance of the multimodal transport from tye place at which the goods are taken in charge, to the place designated for delivery and assumes responsibility for such transport.

One of the MTD(s) must be surrendered, duly endorsed in exchange for the goods. In witness where of the original MTD all of this tenor and date have signed in the number indicated below one of which being accomplished the other(s) to be void.

Subject to the jurisdiction of the courts of Mumbai.

Weight and measurement of container not to be included




```
{
    "$class": "org.legalschema.billoflading.BillOfLading",
    "accountName": "MAERSK LINE",
    "scac": "MAEU",
    "bolNumber": "MAEU-ABC12345678",
    "bookingNumber": "2021030264747",
    "exportReferences": "",
    "onwardInstructions": "",
    "shipper": "resource:org.legalschema.organization.
        Organization#CLAUSE%20TECHNOLOGIES",
    "consignee": "resource:org.legalschema.organization.
        Organization#TO%20ORDER",
    "notifyParty": "resource:org.legalschema.organization.
        Organization#SAME%20AS%20CONSIGNEE",
    "vessel": "Lagua",
    "voyageNumber": "725",
    "portOfLoading": "Shanghai, China",
    "portOfDischarge": "Brisbane, Australia",
    "placeOfReceipt": "Brisbane, Australia",
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    "commodities": [
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            "$class": "org.legalschema.billoflading.Commodity",
            "quantity": 15,
            "unitOfMass": "TONNE",
            "packageType": "CONTAINER",
            "description": "Corn",
```


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Smart Cargo

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“SmartCo”

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Companies House

CS01 (ef)

Confirmation Statement

Company Name: **AQUAFOREST LTD**
Company Number: **04344383**

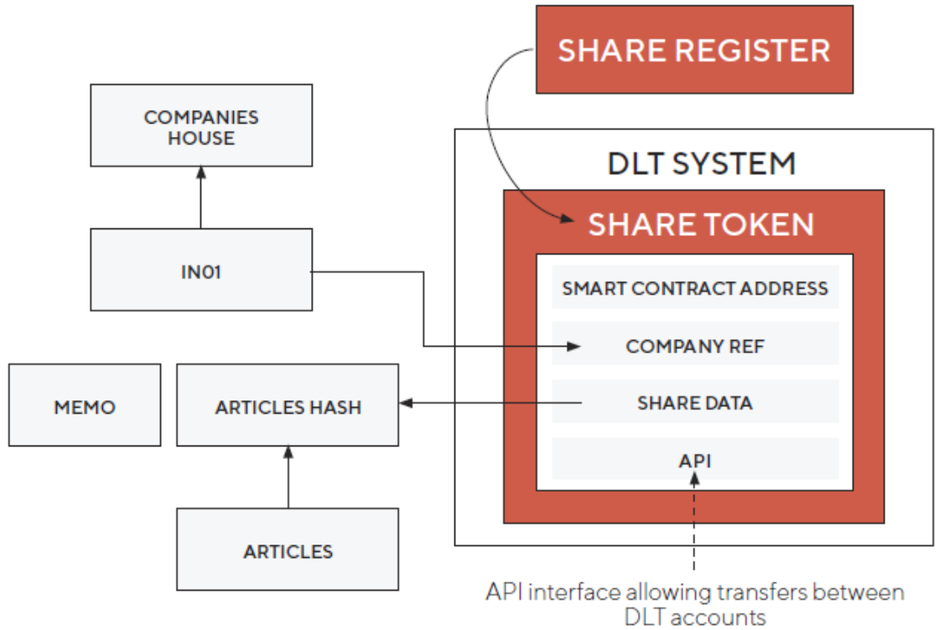
Received for filing in Electronic Format on the: **21/12/2021**

XAJSHZZU

Company Name: **AQUAFOREST LTD**

Company Number: **04344383**

Confirmation Statement date: **21/12/2021**



Share Data includes:

- Unique ID – On-chain address + company reference taken from IN01 data from CH
- Share class and nominal value - link to the section in articles or the filed share class particulars which set out the rights of that class.
- Date of issue/transfer.
- Shareholder address - the recipient DLT address of the share from the on-chain contract that creates the shares
- The extent to which the shares are paid up (assume fully paid up)

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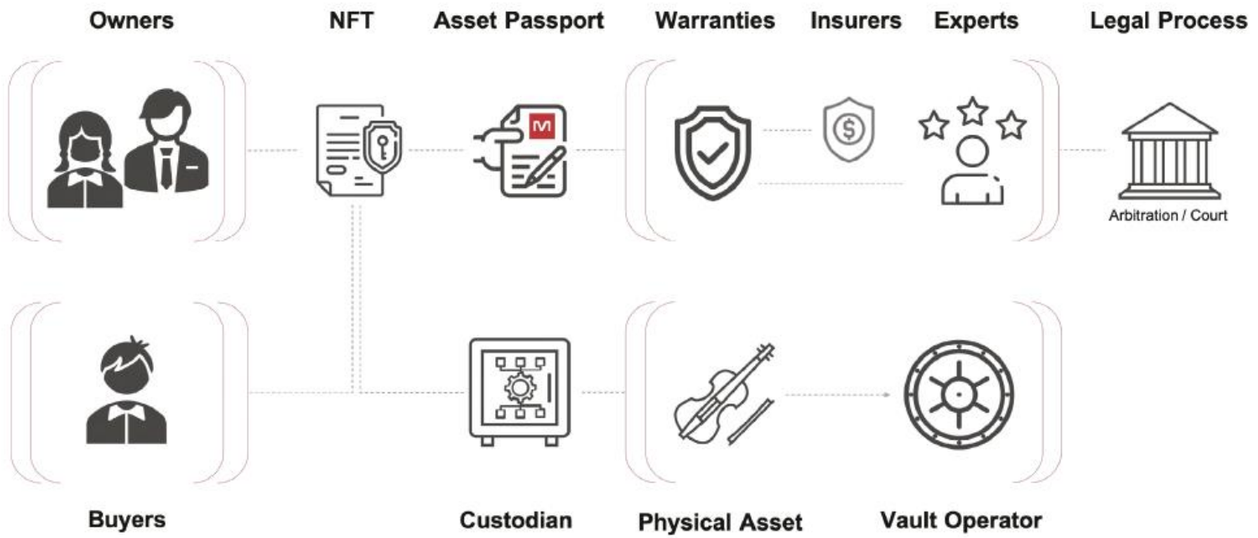
Ownership of Physical Assets

DIGITAL REPRESENTATION AND OWNERSHIP OF PHYSICAL ASSETS

The solution

Mattereum has developed an end-to-end smart legal contract ecosystem for trading in physical assets. Mattereum's smart legal contracts contain provisions for various outcomes, including what happens when, for example, an asset is traded, or placed into or removed from a vault. The information for each asset is digitally recorded in a Mattereum Asset Passport via a series of warranties, whose accuracy is legally enforceable if demonstrated to be incorrect. This is supported by clear provisions should a dispute arise.



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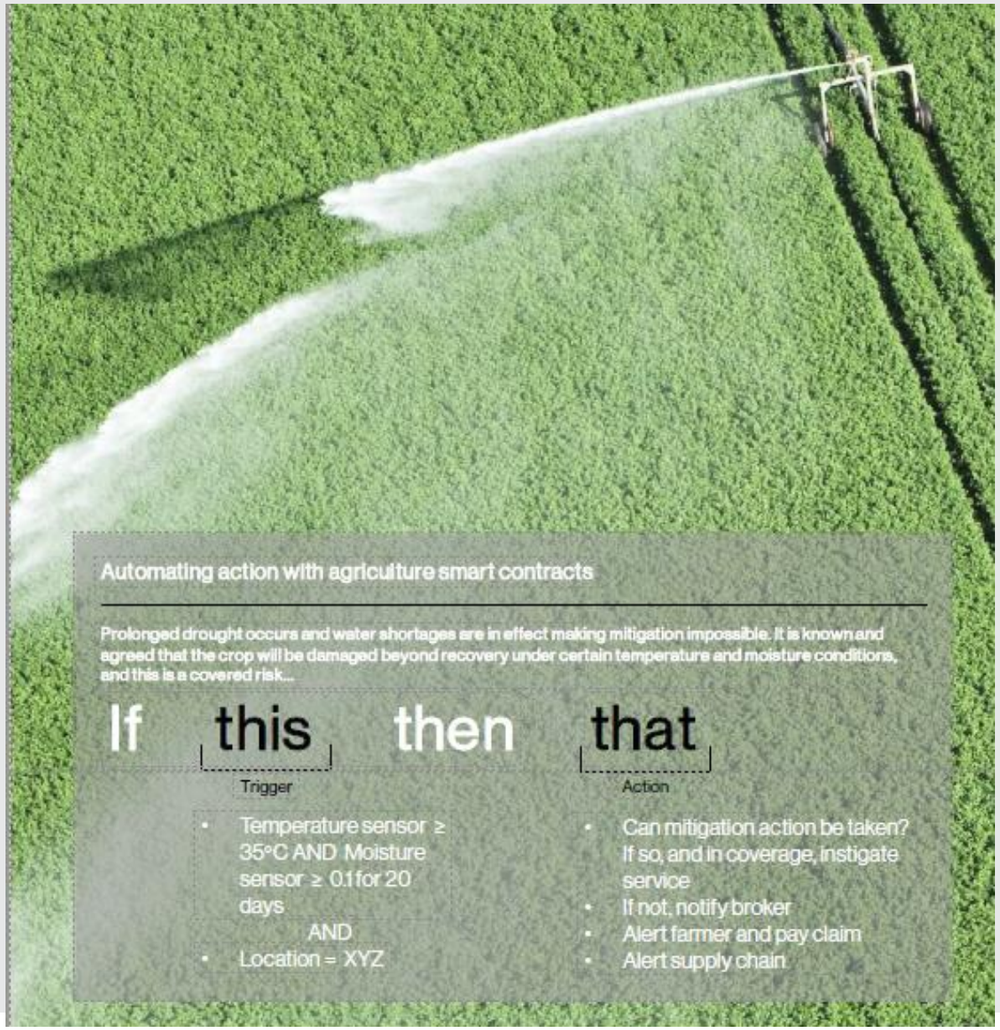
Parametric Insurance : Crop Failure



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4. The Future: Smart Legal Contracts and PDF

working together!

- Machine Readable
  - Data Rich
  - Logic / Reference to Logic
- Collaborative

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PDF Myths

working together!

"Contracts in Word or PDF don't have structured metadata. This is a problem because they contain commercial terms, obligations, liabilities - the lifeblood of commerce"

PDF: the Portable Document Format builds on a standard platform that can be used across the world, giving a stable and consistent representation of the contract's visual layer, independent of browser. PDFs have the advantage of being – for the most part – immutable. Their downsides come from the PDF's limitation as a purely visual medium – there is very little collaboration possible (other than basic field merging), and it's not really possible to work with the limited contract data that's stored in a PDF.

PDF association

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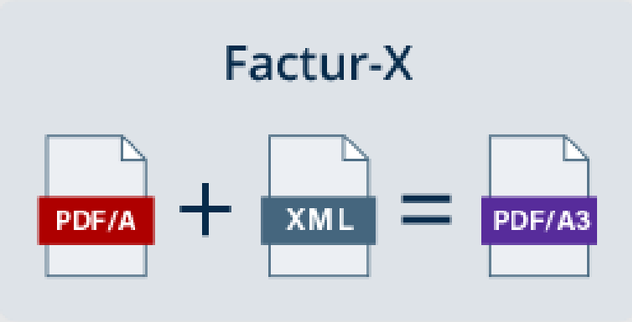
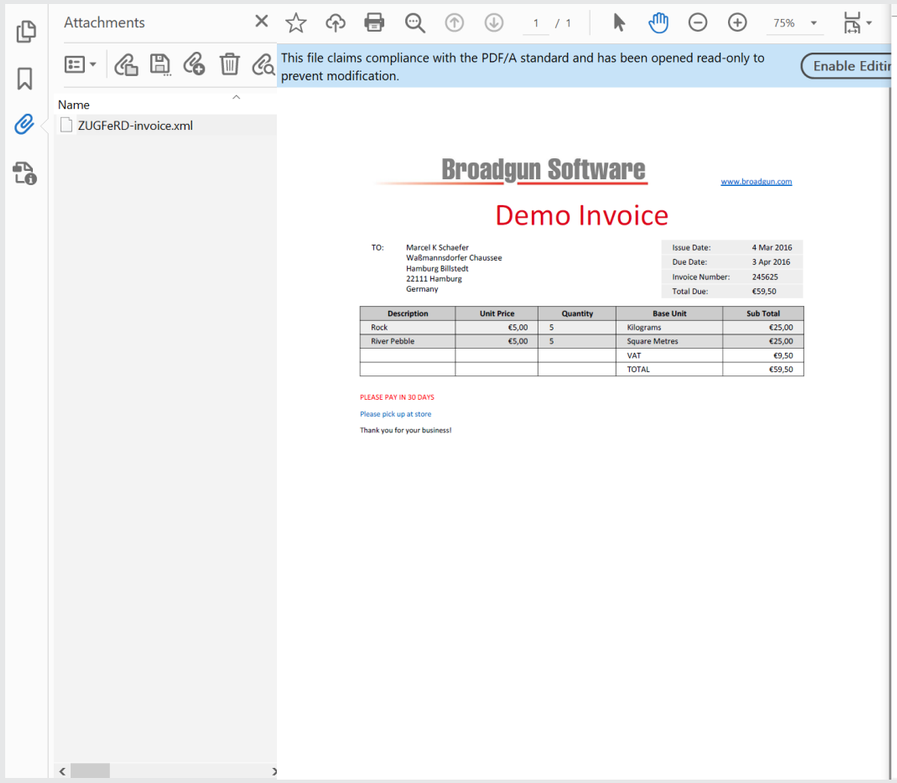
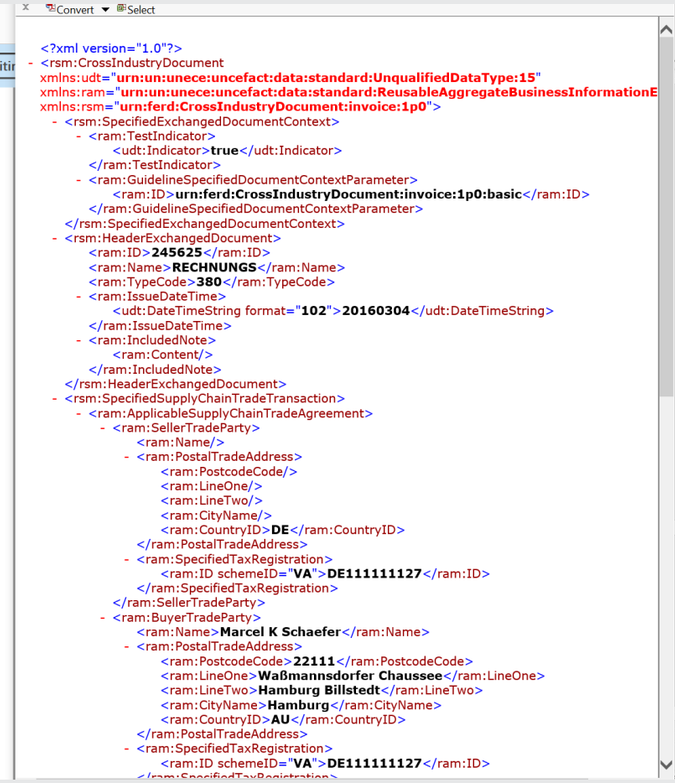
E-Invoicing – EN16931

working together!

- European standard EN 16931
- ZUGFeRD 2.1/Factur-X
- PDF/A-3







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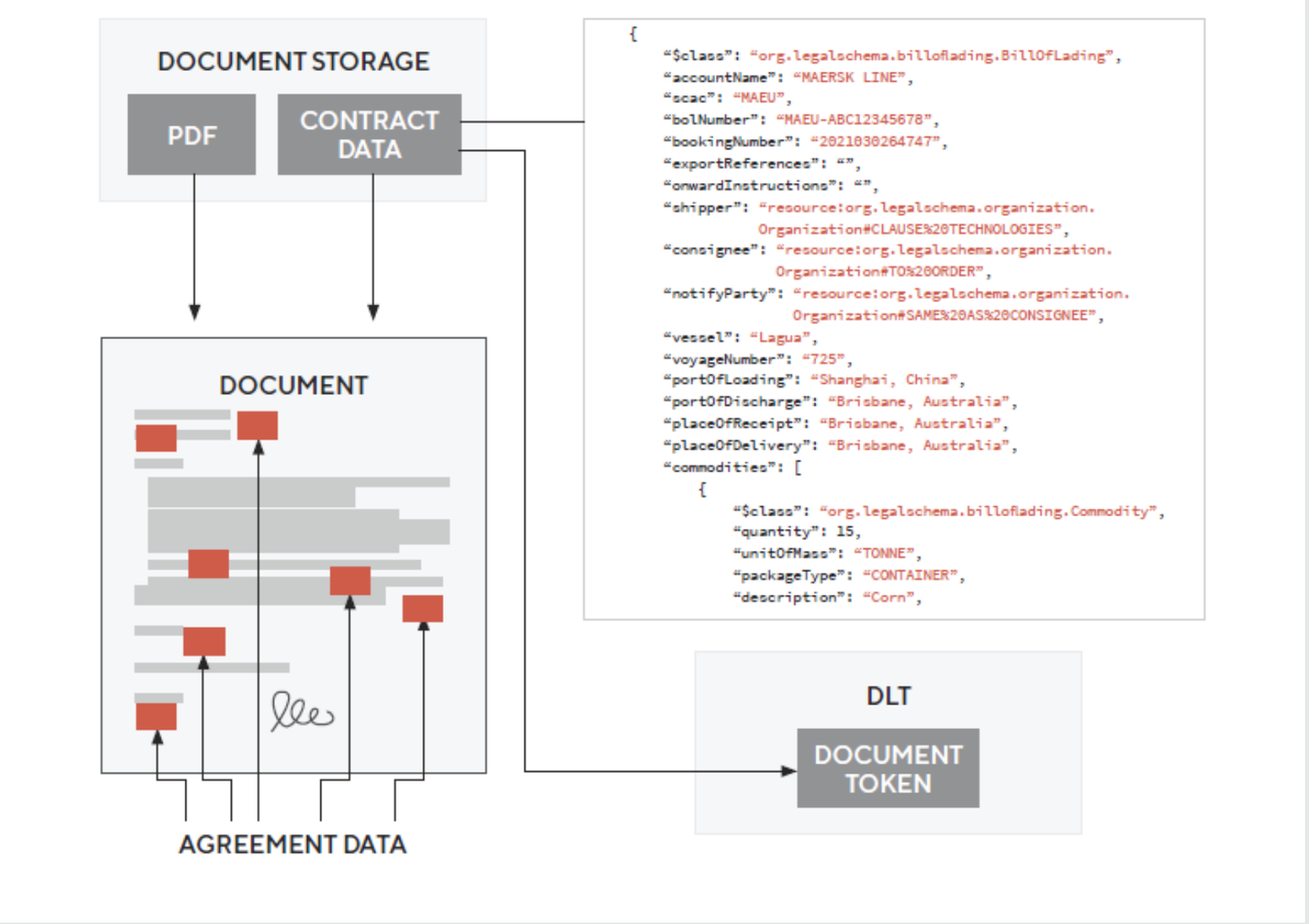
Solutions for PDF Smart Legal Contracts

working together!



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PDF Data Options

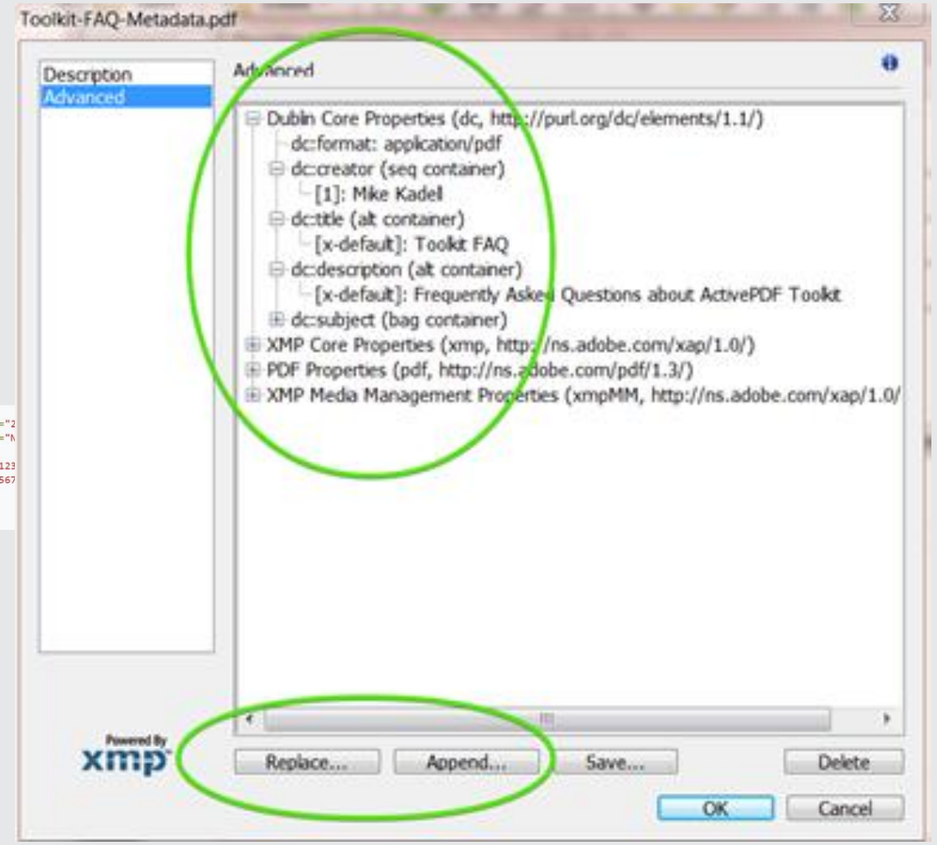
working together!

```json
{
  "first_name": "John",
  "last_name": "Smith",
  "age": 25,
  "address": {
    "street_address": "21 2nd Street",
    "city": "New York",
    "state": "NY",
    "postal_code": "10021"
  },
  "phone_numbers": [
    {
      "type": "home",
      "number": "212 555-1234"
    },
    {
      "type": "fax",
      "number": "646 555-4567"
    }
  ],
  "sex": {
    "type": "male"
  }
}
```

JSON Attachment

```xml
<person>
  <firstName>John</firstName>
  <lastName>Smith</lastName>
  <age>25</age>
  <address>
    <streetAddress>21 2nd Street</streetAddress>
    <city>New York</city>
    <state>NY</state>
    <postalCode>10021</postalCode>
  </address>
  <phoneNumbers>
    <phoneNumber>
      <type>home</type>
      <number>212 555-1234</number>
    </phoneNumber>
    <phoneNumber>
      <type>fax</type>
      <number>646 555-4567</number>
    </phoneNumber>
  </phoneNumbers>
  <sex>
    <type>male</type>
  </sex>
</person>
```

XML Attachment



Embedded XMP

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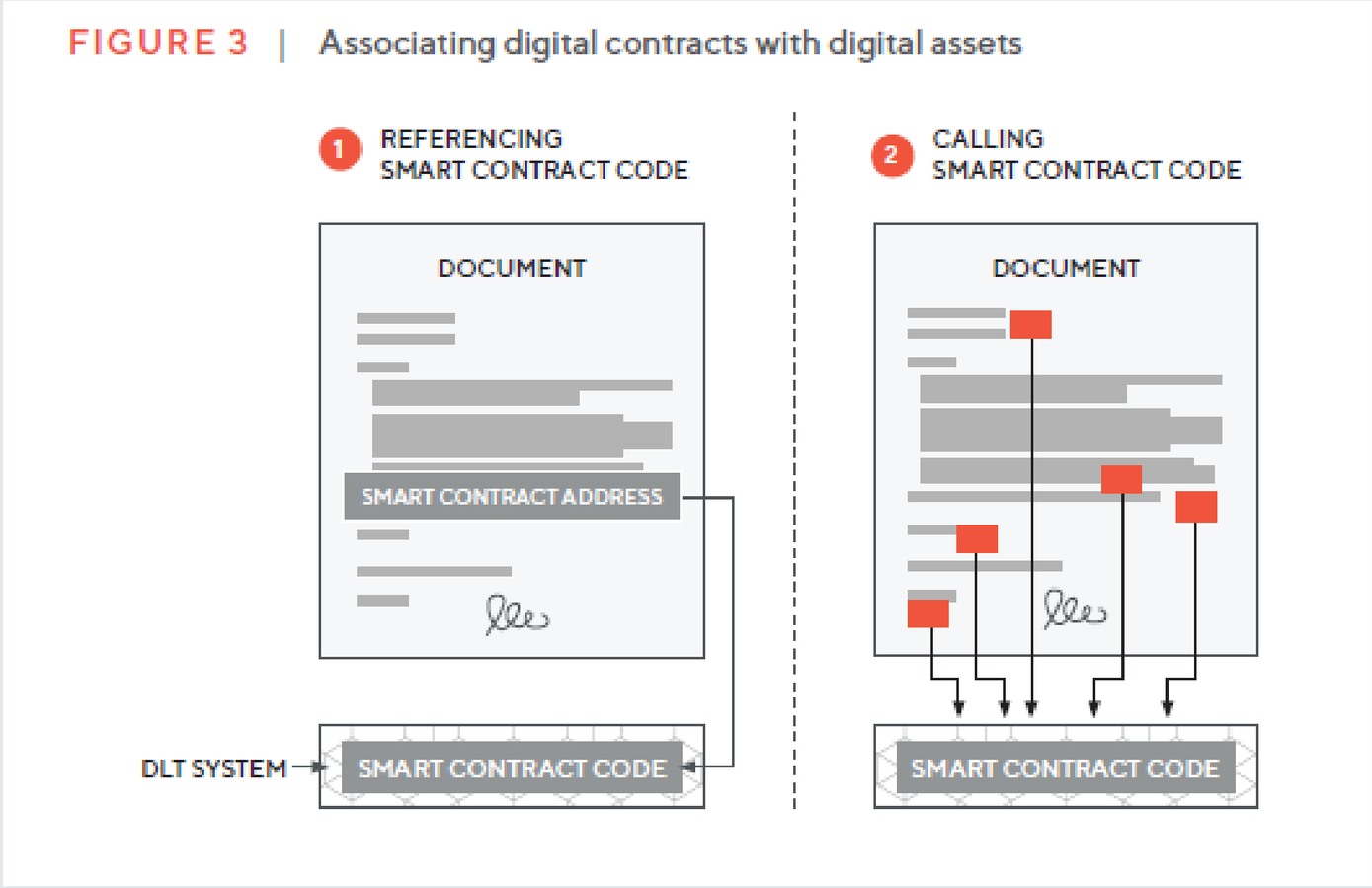
Smart Contract Code



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PDF Package for Smart Legal Contracts

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Rendering	PDF/A presents a generic archival model for representing rendered electronic content.
Metadata	Appropriate metadata (such as that defined by PREMIS) may be included in the PDF using an XMP metadata schema identified in the PDFpackage model. Content semantics may be preserved for reuse by way of tagged PDF.
Attachments	PDFpackage files used for email archives would contain (and thus associate) email attachments with the baseline representation. The PDFpackage model would include requirements and encourage best-practices in using this feature, including attachment identification and processing requirements and recommendations. If appropriate to the use-case, source-files (mailboxes) may also be embedded in the PDFpackage. For case-files, the PDFpackage includes cover materials, tables of contents, indexes or other information as appropriate to the case file type. Associated files are included as attachments, with appropriate metadata stored in the containing PDF files XMP.
Navigation	The PDFpackage's XMP metadata may be used to find attached documents; within these, outlines and links can provide rich navigation.
Data protection (contents)	Rendered page content may be authoritatively redacted using conventional (and long-standing) tools in an archival context.
Data protection (document)	PDF's encryption facilities may be leveraged to protect the document in live workflow settings.
Authenticity	PDF's digital signature facilities may be leveraged to verify authorship and prevent tampering.

https://www.pdfa.org/pdfpackage-a-lightweight-content-management-platform/

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Opportunities for the PDF Community

working together!

- Improve tooling
  - Attached Files
  - Metadata
  - Collaboration
- Consider options for logic layer

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Myths Busted!

> "Contracts in Word or PDF don't have structured metadata. This is a problem because they contain commercial terms, obligations, liabilities - the lifeblood of commerce"

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- 1. Contracts and PDF
- 2. Smart Contracts
- 3. Smart Legal Contracts
- 4. The Future: Smart Legal Contracts and PDF

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References

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