&

Data Management Plan (DMP)
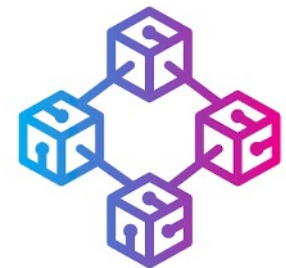
Intellectual property rights

Who will be the owner of the data produced?

How to guarantee property rights?

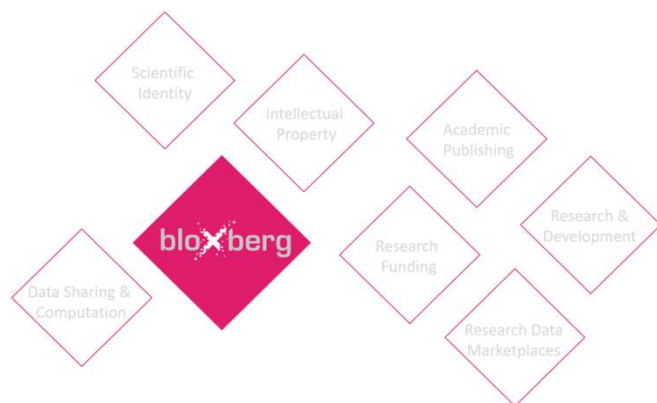How will data be used?

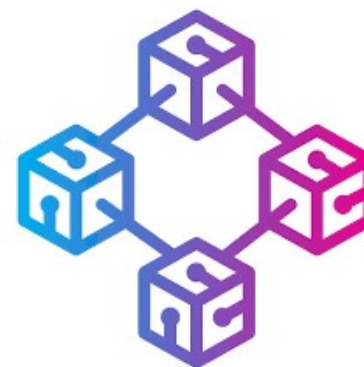**Implementation / Concrete actions** ⇒ **blo✗berg**

bloxberg is the blockchain from science for science

Certification

Certify your Research Data on the blockchain.

This **protects your intellectual property** and **safeguards against potential future scooping** by generating **a unique identifier from your data that is then stored on the chain**. A **certificate** is then created to **provide proof** that this information belongs to you or your organization.

Research stakeholders are then **more open to the dissemination of their data** (files, results, protocols, publications, etc.) **since** they know that, in particular, the **ownership**, **content** and **conditions of use of the data cannot not be altered.**
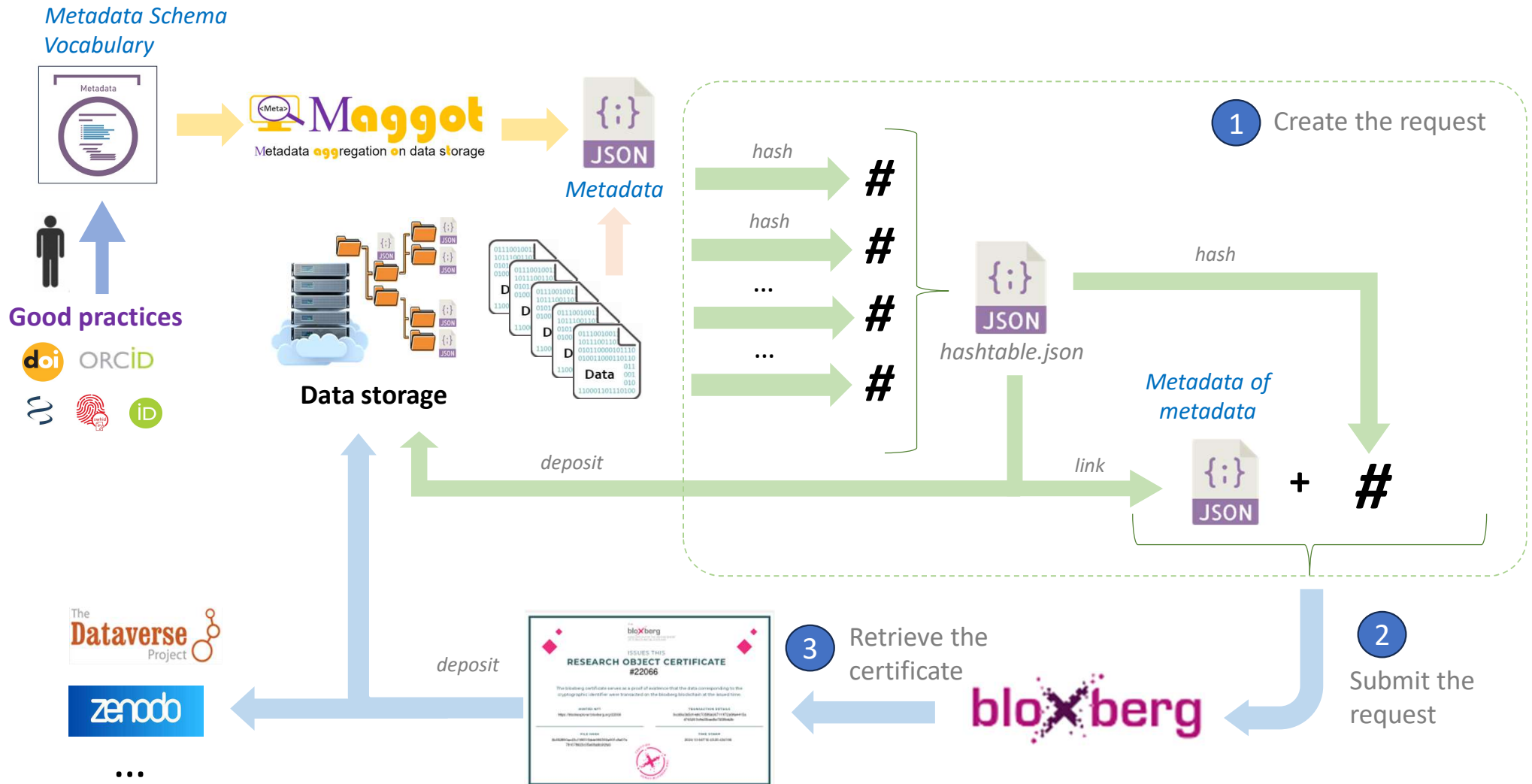
- The bloxberg Association consists of research institutions who run nodes.
- Each research organization will be restricted to running one authority node on the network.

49 nodes (November 2023)
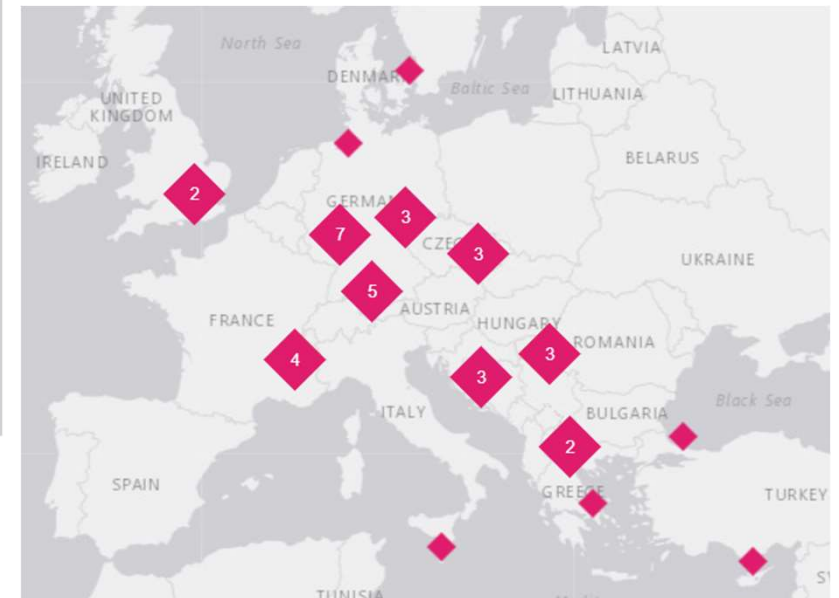
Daniel Jacob - INRAE - Maggot – bloxberg – Nov 2023

Certification of metadata file on the bloxberg blockchain

Metadata Schema Vocabulary
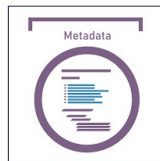
Metadata
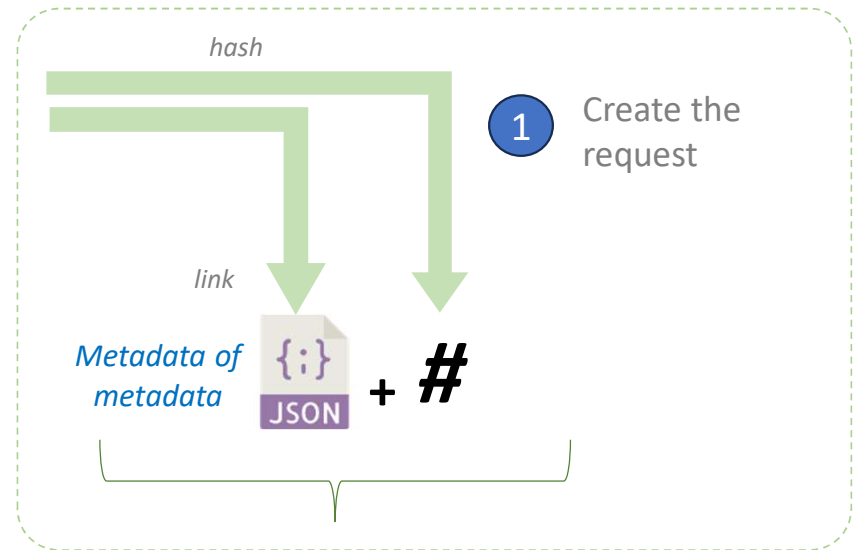
Good practices

doi ORCiD

Maggot
Metadata **agg**regation **on** data st**orage**

Data storage

Data

Metadata

JSON

hash #
hash #
... #
... #
#

JSON
hashtable.json

hash

deposit

link

Metadata of metadata

JSON + #

(1) Create the request

(2) Submit the request

The Dataverse Project

zenodo

...

deposit

bloXberg
RESEARCH OBJECT CERTIFICATE
#22066

(3) Retrieve the certificate

bloXberg

Daniel Jacob - INRAE - Maggot – bloxberg – Nov 2023

Certification of metadata file on the bloxberg blockchain

Daniel Jacob - INRAE - Maggot – bloxberg – Nov 2023

To deposit in a blockchain, you must be authorized to do so so that the certificates are attached to a recognized entity (i.e. Authority)

EXPERIMENTAL - bloxberg Blockchain ?

Certification of metadata file on the bloxberg blockchain

Internal JSON   External JSON

Dataset: FRIM - Fruit Integrative Modelling
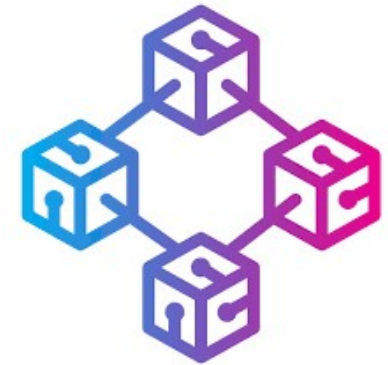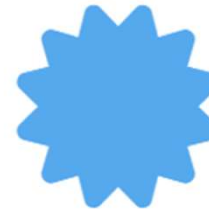
bloxberg Server URL:

https://certify.bloxberg.org/

bloxberg Wallet identifier:

0xC604ffa8adE14dc9A22B6B19bdFC07E489156E53

bloxberg API Token:

●●

Publish

(1) Create the request

▶ Metadata file   👁 META_frim1.json

▶ bloxberg metadata   👁 bloxberg_metadata_frim1.json

▶ bloxberg query   👁 bloxberg_query_frim1.json

Metadata File

```
{
    "profile": "https://pmb-bordeaux.fr/maggot/conf/maggot-schema.json",
    "title": "frim1",
    "fulltitle": "FRIM - Fruit Integrative Modelling",
    "license": "Etalab V2.0 license",
    "depositor": "Jacob Daniel",
    "publication_idnumber": "10.1104/pp.113.231241",
    "publication_url": "https://doi.org/10.1104/pp.113.231241",
    "description": "The project aimed to build a virtual tomato fruit that enables the prediction of
metabolite levels given genetic and environmental inputs, by an iterative process between laboratories
which combine expertise in fruit biology, ecophysiology, theoretical and experimental biochemistry, and
biotechnology.",
    "publication_citation": "Biais B, Bénard C, Beauvoit B, Colombié S, Prodhomme D, Ménard G, Bernillon S,
Gehl B, Gautier H, Ballias P, Mazat J-P, Sweetlove L, Génard M, Gibon Y. 2014. Remarkable reproducibility
of enzyme activity profiles in tomato fruits grown under contrasting environments provides a roadmap for
studies of fruit metabolism. Plant Physiology 164, 1204-1221",
    "status": "Processed",
    "access_rights": "Public",
    "publication_idtype": "doi",
    "contacts": [
        "Gibon Yves"
    ],
    "authors": [
        "Bénard Camille",
        "Biais Benoit",
        "Beauvoit Bertrand",
        "Colombié Sophie"
    ],
    "collectors": [
        "Bénard Camille",
        "Biais Benoit",
        "Ballias Patricia",
        "Maucourt Mickaël"
    ],
    "curators": [
        "Moing Annick",
        "Jacob Daniel"
    ],
    "leader": [
        "Gibon Yves"
    ],
    "wpleader": [
        "Vercambre Gilles"
    ],
    "producer": [
        "Bordeaux Metabolome"
```

EXPERIMENTAL - bloxberg Blockchain ❓

Certification of metadata file on the bloxberg blockchain

Internal JSON   External JSON

Dataset: FRIM - Fruit Integrative Modelling

bloxberg Server URL:
https://certify.bloxberg.org/

bloxberg Wallet identifier:
0xC604ffa8adE14dc9A22B6B19bdFC07E489156E53

bloxberg API Token:
••

Publish

① Create the request

▶ Metadata file   👁 META_frim1.json

▶ bloxberg metadata   👁 bloxberg_metadata_frim1.json

▶ bloxberg query   👁 bloxberg_query_frim1.json

Metadata of the
Metadata File

Same as

```
{
    "@context": {
        "dc": "http://purl.org/dc/terms/"
    },
    "@type": "Dataset",
    "dc:creator": "https://orcid.org/0000-0001-8161-1089",
    "dc:language": "en",
    "dc:format": "application/json",
    "dc:title": "FRIM - Fruit Integrative Modelling",
    "dc:subject": "https://id.loc.gov/authorities/subjects/sh96000740",
    "dc:date": "2023-11-27T16:17:11.3629640Z",
    "dc:description": "The project aimed to build a virtual tomato fruit that enables
    the prediction of metabolite levels given genetic and environmental inputs, by an
    iterative process between laboratories which combine expertise in fruit biology,
    ecophysiology, theoretical and experimental biochemistry, and biotechnology.",
    "dc:publisher": [
        "https://ror.org/00ccpdp17"
    ],
    "dc:rights": "http://spdx.org/licenses/CC-BY-NC-SA-4.0.json",
    "dc:identifier": {
        "@value": "https://pmb-bordeaux.fr/maggot/metadata/frim1?format=maggot",
        "@type": "http://purl.org/dc/terms/URI"
    }
}
```

EXPERIMENTAL - bloxberg Blockchain ❓

Certification of metadata file on the bloxberg blockchain

Internal JSON | External JSON

Dataset: FRIM - Fruit Integrative Modelling

bloxberg Server URL:
https://certify.bloxberg.org/

bloxberg Wallet identifier:
0xC604ffa8adE14dc9A22B6B19bdFC07E489156E53

bloxberg API Token:
••

Publish

① Create the request

▶ Metadata file   👁 META_frim1.json

▶ bloxberg metadata   👁 bloxberg_metadata_frim1.json

▶ bloxberg query   👁 bloxberg_query_frim1.json

Same as

Hash sha256

Metadata of the Metadata File

```json
{
  "@context": {
    "dc": "http://purl.org/dc/terms/"
  },
  "@type": "Dataset",
  "dc:creator": "https://orcid.org/0000-0001-8161-1089",
  "dc:language": "en",
  "dc:format": "application/json",
  "dc:title": "FRIM - Fruit Integrative Modelling",
  "dc:subject": "https://id.loc.gov/authorities/subjects/sh96000740",
  "dc:date": "2023-11-27T16:17:11.3629640Z",
  "dc:description": "The project aimed to build a virtual tomato fruit that enables the prediction of metabolite levels given genetic and environmental inputs, by an iterative process between laboratories which combine expertise in fruit biology, ecophysiology, theoretical and experimental biochemistry, and biotechnology.",
  "dc:publisher": [
    "https://ror.org/00ccpdp17"
  ],
  "dc:rights": "http://spdx.org/licenses/CC-BY-NC-SA-4.0.json",
  "dc:identifier": {
    "@value": "https://pmb-bordeaux.fr/maggot/metadata/frim1?format=maggot",
    "@type": "http://purl.org/dc/terms/URI"
  }
}
```

Embedded

Request

```json
{
  "publicKey": "0xC604ffa8adE14dc9A22B6B19bdFC07E489156E53",
  "crid": [
    "ae008cc8ebd20834befa9442db0e59d53effe5ba6cbb8612f9544f8be2fec2b0"
  ],
  "cridType": "sha2-256",
  "enableIPFS": false,
  "metadataJson": "{ \"@context\": { \"dc\": \"http://purl.org/dc/terms/\" }, \"@type\": \"Dataset\", \"dc:creator\": \"https://orcid.org/0000-0001-8161-1089\", \"dc:language\": \"en\", \"dc:format\": \"application/json\", \"dc:title\": \"FRIM - Fruit Integrative Modelling\", \"dc:subject\": \"https://id.loc.gov/authorities/subjects/sh96000740\", \"dc:date\": \"2023-11-27T16:17:11.3629640Z\", \"dc:description\": \"The project aimed to build a virtual tomato fruit that enables the prediction of metabolite levels given genetic and environmental inputs, by an iterative process between laboratories which combine expertise in fruit biology, ecophysiology, theoretical and experimental biochemistry, and biotechnology.\", \"dc:publisher\": [\"https://ror.org/00ccpdp17\"], \"dc:rights\":\"http://spdx.org/licenses/CC-BY-NC-SA-4.0.json\", \"dc:identifier\": { \"@value\": \"https://pmb-bordeaux.fr/maggot/metadata/frim1?format=maggot\", \"@type\": \"http://purl.org/dc/terms/URI\" }}"
}
```

EXPERIMENTAL - bloxberg Blockchain ❓

Certification of metadata file on the bloxberg blockchain

Internal JSON | External JSON

Dataset: FRIM - Fruit Integrative Modelling

bloxberg Server URL:
https://certify.bloxberg.org/

bloxberg Wallet identifier:
0xC604ffa8adE14dc9A22B6B19bdFC07E489156E53

bloxberg API Token:
●●

Publish

② Submit the request

▶ Metadata file   👁 META_frim1.json

▶ bloxberg metadata   👁 bloxberg_metadata_frim1.json

▶ bloxberg query   👁 bloxberg_query_frim1.json

▶ bloxberg response   👁 bloxberg_response_frim1.json

```
[
  {
    "@context": [
      "https://www.w3.org/2018/credentials/v1",
      "https://w3id.org/bloxberg/schema/research_object_certificate_v1"
    ],
    "type": [
      "VerifiableCredential",
      "BloxbergCredential"
    ],
    • • •
    "proof": {
      "type": "MerkleProof2019",
      "created": "2024-10-04T10:43:20.434196",
      "proofValue": "z7veGu1qoKR3AS5LdNM9AqaDFFh3xPrawvwQGczsyivqrt65zJSRKkNLVFsxQQZcZitkcHAQgmRBAE
                      pXEVvwWDoxdm1AXoHXim4MWwrdmW8JVfM2JG46je8qFW1HwKFLDdUftm49qmB5bVoqKg1XS4UFKgG7fHbdKNomRJBuwKh
                      8AXCbLZmxQ2xVgQQVkAPAPd8irRk26cwJkFA47CcMfD9tuvRbYW67887uhPEsnoWQxhnBbRxRCH31T2WBPdw7Sg7R8BGf
                      kP7wic6JqynAQjy3QfmRxV2XQy7ULSAUsfJhp7WbKFf35b",
      "proofPurpose": "assertionMethod",
      "verificationMethod": "ecdsa-koblitz-pubkey:0xD748BF41264b906093460923169643f45BDbC32e",
      "ens_name": "mpdl.berg"
    }
  }
]
```

Proof of Authority

Transactions and blocks are validated by approved accounts, known as validators.

However the process is automated and does not require validators to be constantly monitoring their computers.

https://en.wikipedia.org/wiki/Proof_of_authority

Daniel Jacob - INRAE - Maggot – bloxberg – Nov 2023

EXPERIMENTAL - bloxberg Blockchain ❓

Certification of metadata file on the bloxberg blockchain

Internal JSON · External JSON

Dataset: FRIM - Fruit Integrative Modelling

bloxberg Server URL:
https://certify.bloxberg.org/

bloxberg Wallet identifier:
0xC604ffa8adE14dc9A22B6B19bdFC07E489156E53

bloxberg API Token:
•••

Publish

③ Retrieve the certificate

▶ Metadata file — 👁 META_frim1.json
▶ bloxberg metadata — 👁 bloxberg_metadata_frim1.json
▶ bloxberg query — 👁 bloxberg_query_frim1.json
▶ bloxberg response — 👁 bloxberg_response_frim1.json
▶ bloxberg certificate — 👁 bloxberg_certificate_frim1.zip

Success : the metadata file has been certified on the bloxberg blockchain
Download the ZIP which contains the corresponding certificate as a PDF file

[
  {
    "@context": [
      "https://www.w3.org/2018/credentials/v1",
      "https://w3id.org/bloxberg/schema/research_object_certificate_v1"
    ],
    "type": [
      "VerifiableCredential",
      "BloxbergCredential"
    ],
    ...
    "proof": {
      "type": "MerkleProof2019",
      "created": "2024-10-04T10:43:20.434196",
      "proofValue": "z7veGu1qoKR3AS5LdNM9AqaDFFh3xPrawvwQGczsyivqrt65zJSRKkNLVFsxQQZcZitkcHAQgmRBAE
      pXEVvwWDoxdm1AXoHXim4MWwrdmW8JVfM2JG46je8qFW1HwKFLDdUftm49qmB5bVoqKg1XS4UFKgG7fHbdKNomRJBuwKh
      8AXCbLZmxQ2xVgQQVkAPAPd8irRk26cwJkFA47CcMfD9tuvRbYW67887uhPEsnoWQxhnBbRxRCH31T2WBPdw7Sg7R8BGf
      kP7wic6JqynAQjy3QfmRxV2XQy7ULSAUsfJhp7WbKFf35b",
      "proofPurpose": "assertionMethod",
      "verificationMethod": "ecdsa-koblitz-pubkey:0xD748BF41264b9060934609231169643f45BDbC32e",
      "ens_name": "mpdl.berg"
    }
  }
]

blo**X**berg
ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND BLOCKCHAIN

ISSUES THIS

RESEARCH OBJECT CERTIFICATE
#22066

The bloxberg certificate serves as a proof of existence that the data corresponding to the cryptographic identifier were transacted on the bloxberg blockchain at the issued time.

MINTED NFT
https://blockexplorer.bloxberg.org/22066

TRANSACTION DETAILS
0xc60e3b5d14dfc70589a90711f72af9fa4415a
4745201b9e23bac8a7f238eb2b

FILE HASH
6b552890ac43c19951f0dde990350a901cffa07e
781078623c05e68a9b9f2fa9

TIME STAMP
2024-10-04T10:43:20.434196

CERTIFIED · VERIFY.BLOXBERG.ORG

Daniel Jacob - INRAE - Maggot – bloxberg – Nov 2023

Maggot — Metadata aggregation on data storage

https://inrae.github.io/pgd-mmdt/bloxberg/

bloxberg

https://bloxberg.org/