

A large, abstract graphic on the left side of the slide features three stylized, glowing blue network structures. These structures resemble molecular models or complex data graphs, composed of small blue dots (nodes) connected by thin blue lines (edges). They are arranged diagonally across the frame, with one prominent central cluster and two smaller ones at the top and bottom.

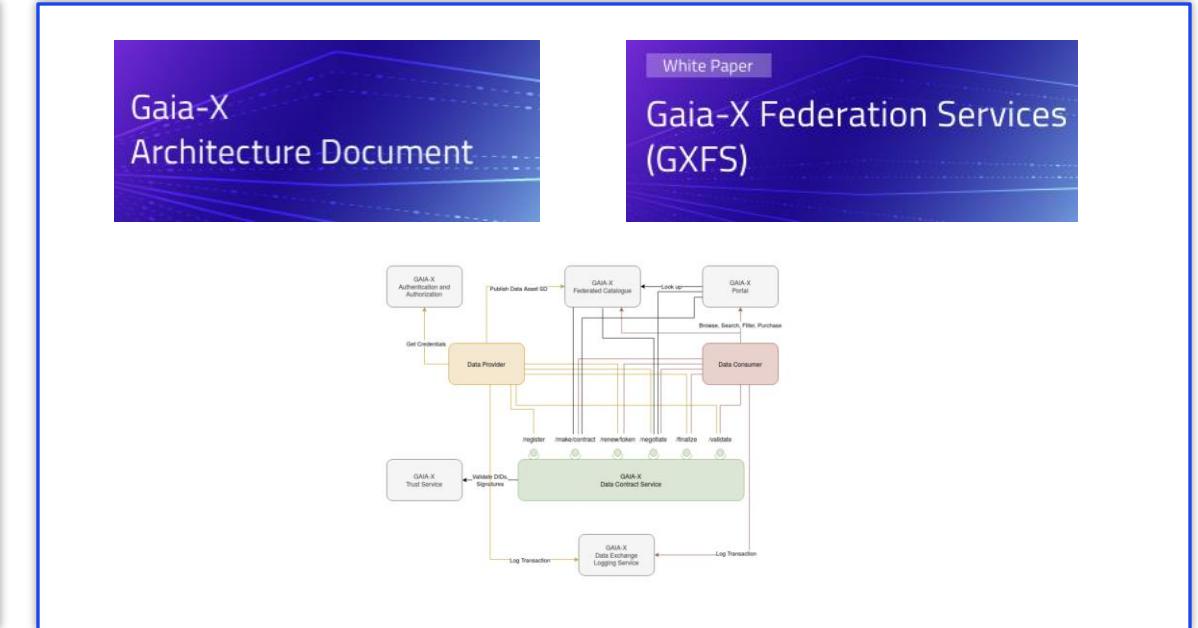
**presentation**

# Minimal Viable Gaia-X



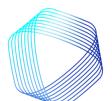
## our starting point

## expectation vs. reality



© Federal Ministry for Economic Affairs and Climate Action

## exceptional & necessary



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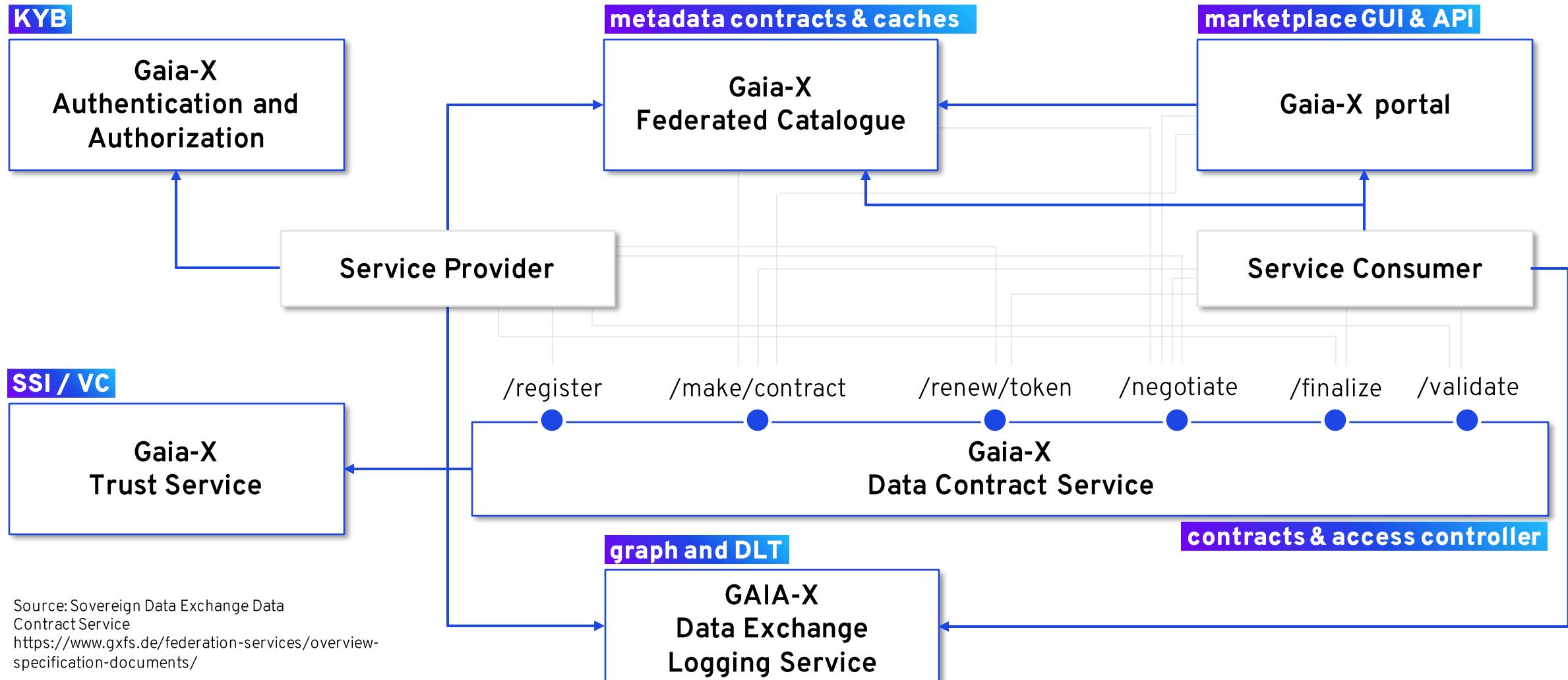
## why decentralized?



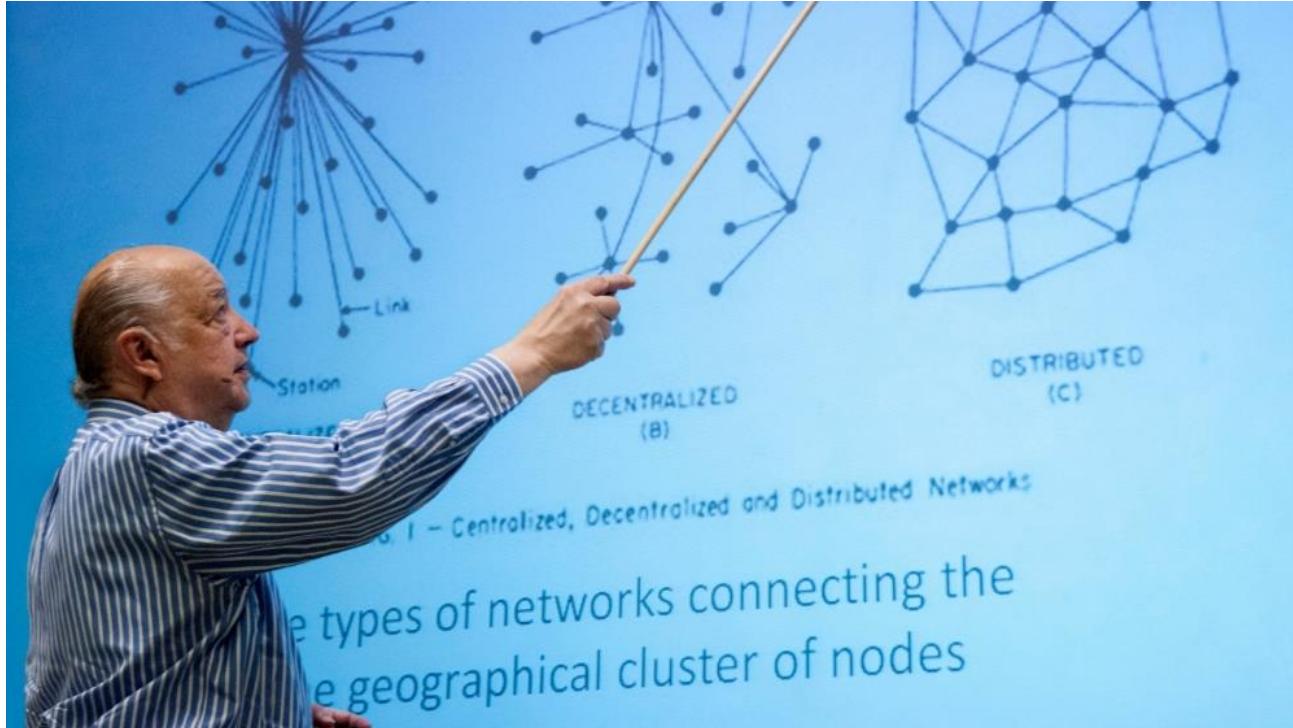
imgflip.com

it is very hard to decentralize later.

# Gaia-X federation services & the Minimal Viable Gaia-X



# distribution leads to resilience and reduces dependencies



Paul Baran presents his work at a RAND Alumni Association event on July 25, 2009  
Photo by Diane Baldwin/RAND Corporation

Paul Baran's seminal 1964 article "On Distributed Communications Networks"

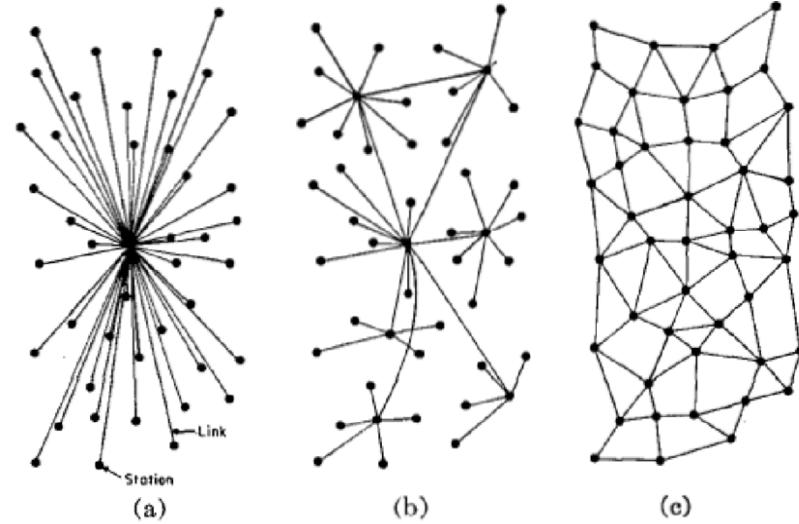
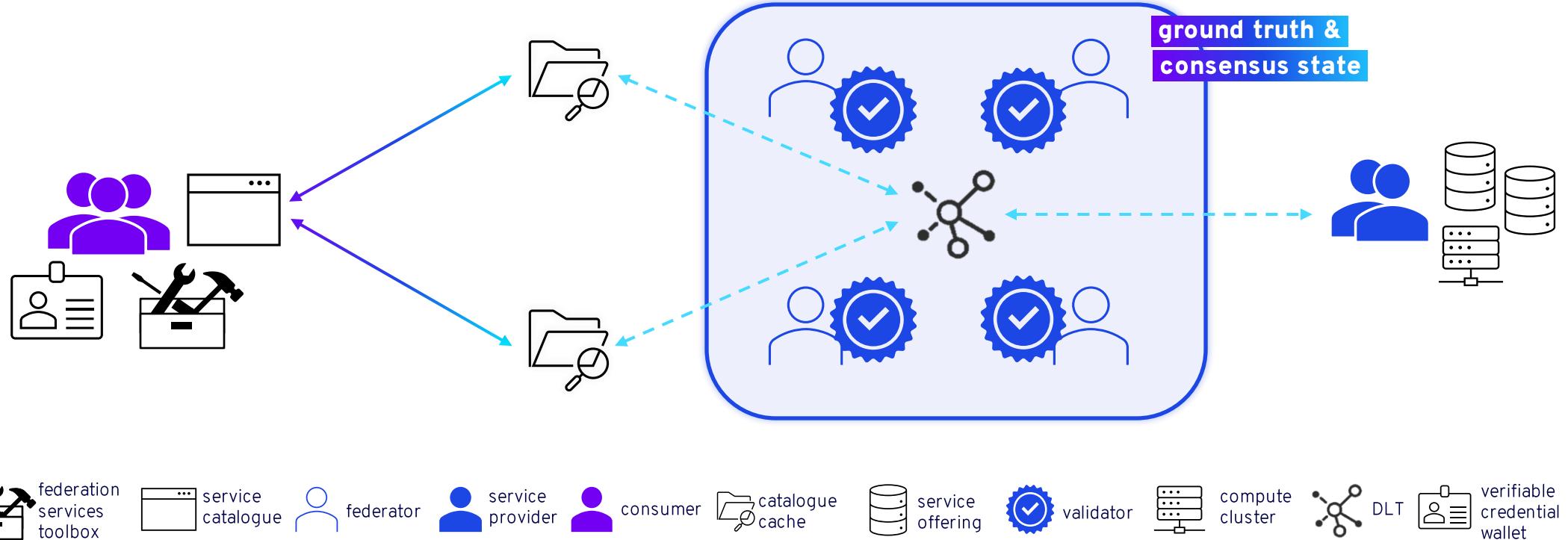


Fig. 1—(a) Centralized. (b) Decentralized. (c) Distributed networks.

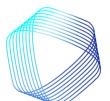
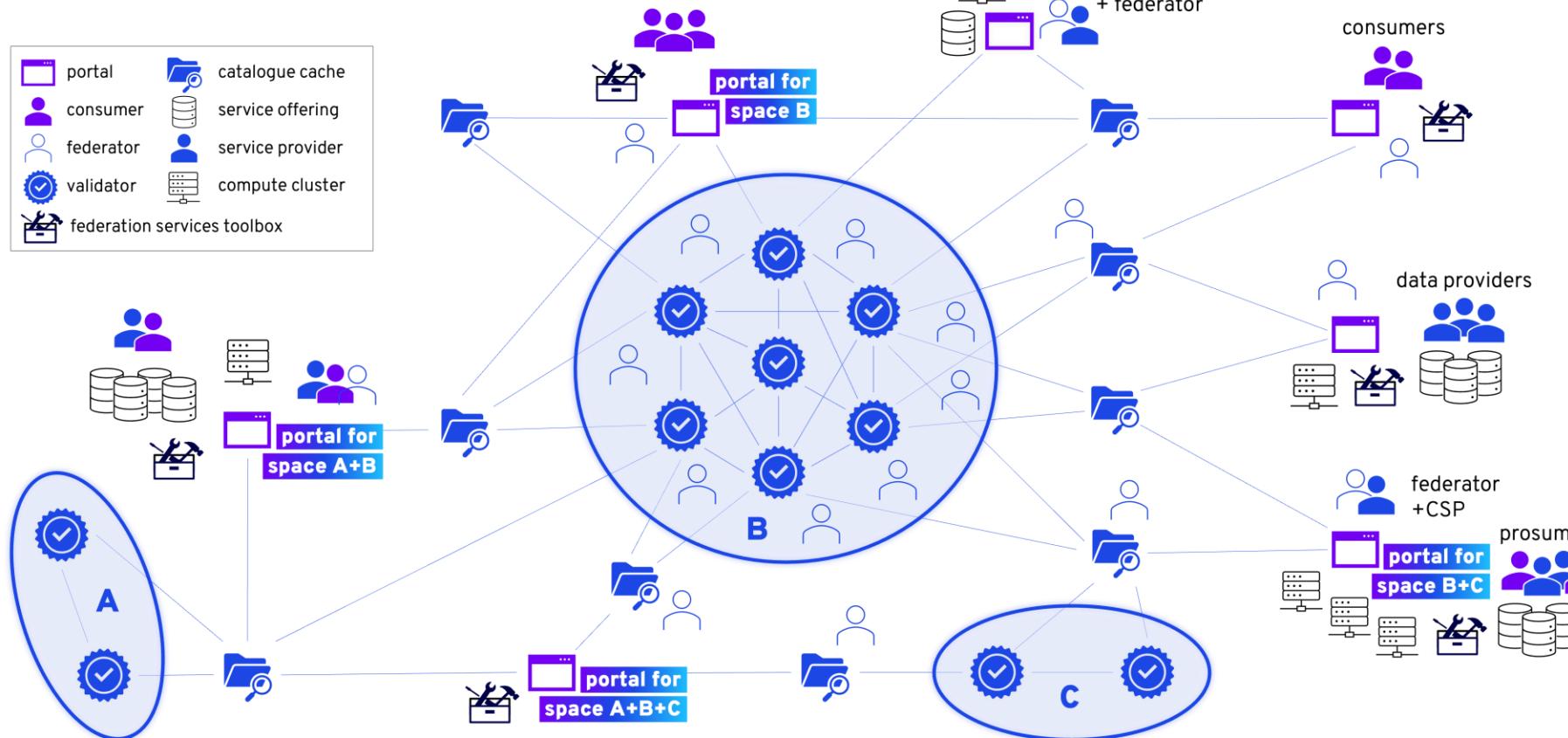
**centralization can be an expensive liability.**

# remove all single points of failure from the federation



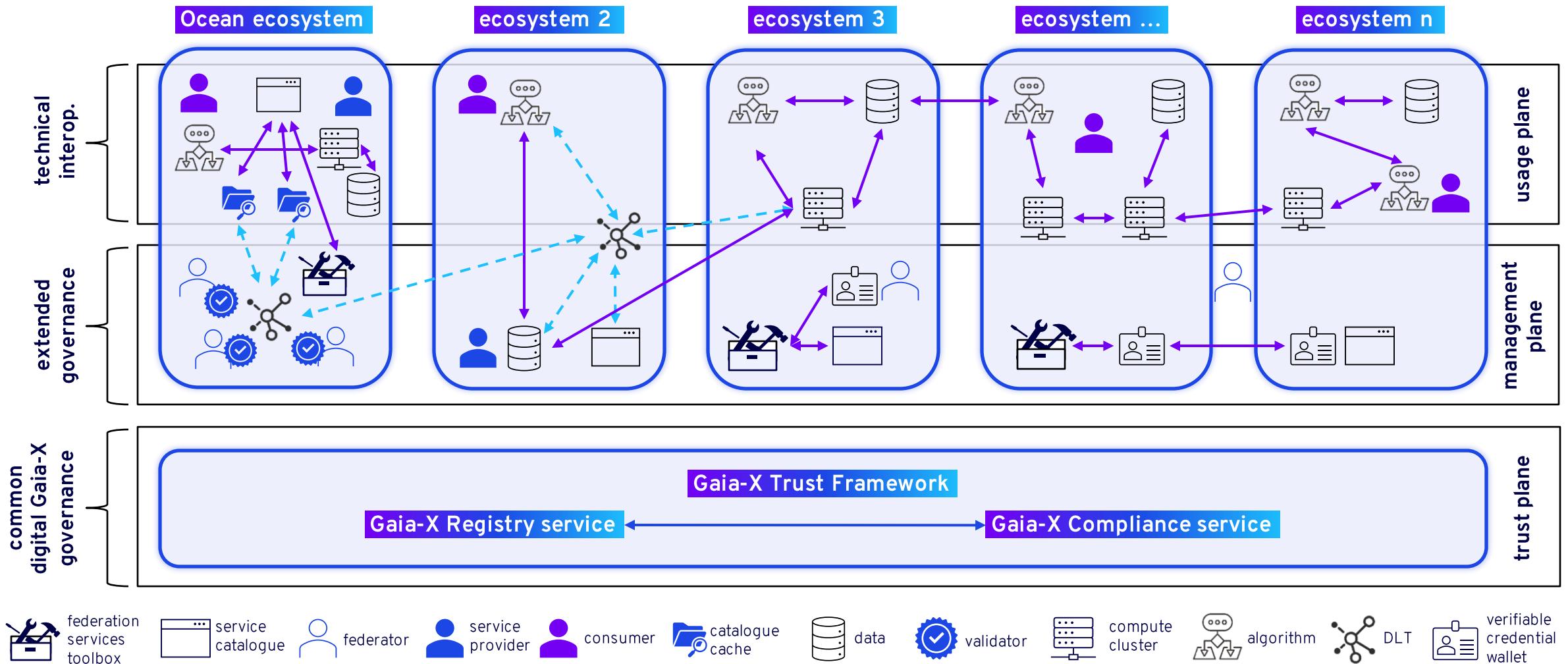
# composability

creation and connection of complex services  
from atomic and elementary services



## introduction of a Minimal Viable Gaia-X

# there will be many ecosystems. how to start a decentralized one?



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Image is licensed under a CC BY 4.0 license, Gaia-X European Association for Data and Cloud AISBL.  
Remixed by deltaDAO AG for illustration purposes.

# vision Gaia-X & European data economy / data act

fairness  
&  
competitiveness

GDPR-compliance  
&  
data security

increase access,  
lower barriers  
& transaction costs

minimize lock-in  
&  
open-source software

incentives to share  
&  
incentives to collaborate

enable investments,  
foster innovation,  
& fair returns

auditability,  
provenance &  
transparency

open private data  
&  
increase B2B use

reduce fragmentation  
& EU-wide regulatory  
framework

# guiding principles

reuse existing software as much as possible

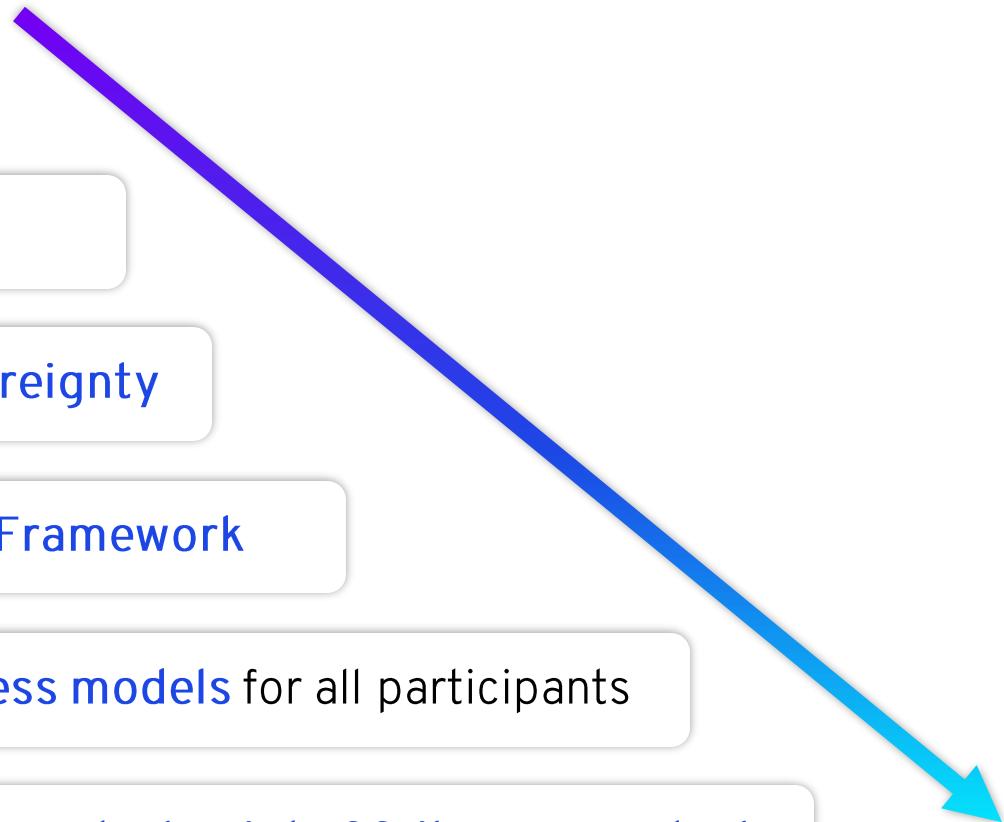
be transparent, use free open-source

enable technical data sovereignty

enable Gaia-X Trust Framework

sustainable business models for all participants

no lock-in, no central point of failure or control



# made with love and 100% free open-source technology



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VMware Tanzu™



kubernetes



ocean



Gatsby



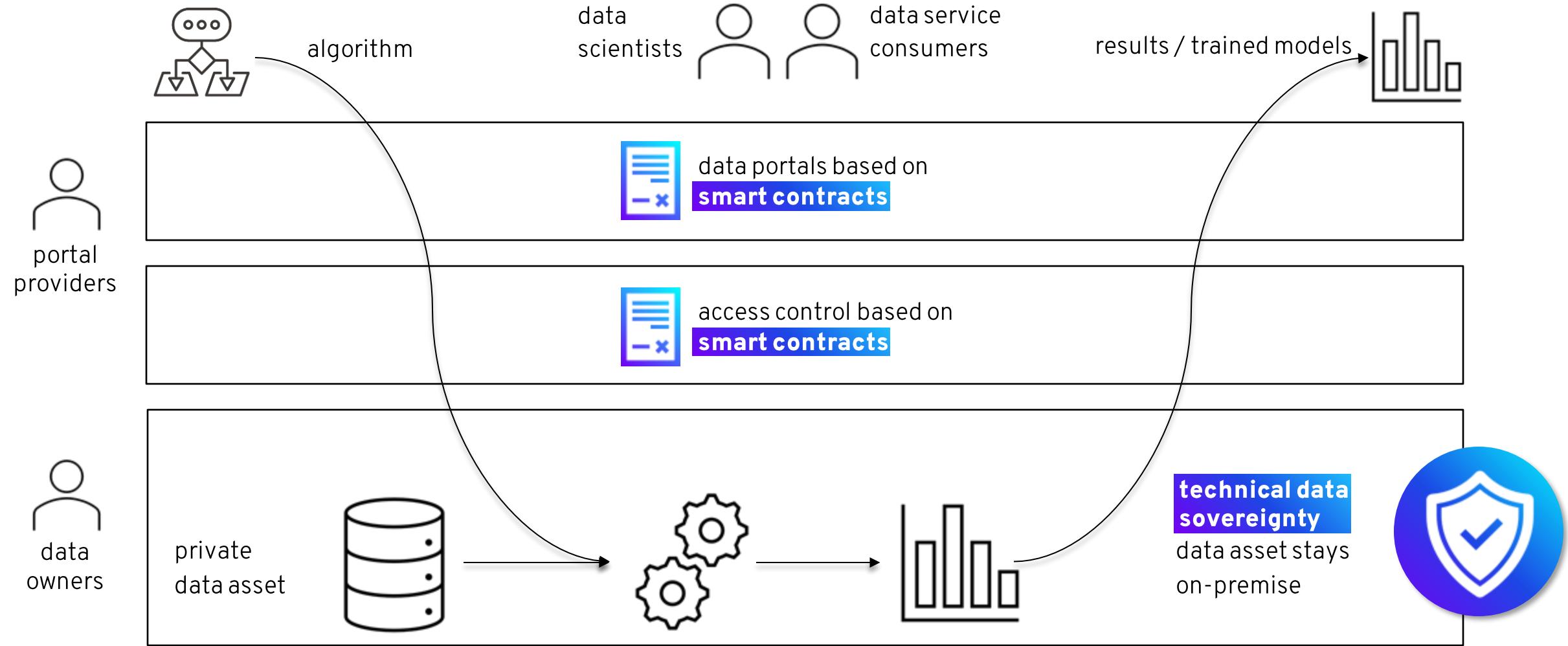
ubuntu



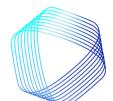
solidity



# compute-to-data enables true technical data sovereignty



# portal.minimal-gaia-x.eu



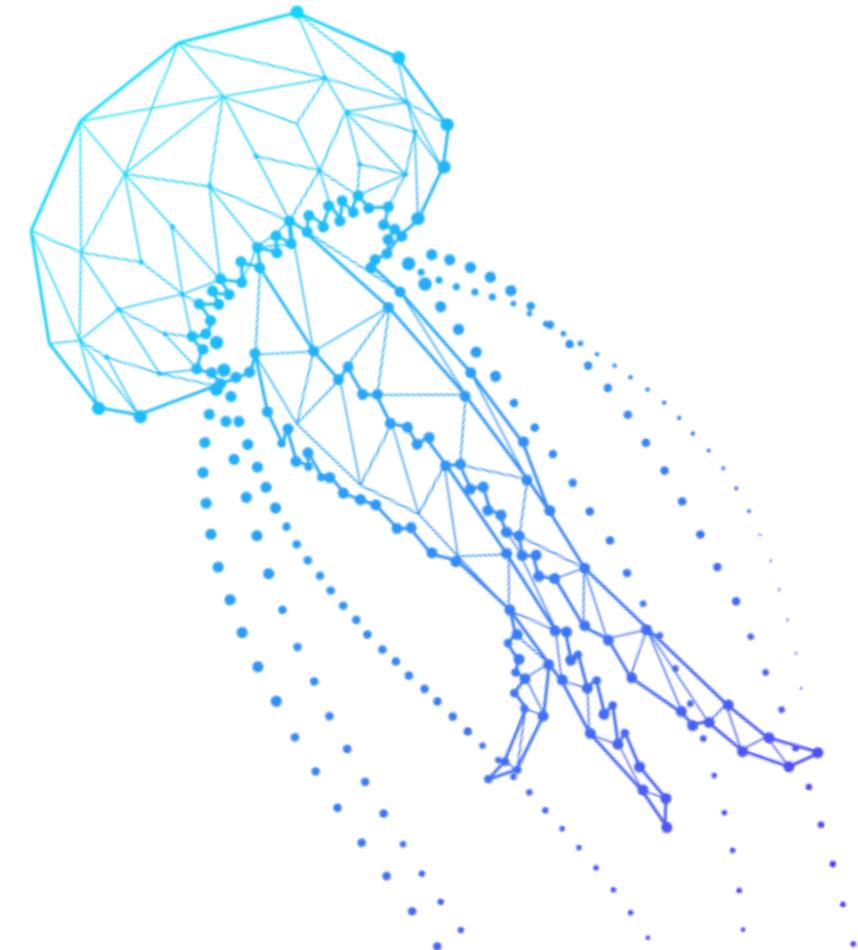
# Minimal Viable Gaia-X portal



powered by  
Ocean Protocol



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# Hackathon #1 - First Minimal Viable Gaia-X Demonstrator

A screenshot of the MVG Portal Demonstrator website. The top navigation bar includes "Publish", "Profile", a search icon, "Connect Wallet", and a settings icon. The main title is "MVG Portal Demonstrator" with a subtitle "A platform to find, publish and consume Data Services in the Gaia-X Test Network." Below this, it says "powered by" with the Ocean Protocol logo. A large blue banner at the bottom features a play button icon with "START NOW" text and a link to "Gaia-X on Ocean Protocol Academy".

<https://portal.minimal-gaia-x.eu>

Video: <https://youtu.be/R49CXPTRamg>

Medium [Minimal Viable Gaia-X blogpost](#)



# for F.A.I.R. science and to connect researchers & businesses



Development build of the Universitat de Lleida portal for the Gaia-X hackathon #2.

Universitat de Lleida

Search...  Connect Wallet

publish account browse

## UDL Science and Research Portal

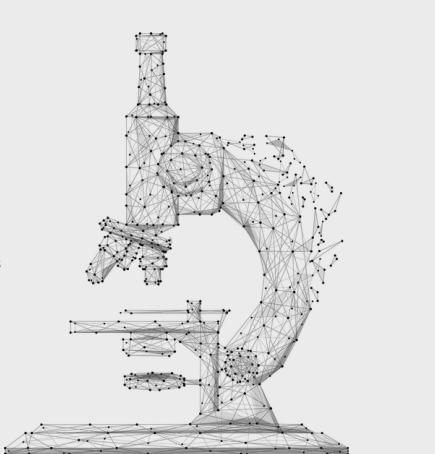
An open research and science platform following the FAIR guiding principles of findability, accessibility, interoperability and reusability.

powered by Ocean Protocol

 ocean

**Goal**

The Universitat de Lleida MVG Portal aims to accelerate the progress of research and science, increase the quality of data, and foster collaboration between research and educational institutions. On the research portal, data scientists and researchers can find, consume and share research data sets and algorithms. Depending on the publisher's decision, the data assets can be consumed either by granting compute or download access to the data assets.



<https://udl.portal.minimal-gaia-x.eu>

# for SMEs and GDPR-compliant data usage

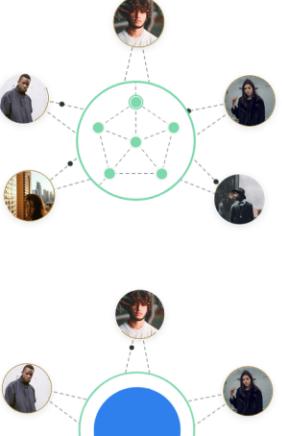
Development build of the foreverontheblockchain portal for the Gaia-X hackathon #2.

foreverontheblockchain account browse Search... <https://forever.portal.minimal-gaia-x.eu>

## GDPR compliant data monetization with Compute-to-Data

powered by Ocean Protocol





01

### compute-to-data

Compute-to-Data, powered by Ocean Protocol, enables privacy-preserving data monetization for anyone. A trusted algorithm is brought to the data and is executed on-premise while the data always stays with us. We keep full ownership and control while you are invited to obtain valuable insights from our customer base. Ocean Protocol solves the trade-off between monetizing private data and the risk of exposing it while being fully

Medium [foreverontheblockchain Blogpost](#)

# for regulators and the finance industry



Development build of the safeFBDC portal for the Gaia-X hackathon #2.

safeFBDC Portal account browse Search... Connect Wallet ⚙️

powered by Ocean Protocol

ocean

20  
21

## safe FBDC

**Our vision** Our vision of FBDC is a federated ecosystem that provides business, academic, and regulatory stakeholders with a secure, data sovereignty-preserving infrastructure for the exchange and AI-powered mobilization of financial data.

- We develop, prototype, and validate infrastructures for the processing and secure exchange of financial data.
- We ensure that data owners retain sovereignty over their data.
- We develop AI-powered applications to process, exploit, and monetize distributed datasets based on various use cases.
- We ensure the compatibility of our structures and developments with the requirements of the markets and with important data structures under development, such as Gaia-X or International Data Spaces.

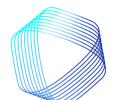
20  
21

## Background

safeFBDC is a research project funded by the Federal Ministry for Economic Affairs and Energy (BMWi) with a three-year project duration (2021-2023). The consortium under the leadership of TechQuarter consists of eleven founding and 30+ associated partners covering a large part of the German financial industry and beyond.

20

<https://safefbdc.portal.minimal-gaia-x.eu>



# for enterprise marketplaces and cloud service providers



The homepage of the Acentrik Data Marketplace. It features a dark background with a glowing red and blue network graph. The text "Your Data. Your Marketplace." is prominently displayed. At the top, there are navigation links: "Explore &amp; Buy Data", "Publish &amp; Sell Data", "Compute-to-Data", "Login", and "Sign Up". Below the main title are four buttons: "Our Features", "Explore &amp; Buy", "Publish &amp; Sell", and "About Us". A search bar with the placeholder "Search For Assets" and a "Explore Now" button are also present.

<https://sandbox.acentrik.io/>

Medium [Acentrik bloqpost](#)

A screenshot of the "Explore Available Assets" page in the Acentrik Data Marketplace. The page shows a grid of asset cards. One card is highlighted with a yellow border. The cards include details such as the asset type (e.g., Algorithm, Dataset), category, publisher, description, purchase options, and download counts. The interface includes filters, a search bar, and a sidebar with navigation links like "Explore &amp; Buy Data", "Publish &amp; Sell Data", and "Compute-to-Data".

# Gaia-X Lab 0.8.3

## Onboarding Portal

This web app demonstrates how SSI could be used to issue Gaia-X participation credentials in a way that is cryptographically secure, privacy-respecting, and machine-verifiable.

[REGISTER CREDENTIAL](#)

[VERIFY CREDENTIAL](#)

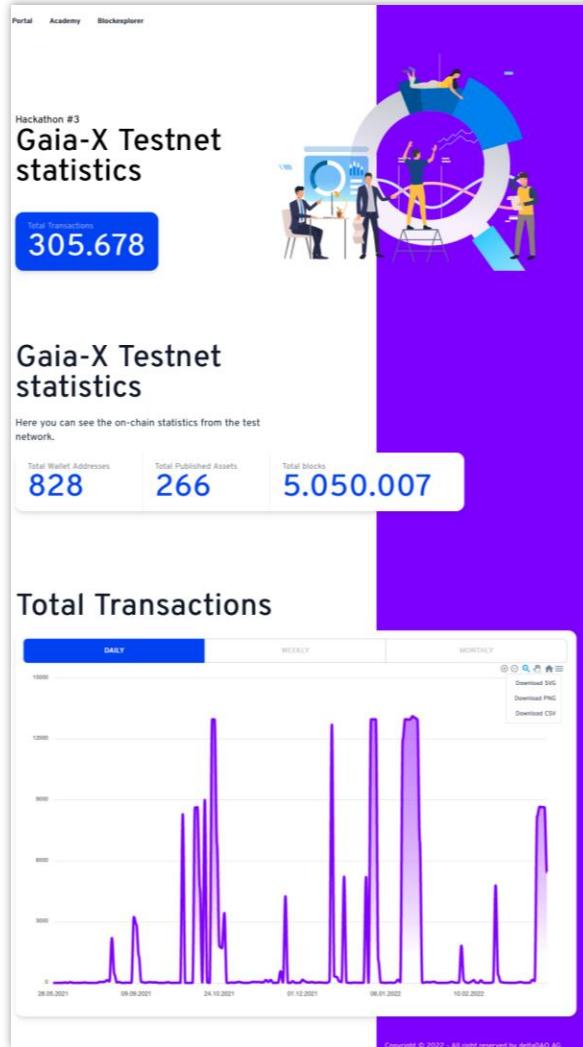




### 3. List of defined trust anchors

Name	Defined as
State	<p>The Trust Service Providers (TSP) must be a state validated identity issuer.</p> <ul style="list-style-type: none"> <li>- For <code>participant</code>, if the <code>legalAddress.country</code> is in EEA, the TSP must be eIDAS compliant.</li> <li>- Until end of 2022 Q1, to ease the onboarding and adoption this framework DV SSL can also be used.</li> <li>- <b>Gaia-X</b> association is also a valid TSP for Gaia-X association members.</li> </ul>
eIDAS	<p>Issuers of Qualified Certificate for Electronic Signature as defined in eIDAS Regulation (EU) No 910/2014</p> <p>(homepage: <a href="https://esignature.ec.europa.eu/efda/tl-browser/#/screen/home">https://esignature.ec.europa.eu/efda/tl-browser/#/screen/home</a>)</p> <p>(machine: <a href="https://ec.europa.eu/tools/lotl/eu-lotl.xml">https://ec.europa.eu/tools/lotl/eu-lotl.xml</a>)</p>
DV SSL	<p>Domain Validated (DV) Secure Sockets Layer (SSL) certificate issuers are considered to be temporarily valid Trust Service Providers.</p> <p>(homepage: <a href="https://wiki.mozilla.org/CA/Included_Certificates">https://wiki.mozilla.org/CA/Included_Certificates</a>)</p> <p>(machine: <a href="https://ccadb-public.secure.force.com/mozilla/IncludedCACertificateReportPEMCSV">https://ccadb-public.secure.force.com/mozilla/IncludedCACertificateReportPEMCSV</a>)</p>
Gaia-X	<i>To be defined after 2022Q1.</i>
EDPB CoC	<p>List of Code of Conduct approved by the EDPB</p> <p>(homepage: <a href="https://edpb.europa.eu/our-work-tools/documents/our-documents_fr?f%5B0%5D=all_publication_type%3A61&amp;f%5B1%5D=all_topics%3A125">https://edpb.europa.eu/our-work-tools/documents/our-documents_fr?f%5B0%5D=all_publication_type%3A61&amp;f%5B1%5D=all_topics%3A125</a>)</p>
gleif	<p>List of registered LEI issuers.</p> <p>(homepage: <a href="https://www.gleif.org/en/about-lei/get-an-lei/find-lei-issuing-organizations">https://www.gleif.org/en/about-lei/get-an-lei/find-lei-issuing-organizations</a>)</p> <p>(machine: <a href="https://api.gleif.org/api/v1/registrationAuthorities">https://api.gleif.org/api/v1/registrationAuthorities</a>)</p>

<https://registry.gaia-x.eu/api-docs/#/Trust%20Anchor/post> api trustAnchor



May 2021 – March 2022

Total Transactions

**314.087**

Total Wallet Addresses

**828**

Total Published Assets

**266**

Total blocks

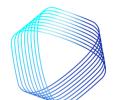
**5.050.007**

**Hackathon 3**  
**> 4600 Transactions**  
**> 100 Gaia-X Participant Credentials**

<https://stats.minimal-gaia-x.eu/>

## Repositories

- <https://github.com/deltaDAO/gaia-x-testnet-statistics-api>
- <https://github.com/deltaDAO/gaia-x-testnet-statistics>
- <https://github.com/deltaDAO/gaia-x-snapshot>



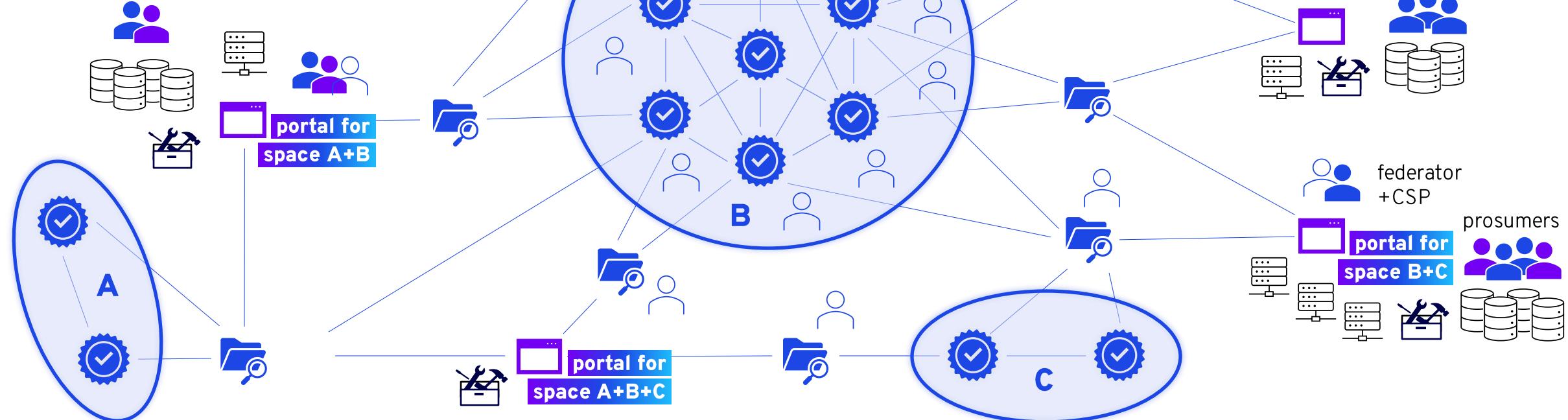
**deltaDAO**

| data economy solutions – GDPR compliant | contact@delta-dao.com

## introduction of a Minimal Viable Gaia-X

### creation and connection of complex services from atomic and elementary services

	portal
	consumer
	federator
	validator
	federation services toolbox

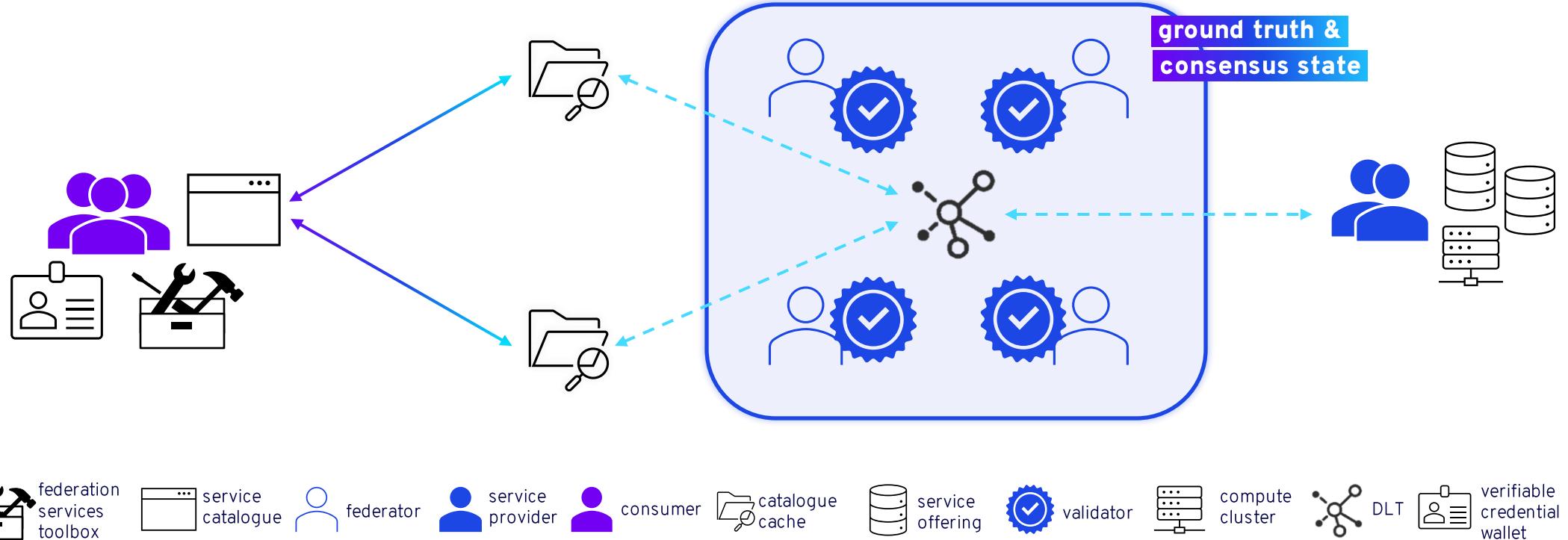


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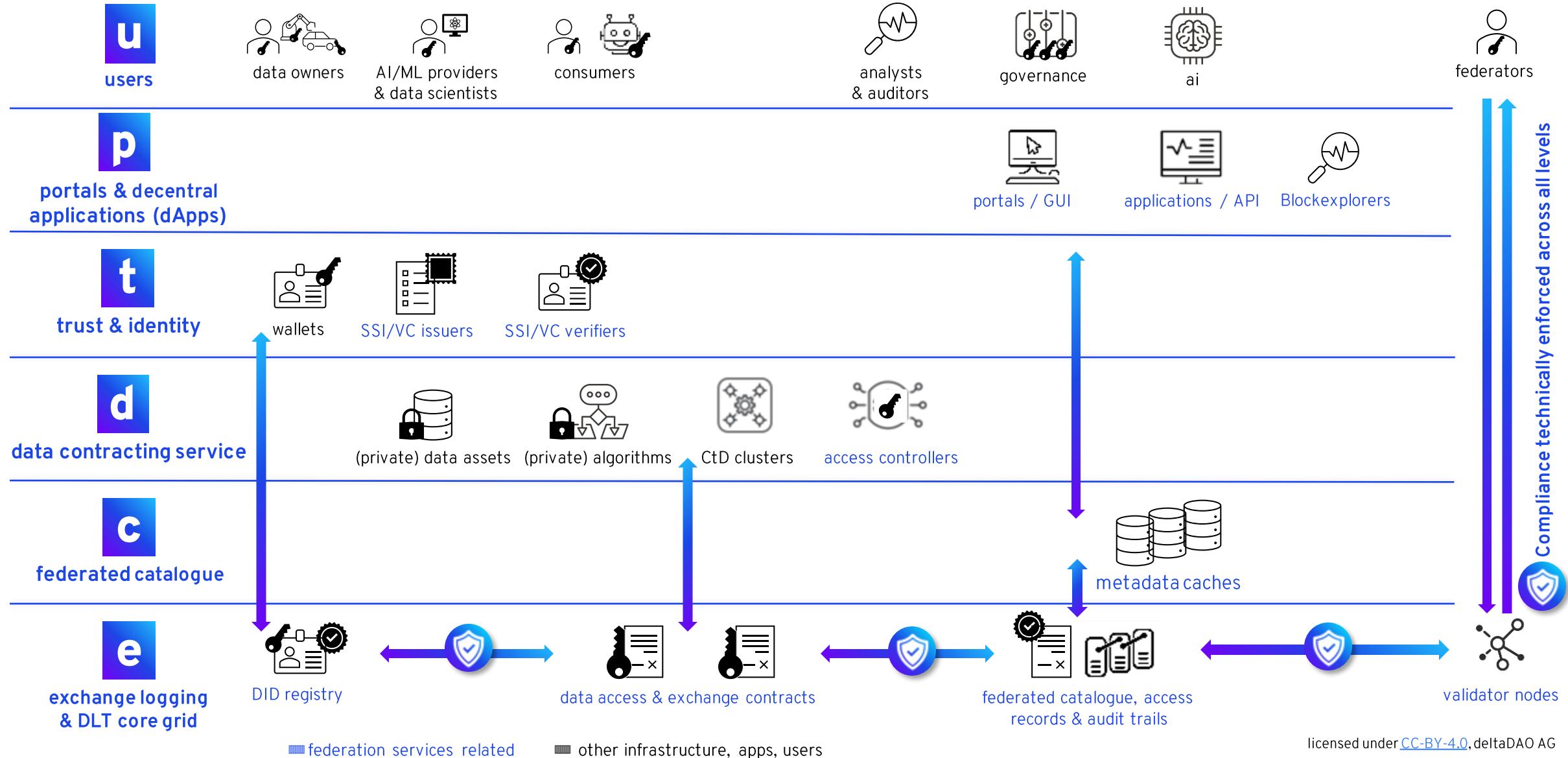
# remove all single points of failure from the federation



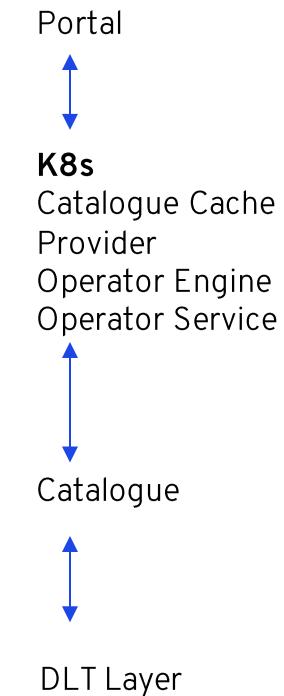
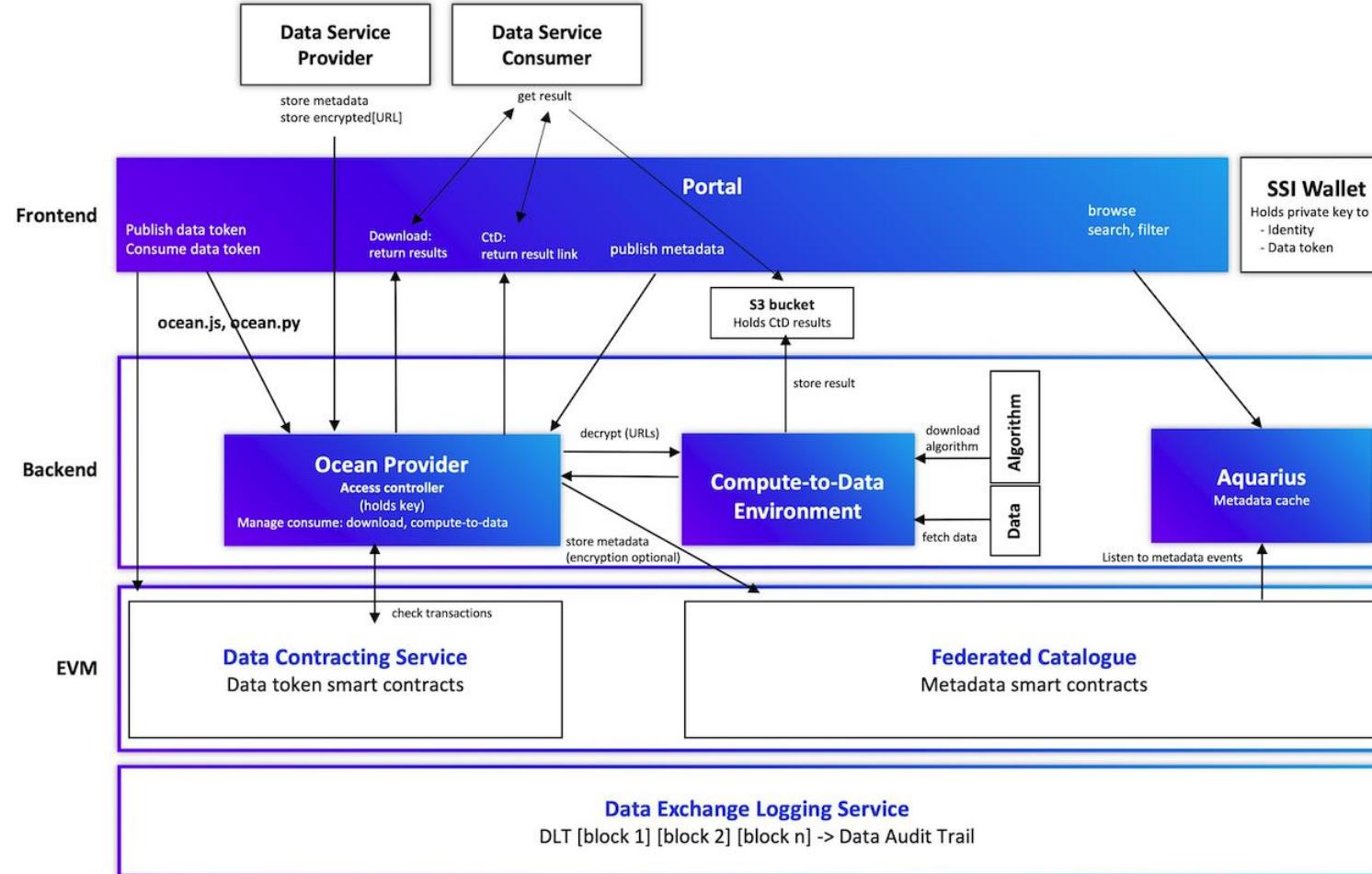
# portal.minimal-gaia-x.eu



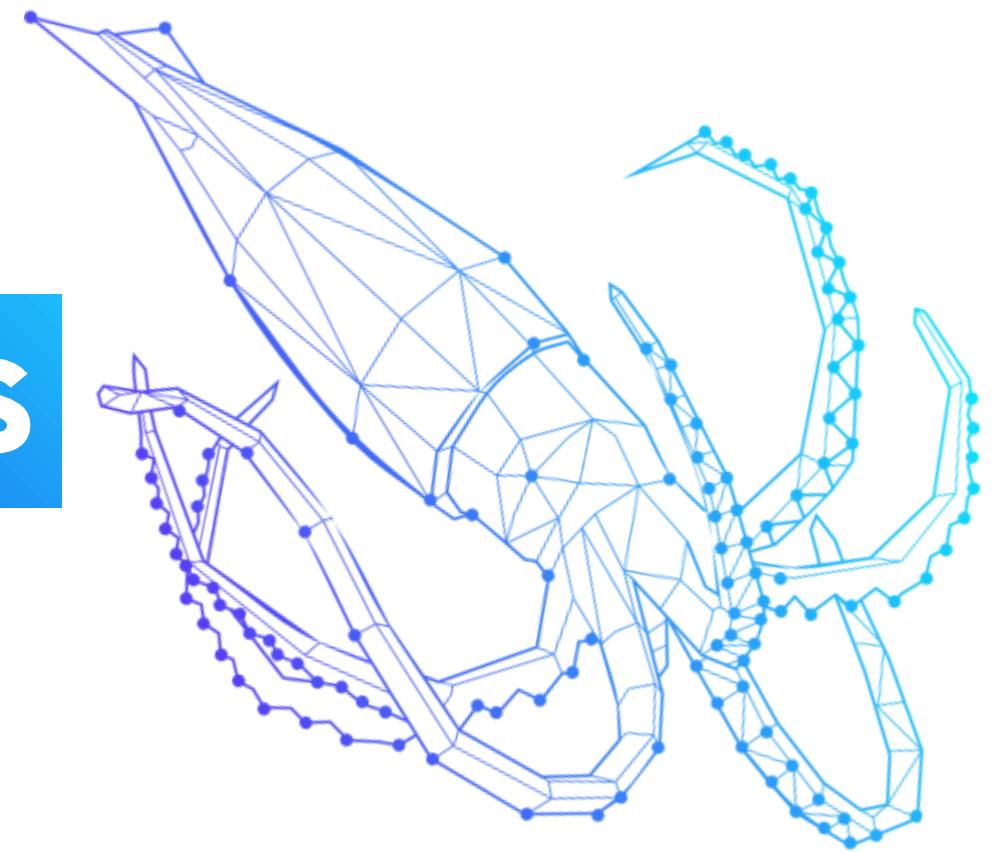
# MVP Gaia-X federation services & decentralized core grid



# deep dive #1



# Minimal Viable Gaia-X Features



# decentralized catalogue, minutes to publish and consume

gaia-x

**104 results**

**DATASETS** **ALGORITHMS** **CATEGORIES**

		SORT	PUBLISHED
FULL - Copernicus Sentinel Data Fusion with CNES Orfeo toolbox (Algorithm)	TENANE-58	ALGORITHM	1 OCEAN
QUICK - Copernicus Sentinel Data Fusion with CNES Orfeo toolbox (Algorithm)	STUJEL-8	ALGORITHM	1 OCEAN
Copernicus Sentinel Data Fusion with CNES Orfeo toolbox (Dataset)	INVDOL-81	DATA SET	1 OCEAN
Provider tests	PERWHA-66	ALGORITHM	1 OCEAN
Provider test	BILCOD-50	DATA SET	1 OCEAN
Bids test	VIBSEA-6	ALGORITHM	1 OCEAN
Test Dataset	GENSHA-68	DATA SET	1 OCEAN
Foreverontheblockchain Algorithm	JUDSTA-51	ALGORITHM	1 OCEAN
Foreverontheblockchain Dataset	QUICLA-8	DATA SET	1 OCEAN
Yolov5 Algorithm	CONWHA-61	ALGORITHM	1 OCEAN
Yolov5 Dataset examples	DOWLIN-26	DATA SET	1 OCEAN
QUICK - Copernicus Sentinel Data Fusion with CNES Orfeo toolbox	ADACUT-79	ALGORITHM	1 OCEAN
FULL - Copernicus Sentinel Data Fusion with CNES Orfeo toolbox	ADACUT-79	ALGORITHM	1 OCEAN
Data Fusion Dataset - Copernicus Sentinel-1 SLC IW and Sentinel 2 L2A	HUBHER-51	DATA SET	1 OCEAN

gaia-x

**PUBLISH**

Highlight the important features of your data set or algorithm to make it more discoverable and catch the interest of data consumers.

**Publishing Data Set**

Successfully published. [How create a price on your data set?](#)

**GO TO DATA SET →**

**Collected Form Values**

```
{
  "owner": "...",
  "archver": "...",
  "dataTokenDetails": {
    "name": "...",
    "symbol": ...
  }
}
```

## YOLOv5 Image Classification Sample Data (POC)

GAIA-X Testnet

**DATA SET** Inspired Lobster Token — INSLOB-11

Published By [0x68C2...260B](#)  
5 days ago — updated 5 days ago

**Service** Online / Available  
**Type** Machine Learning  
**Domain** Mobility

**About this Data Service Offering**

This data service offering consists of data for a real-time object detection algorithm, which identifies specific objects in a sample set of videos and images. The algorithm uses features learned by a deep convolutional neural network to detect an object.

The YOLOv5 algorithm is listed in the [Minimal Viable Gaia-X Portal](#) here.

This data service can be translated to many other use cases, i.e. traffic detection, smart cities, agricultural use cases etc.

**About the Use Case**

This use case demonstrates how algorithm and data providers can train and monetize their machine learning scripts by making them available in Gaia-X. At the same time consumers in Gaia-X can use existing and well-trained models for classification, analysis and forecasting without the need to share their data and/or acquire personnel or

**USE**

5 OCEAN ≈ €2.51

Select an algorithm to start a compute job

Search by title, datatoken, or DID...

YOLOv5 Object Classification Algorithm (POC) ↗  
L009H-49 | 0x68C2...466346ec7E826933941447249cCC51981B04400

You will pay 5 OCEAN

**BUY COMPUTE JOB**

You do not have enough OCEAN in your wallet to purchase this asset.

<https://catalogue.minimal-gaia-x.eu>

Tutorial: <https://youtu.be/eAbnM5bfEMc>

# SSI integration & access control for technical sovereignty

**Set allowed algorithms**

Selected Algorithms

Search by title, datasetoken, or DID...

<input checked="" type="checkbox"/> Demonstrator Algorithm A European Data Economy in 2021 ↗ CERFIS-7	1
<input type="checkbox"/> QUICK - Copernicus Sentinel Data Fusion with CNES Orfeo toolbox (Algorithm) ↗ REDNHA-3	1
<input type="checkbox"/> FULL - Copernicus Sentinel Data Fusion with CNES Orfeo toolbox (Algorithm) ↗ TEINNE-58	1
<input type="checkbox"/> QUICK - Copernicus Sentinel Data Fusion with CNES Orfeo toolbox (Algorithm) ↗ STUUEL-8	1
<input type="checkbox"/> Provider tests ↗ PELENA-66	1
<input type="checkbox"/> Bids test ↗ VIBSEA-6	1
<input type="checkbox"/> Foreverontheblockchain Algorithm ↗ J005TA-51	1
<input type="checkbox"/> Yolo5 Algorithm ↗ COMNHA-61	1
<input type="checkbox"/> QUICK - Copernicus Sentinel Data Fusion with CNES Orfeo toolbox ↗ ADACUT-79	1

Choose one or multiple algorithms you trust to allow them to run on this data set.

All Algorithms

Allow any published algorithm

Allow any published algorithm to run on this data set.

**SUBMIT**    **CANCEL**

Allow ETH Address

e.g. 0x12345678901234567890abcd

**ADD**

Enter ETH address and click ADD button to append the list. Only ETH address in allow list can consume this asset. If the list is empty means anyone can download or compute this asset

Deny ETH Address

e.g. 0x12345678901234567890abcd

**ADD**

Enter ETH address and click ADD button to append the list. If ETH address is fall under deny list, download or compute of this asset is denied

Disable Consumption

Disable

Disable dataset being download or compute when dataset undergoing maintenance.

**SUBMIT**    **CANCEL**

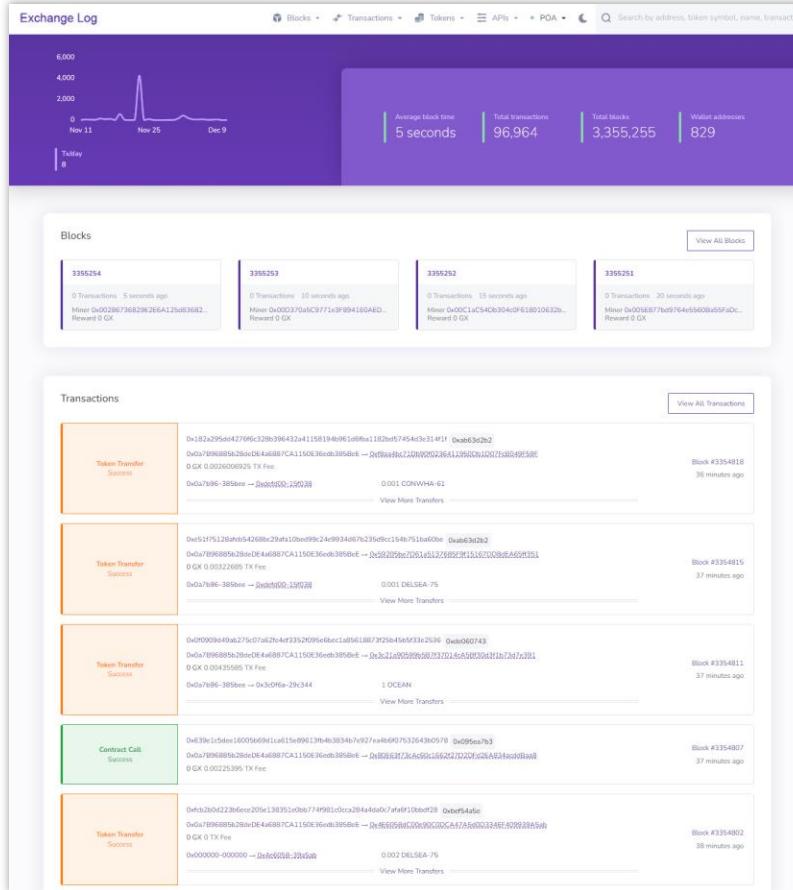
```

13 },
14 "@id": "ex:de_NBI",
15 "gax:type": "gax-participant:Provider",
16 "gax-participant:hasLegallyBindingName": "de.NBI",
17 "gax-participant:hasLogo": {
18   "@id": "https://bonian.de/denbi_small.png"
19 },
20 "gax-participant:hasCommercialRegister": {
21   "gax:type": "vcard:Address",
22   "vcard:street-address": "Universittstrasse 27",
23   "vcard:postal-code": "33615"
24 },
25 "gax-participant:hasLegallyBindingAddress": {
26   "gax:type": "vcard:Address",
27   "vcard:street-address": "Universittstrasse 27",
28   "vcard:postal-code": "33615"
29 },
30 "gax-participant:hasLegalForm": {
31   "gax:value": "E.g. Societas Europaea"
32 },
33 "gax-participant:hasWebAddress": {
34   "gax:value": "https://www.denbi.de",
35   "gax:type": "xsd:anyURI"
36 },
37 "gax-participant:hasSalesTaxID": {
38   "gax:value": "E.g. DE 12951565"
39 },
40 "gax-participant:hasLegalRegistrationNumber": {
41   "gax:value": "E.g. HRB 1234"
42 },
43 "gax-participant:hasJurisdiction": {
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45 },
46 "gax-participant:hasIndividualContactLegal": {
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57 },
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60 "individualContactTechnical": "support@delta-dao.com",
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62 "legalForm": "Stock Company",
63 "legalRegistrationNumber": "HRB 170364",
64 "legallyBindingAddress": {
65   "countryName": "Germany",
66   "locality": "Hamburg",
67   "postCode": "22303",
68   "streetAddress": "Geibelstr. 46B"
69 },
70 "legallyBindingName": "deltaDAO AG",
71 "trustState": "untrusted",
72 "webAddress": {
73   "url": "https://www.delta-dao.com/"
74 },
75 },
76 "id": "did:ebsi-eth:00000001/credentials/1872",
77 "issuanceDate": "2020-08-24T14:13:44Z",
78 "issuer": "did:ebsi:z224RU8HfsGocXguF5uqsnsU",
79 "type": [ "VerifiableCredential", "GaiaxCredential" ],
80 "proof": {
81   "type": "EdDSASeCP256k1Signature2019",
82   "creator": "did:ebsi:z224RU8HfsGocXuoF5uqsnsU".
83 }
84 },
85 "id": "did:ebsi-eth:00000001/credentials/1872",
86 "issuanceDate": "2020-08-24T14:13:44Z",
87 "issuer": "did:ebsi:z224RU8HfsGocXguF5uqsnsU",
88 "type": [ "VerifiableCredential", "GaiaxCredential" ],
89 "proof": {
90   "type": "EdDSASeCP256k1Signature2019",
91   "creator": "did:ebsi:z224RU8HfsGocXuoF5uqsnsU".
92 }
93 }
94 
```

Tutorial: [https://youtu.be/vFfYo8LxbzM?list=PLIQB1A\\_2lytB5Cf6P0uTTN4hRGbAxw7E](https://youtu.be/vFfYo8LxbzM?list=PLIQB1A_2lytB5Cf6P0uTTN4hRGbAxw7E)

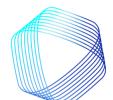


# automatic audit trails & security & privacy by design

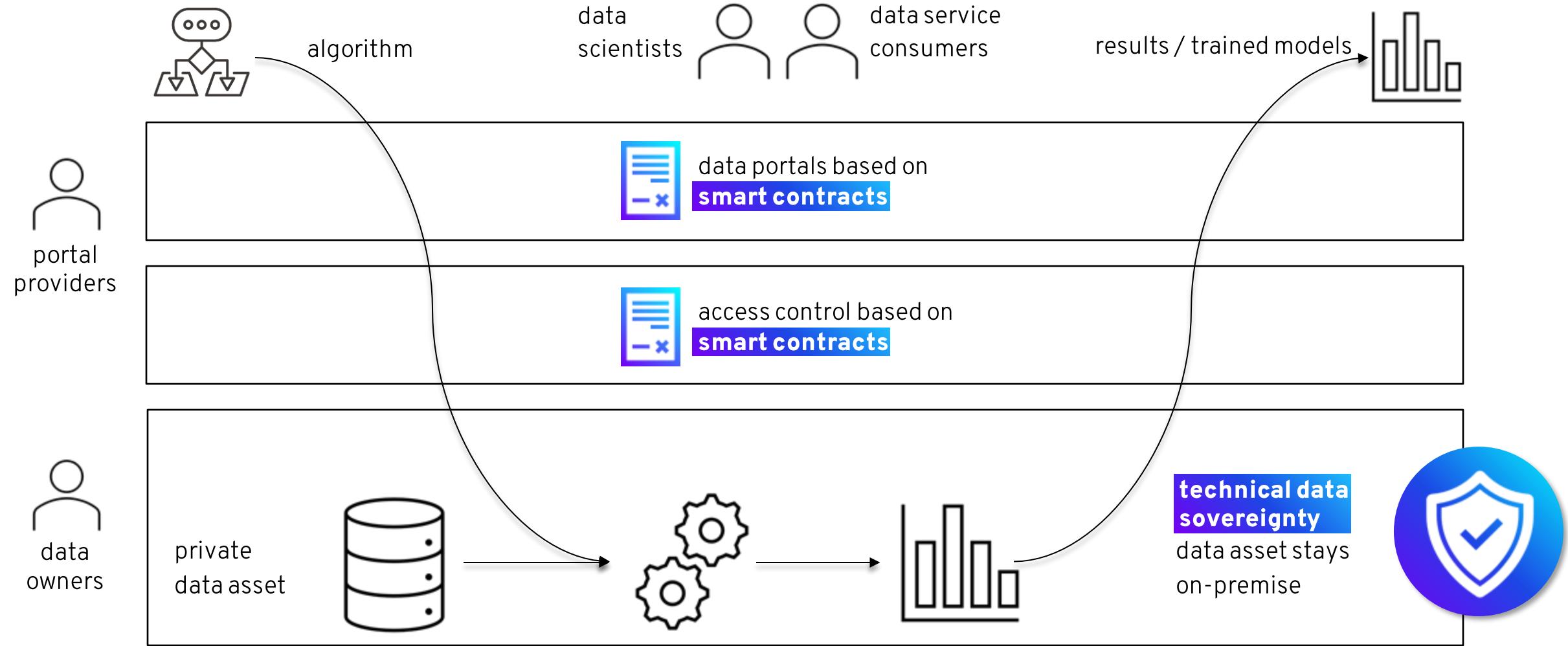


Transaction Details	
Transaction Hash	0x182a295dd4276f6c328b396432a41158194b961d6fba1182bd57454d3e314f1f
Result	Success
Status	Confirmed
Block	Confirmed by 2,045
Timestamp	3 hours ago   December-12-2021 06:25:50 PM +1 UTC   Confirmed within <= 5.0 seconds
From	0xa07b96885b28dede4a6887ca1150e36edb385bee
Interacted With (To)	0xf8aa4bc71db90f0236411950db1d07fc049f59f
Tokens Transferred	
From	0xa07b96885b28de4a6887ca1150e36edb385BeE
To	0x3c0F6a52c84A79eBC52C56Ff8C029a30F929C344
For	0.998 CONWHA-61
From	0xa07b96885b28de4a6887ca1150e36edb385BeE
To	0x9984b2453eC7D99a73A5B3a46Da81f197B753C8d
For	0.001 CONWHA-61
From	0xa07b96885b28de4a6887ca1150e36edb385BeE
To	0xDefD0018969cd2d4E648209F876ADe184815f038
For	0.001 CONWHA-61
Value	0 GX
Transaction Fee	0.0022258425 GX
Gas Price	52.5 Gwei

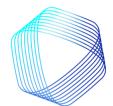
<https://exchangelog.minimal-gaia-x.eu/>

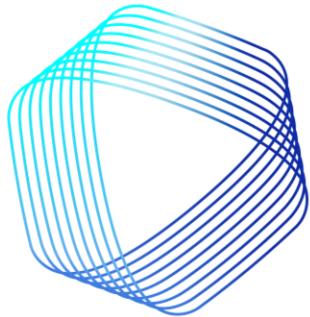


# compute-to-data enables true technical data sovereignty



# portal.minimal-gaia-x.eu





# deltaDAO

**data economy solutions – GDPR compliant**

## **deltaDAO AG**

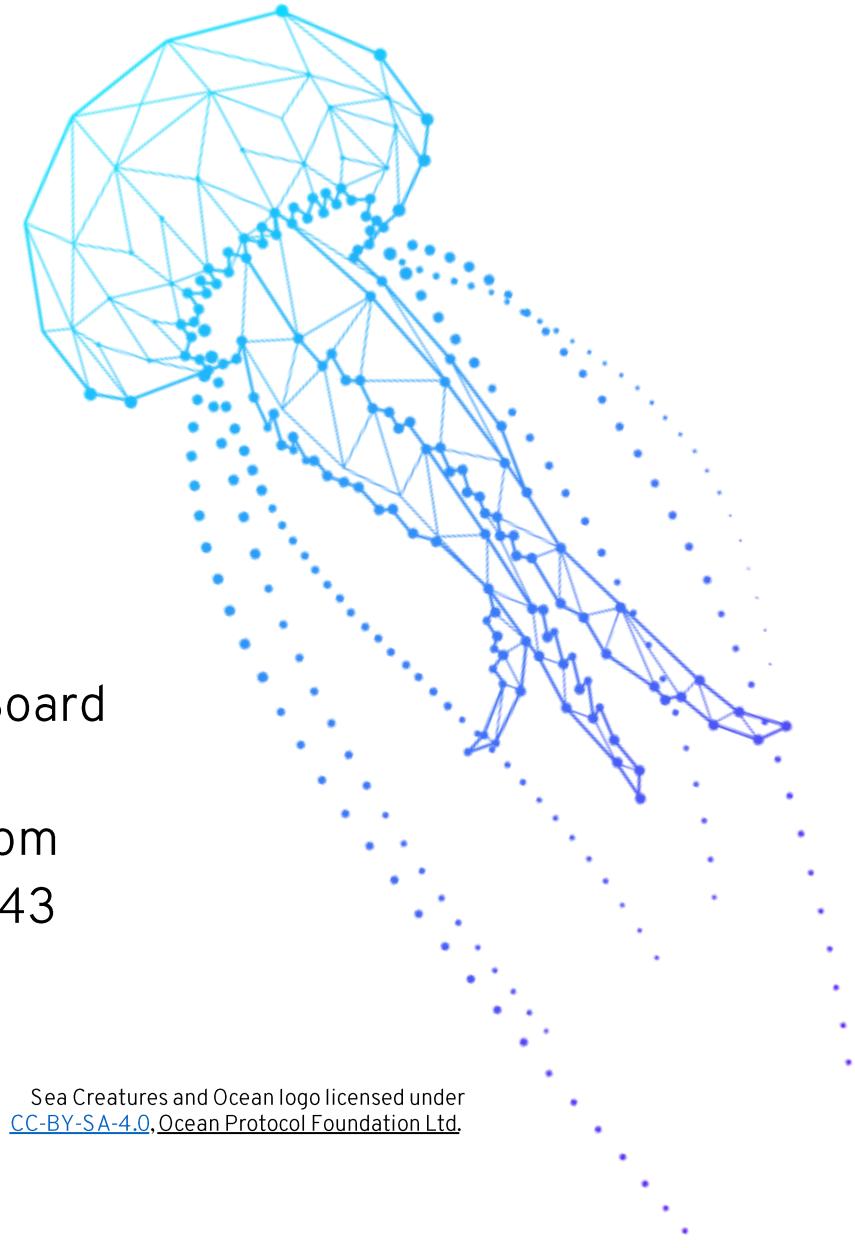
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