



› **SEMANTIC INTEROPERABILITY FOR DATA SPACES:
PUTTING THE VOCABULARY HUB IN PLACE**

› WOUTER VAN DEN BERG

- › Consultant data standards & interoperability
- › Years of experience creating and maintaining message standards in numerous domains
- › User researcher for TNO's Semantic Treehouse platform



[Wouter van den Berg](#)

TNO

wouter.vandenberg@tno.nl

[TNO Data Ecosystems](#)



<https://semantic-treehouse.nl>



› AGENDA

01. INTRODUCTION

02. DATA SPACES? VOCABULARY HUB?

03. SEMANTIC TREEHOUSE

04. DEMO: ONTOLOGY-DRIVEN API SPECIFICATION

05. PUTTING THE VOCABULARY HUB IN PLACE

06. QUESTIONS & DIALOGUE

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› **THE MONEY**

756 mil. EUR

EU funding 2021 - 2022

THE POLITICS

The European data strategy of February 2020:

A common European data space, a single market for data

*creating a single market for data that will ensure Europe's **global competitiveness** and **data sovereignty**.*

Availability of high quality data to create and innovate

Data can flow within the EU and across sectors

Rules for access and use of data are fair, practical and clear & clear data governance mechanisms are in place

European rules and values are fully respected

defending and promoting European values and rights in the digital world.



THE VISION

Common European data spaces

Rich pool of data
(varying degree of
accessibility)

Free flow of data
across sectors and
countries

Full respect of GDPR

Horizontal
framework for data
governance and data
access



Health



Industrial &
Manufacturing



Agriculture



Finance



Mobility



Green Deal



Energy



Public
Administration

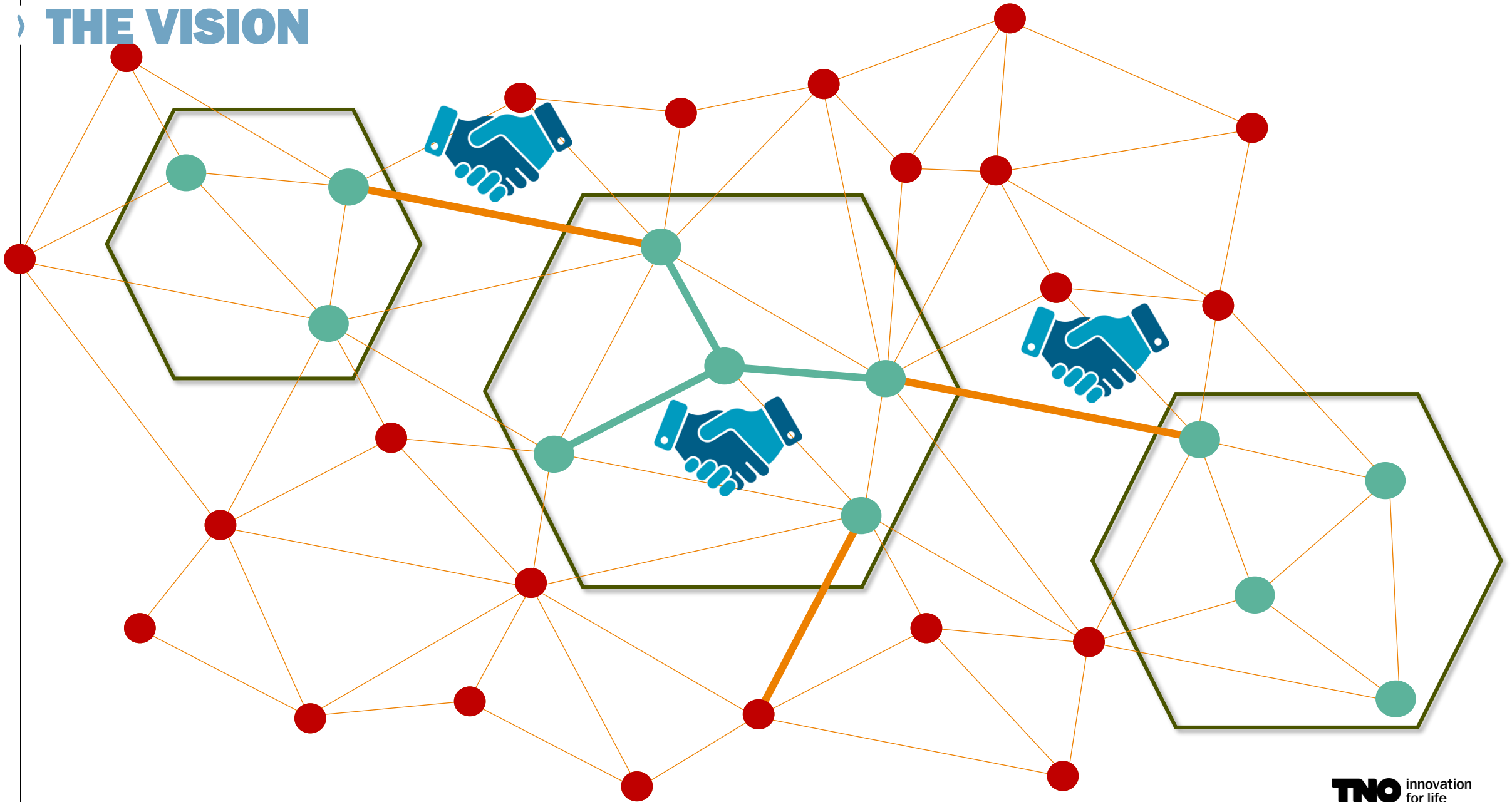


Skills

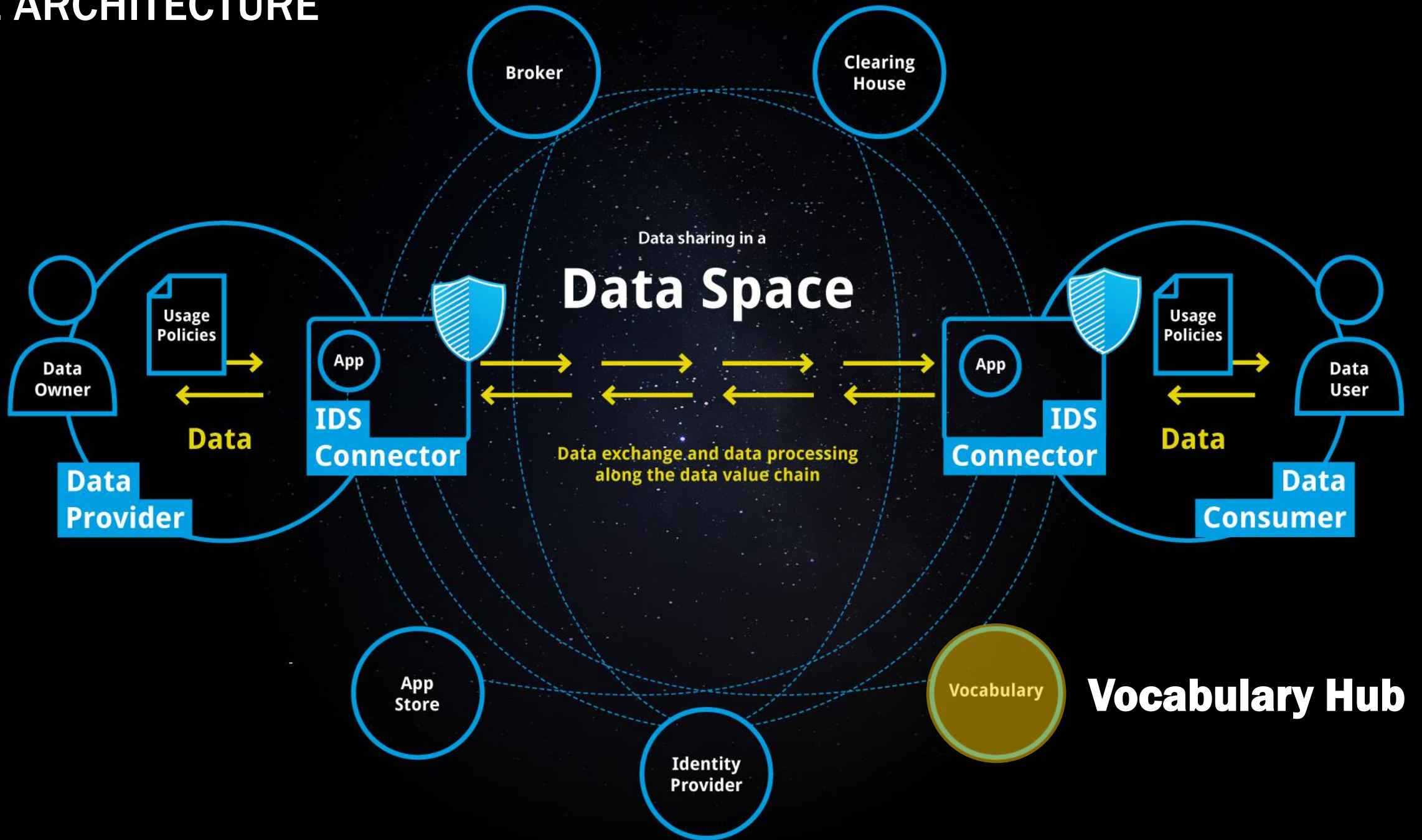
- Technical tools for data pooling and sharing
- Standards & interoperability (technical, semantic)

- Sectoral Data Governance (contracts, licenses, access rights, usage rights)
- IT capacity, including cloud storage, processing and services

THE VISION



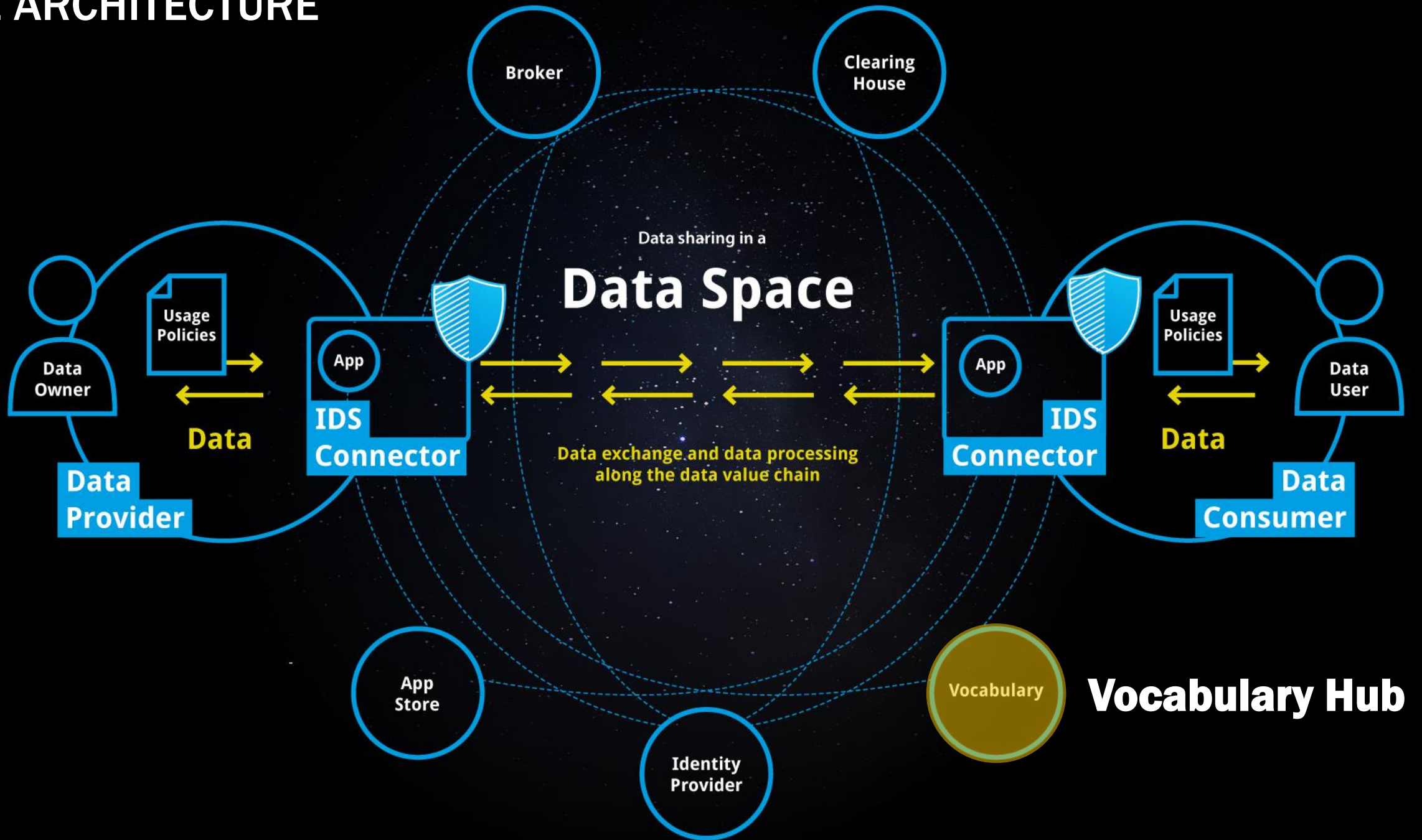
THE ARCHITECTURE



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The **Vocabulary Hub** serves the maintenance of shared vocabularies and related (schema) documents.

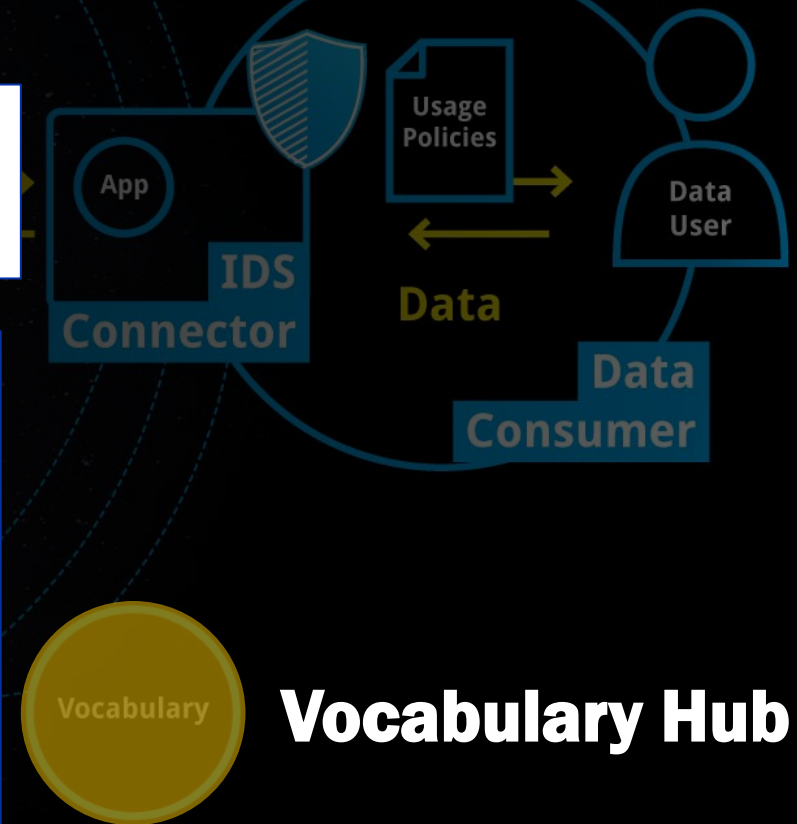
- [IDS Information Model](#)

Vocabulary Hub

Server providing maintenance facilities for editing, browsing and downloading vocabularies and related documents; mirrors a set of external third-party vocabularies ensuring seamless availability and resolution

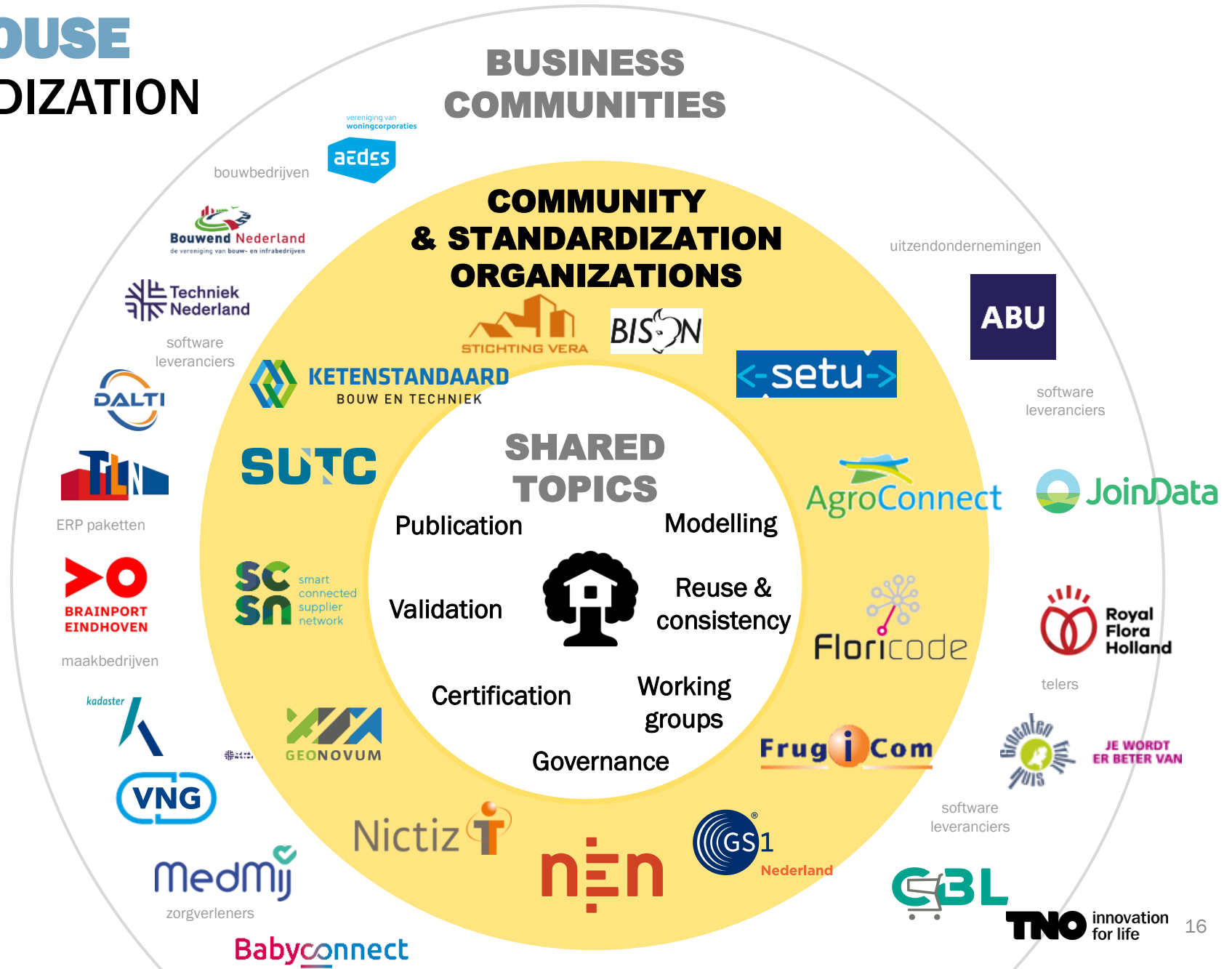
Vocabulary hubs are central servers that store vocabularies and enable collaboration. Collaboration may comprise search, selection, matching, updating, requests for changes, version management, deletion, duplicate identification, and unused vocabularies. Vocabulary hubs need to be managed.

- [IDS Reference Architecture Model \(IDS RAM\)](#)

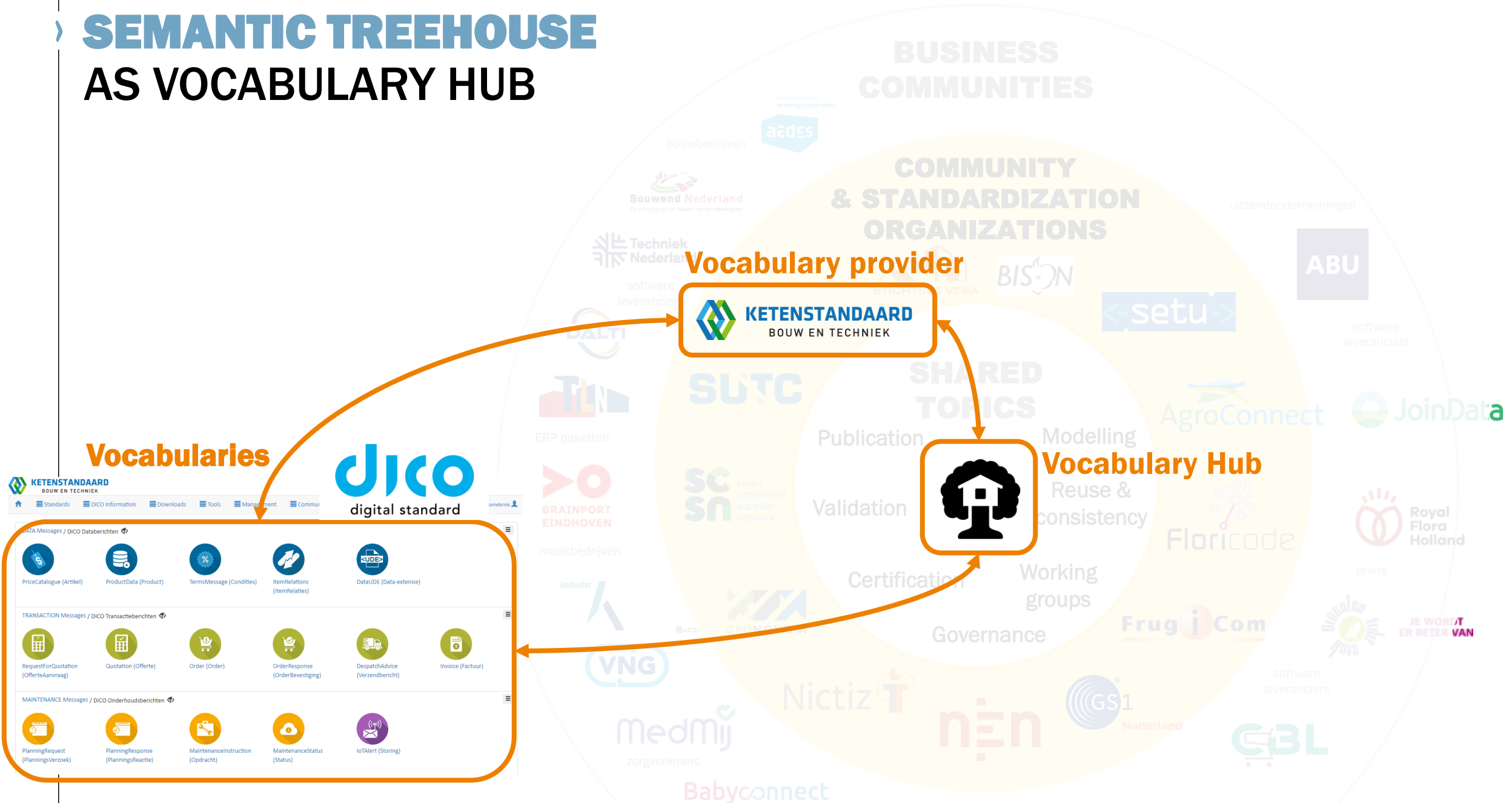


Vocabulary Hub

SEMANTIC TREEHOUSE SUPPORTS STANDARDIZATION ORGANIZATIONS



SEMANTIC TREEHOUSE AS VOCABULARY HUB



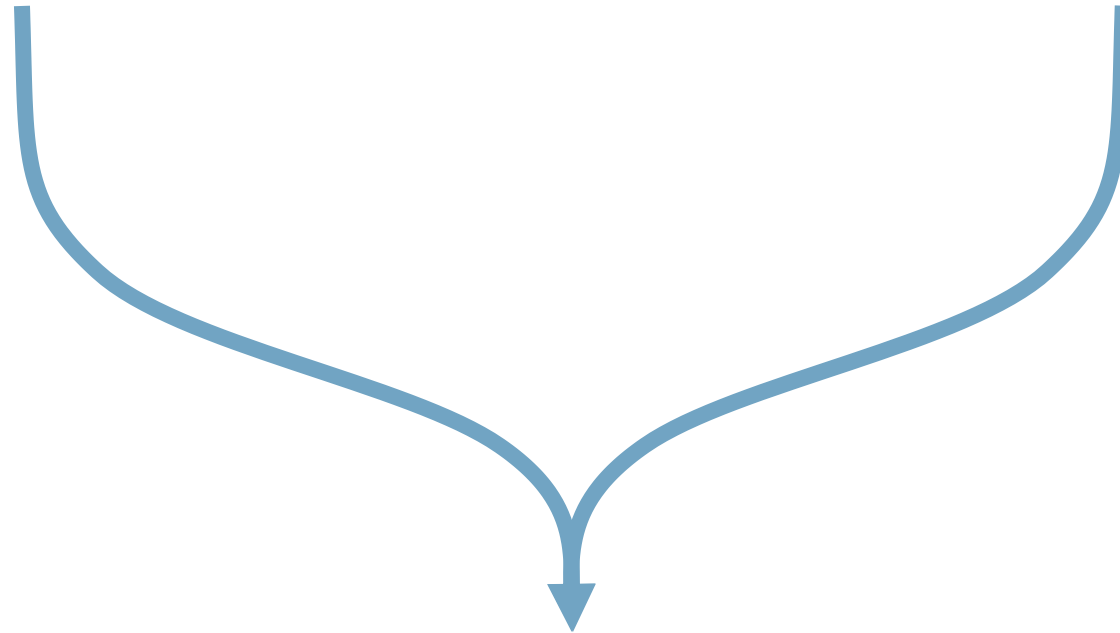
› WHAT'S BEEN DRIVING US

Ambition 1

Facilitate semantic interoperability

Ambition 2

Harness the power of linked data



Ontology-based specification of message models and APIs

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Step 1: Data model version

Step 2: Message specification

Step 3: Summary & export

Edit message model version

[Version mngt](#)[Release notes](#)[Message model](#)[Namespaces](#)[Validator syntax](#)[Documentation](#)[Acknowledgements](#)

IMPORT ONTOLOGIES

[OWL-core v3.0.0](#)[eCatalogue-core-layer v3.0.0](#)[eCatalogue-SHACL-shapes v3.0.0](#)[SHACL-shapes v3.0.0](#)[eCatalogue-restrictions v3.0.0](#)[OWL-restrictions v3.0.0](#)[Add OntologyVersion](#)

MESSAGE DEFINITION

MESSAGE NAME



BASED ON CLASS (FULL URI)

NAMESPACE URI

PREDECESSOR

MAPPINGS



Step 1: Data model version

Step 2: Message specification

Step 3: Summary & export

EPO-test v0.02



Search by name



- [1..1] Catalogue_transaction
- ▶ [0..1] isProvidedByCatalogueProvider
 - + [0..n] isSubordinatedTo ⓘ
 - + [0..n] hasValidity ⓘ
 - + [1..n] isComposedOf ⓘ
 - + [0..1] hasSpecificPaymentArrangemer
 - + Add all
 - + Add next level descendants

Catalogue_transaction v0.02



Element Value constraints Usage notes Syntax binding Development Techn. details

ELEMENT NAME

Catalogue_transaction

LABEL

Catalogue_transaction

NAMESPACE

http://data.europa.eu/a4g/ontology#

DEFINITION

A describing a set of items offered for purchase that can be processed in an electronic way.

MIN MULTIPLICITY

1

MAX MULTIPLICITY

1





Step 1: Data model version

Step 2: Message specification

Step 3: Summary & export

Configure your Semantic API using the following output

XML syntax

JSON syntax

CSV syntax

XSD

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" >
  <!--==== Root element definitions =====>
  <xs:element name="Catalogue_transaction" type="Catalogue_transaction" />
  <xs:annotation base="Catalogue_transaction">
    <xs:documentation>
      <sth:definition>A describing a set of :
    </xs:documentation>
  </xs:annotation>
</xs:element>
  <!--==== ComplexType definitions =====>
  <xs:complexType name="CatalogueProvider">
    <xs:sequence>
      <xs:element name="playedByOrganisation" type="playedByOrganisation" />
    </xs:sequence>
  </xs:complexType>
</xs:schema>
```

Example

```
<?xml version="1.0" encoding="UTF-8"?>
<Catalogue_transaction xmlns="http://data.europa.eu/a4g/ontology#" >
  <isProvidedByCatalogueProvider>
    <playedByOrganisation>
      <hasLegalName/>
      <hasRegisteredAddress>
        <postName/>
        <addressArea/>
        <locatorName/>
        <adminUnitL2/>
        <fullAddress/>
        <locatorDesignator/>
        <adminUnitL1/>
        <postCode/>
        <thoroughfare/>
      </hasRegisteredAddress>
    </playedByOrganisation>
  </isProvidedByCatalogueProvider>
</Catalogue_transaction>
```

RML

```
@prefix rml: <http://semweb.mmlab.be/ns/rml#> .
@prefix ql: <http://semweb.mmlab.be/ns/ql#> .
@prefix rr: <http://www.w3.org/ns/r2rml#> .
@prefix ns0: <http://data.europa.eu/a4g/ontology#> .
@prefix org: <http://www.w3.org/ns/org#> .

[]
  rml:logicalSource [
    rml:source "http://www.example.com/root"
    rml:referenceFormulation ql:XPath ;
    rml:iterator "/Catalogue_transaction"
  ] ;
  rr:subjectMap [
    rr:termType rr:BlankNode ;
    rr:class ns0:Catalogue
  ] ;
```


Configure your Semantic API using the following output

[XML syntax](#) [JSON syntax](#) [CSV syntax](#)

JSON schema

YAML JSON

Example

```
id: 'http://data.europa.eu/a4g/ontology#C:'  
$schema: 'https://json-schema.org/draft/2020-  
title: 'EPO-test version 0.02'  
description: 'Generated by Semantic Treehouse'  
additionalProperties: false  
properties:  
  isProvidedByCatalogueProvider:  
    additionalProperties: false  
    properties:  
      playedByOrganisation:  
        additionalProperties: false  
        properties:  
          hasLegalName:  
            type: object  
          hasRegisteredAddress:
```

```
{  
  "isProvidedByCatalogueProvider": {  
    "playedByOrganisation": {  
      "hasLegalName": {},  
      "hasRegisteredAddress": {  
        "postName": [  
          {}  
        ],  
        "addressArea": {},  
        "locatorName": {},  
        "adminUnitL2": {},  
        "fullAddress": {},  
        "locatorDesignator": {},  
        "adminUnitL1": {},  
        "postCode": [  
          {}  
        ]  
      }  
    }  
  }  
}
```

RML

```
@prefix rml: <http://semweb.mmlab.be/ns/rml#>  
@prefix ql: <http://semweb.mmlab.be/ns/ql#>  
@prefix rr: <http://www.w3.org/ns/r2rml#> .  
@prefix ns0: <http://data.europa.eu/a4g/onto: >  
@prefix org: <http://www.w3.org/ns/org#> .  
  
[]  
  rml:logicalSource [  
    rml:source "http://www.example.com/root"  
    rml:referenceFormulation ql:JSONPath ;  
    rml:iterator "$"  
  ] ;  
  rr:subjectMap [  
    rr:termType rr:BlankNode ;  
    rr:class ns0:Catalogue
```





Step 1: Data model version

Step 2: Message specification

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Configure your Semantic API using the following output

[XML syntax](#)[JSON syntax](#)[RDF syntax](#)[CSV syntax](#)

SHACL specification

```

@prefix sh: <http://www.w3.org/ns/shacl#>
@prefix ns0: <urn:cen.eu:en16931#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-
@prefix xsd: <http://www.w3.org/2001/XMLSchema

[]
  a sh:NodeShape ;
  sh:targetClass ns0:InvoiceType ;
  sh:property [
    a sh:PropertyShape ;
    sh:name "BG-1 INVOICE NOTE" ;
    sh:description "A group of business terms
    sh:order 20 ;
    rdfs:comment "The receiver is required to
    sh:path ns0:invoiceNote ;

```

Example

```

@prefix ns0: <urn:cen.eu:en16931#> .

[]
  a ns0:InvoiceType ;
  ns0:invoiceNumber [ a ns0:IdentifierType ]
  ns0:invoiceIssueDate [ a ns0:DateType ] ;
  ns0:invoiceTypeCode [ a ns0:CodeType ] ;
  ns0:invoiceCurrencyCode [ a ns0:CodeType ]
  ns0:vatAccountingCurrencyCode [ a ns0:Code
  ns0:valueAddedTaxPointDate [ a ns0:DateType
  ns0:valueAddedTaxPointDateCode [ a ns0:Code
  ns0:paymentDueDate [ a ns0:DateType ] ;
  ns0:buyerReference [ a ns0:TextType ] ;
  ns0:projectReference [ a ns0:DocumentRefer
  ns0:contractReference [ a ns0:DocumentRefer

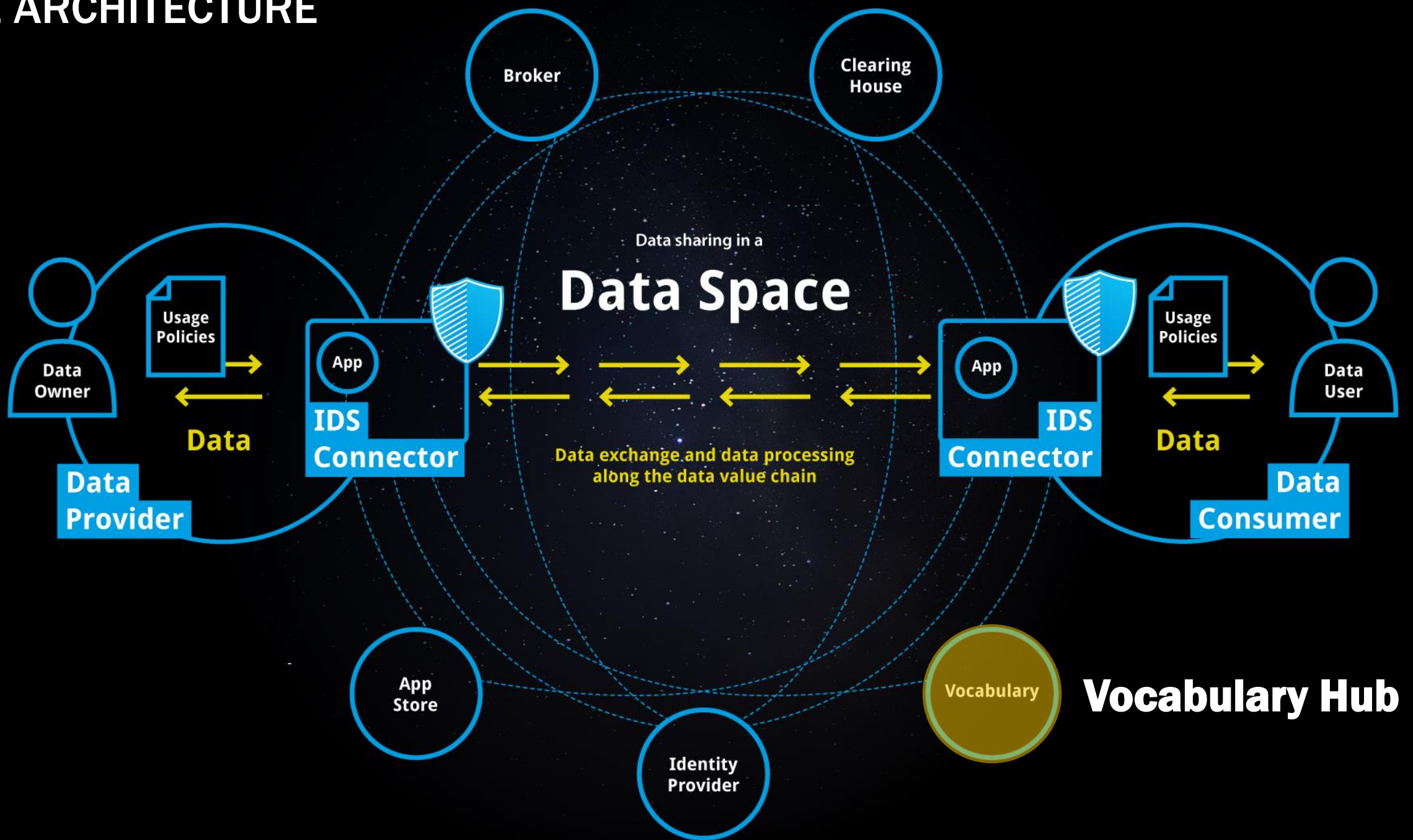
```



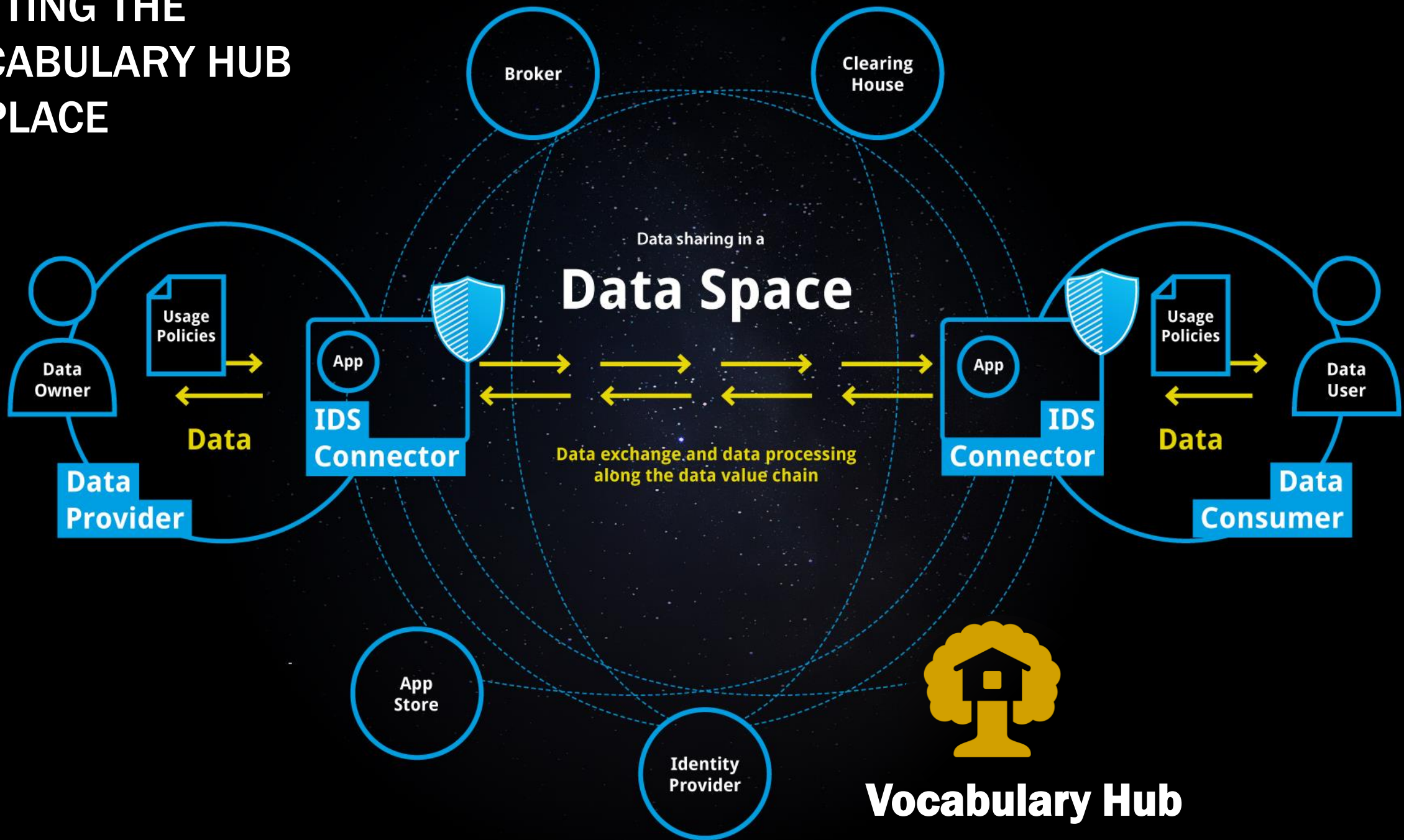
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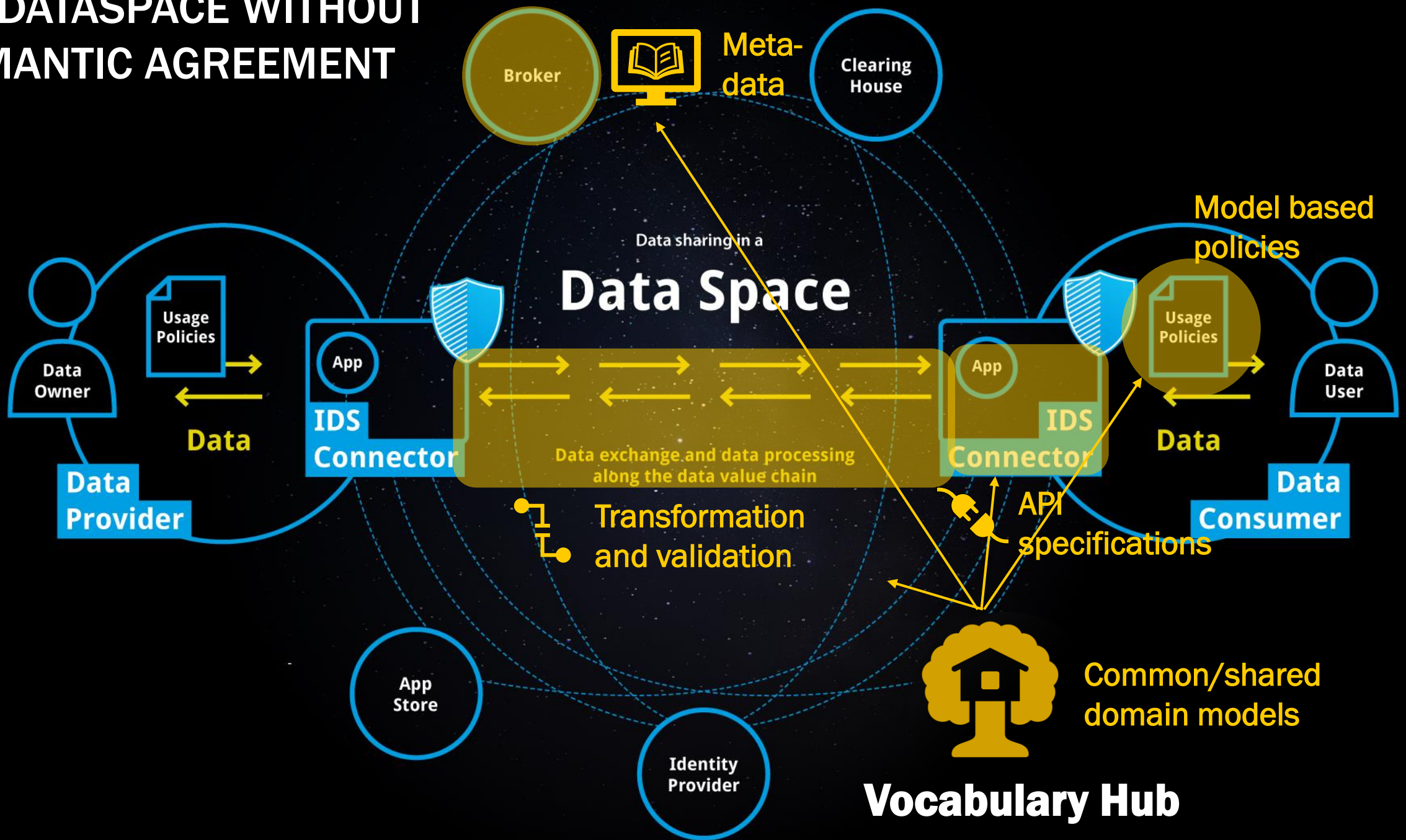
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PUTTING THE VOCABULARY HUB IN PLACE



NO DATASPACE WITHOUT SEMANTIC AGREEMENT



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› STAY CONNECTED!

- › Join our community on Discord: <https://discord.gg/PaSdt3ddZA>
 - › To get updates
 - › To test / play around with the tool?
 - › To give feedback
- › Want to know more?
 - › We post regular updates on <https://semantic.treehouse.nl>
 - › Check out the white paper [The Vocabulary Hub to configure data space connectors](#)*
- › See opportunities?
 - › Semantic Treehouse is going open source soon. Get in touch

*https://www.trusts-data.eu/wp-content/uploads/2022/06/04_TNO-april-2022-The-Vocabulary-Hub-to-configure-data-space-connectors.pdf



QUESTIONS & DIALOGUE