INTERNATIONAL DATA SPACES ASSOCIATION

Tech Talk

Semantic interoperability – successful data sharing through common understanding

April 6, 2023 | 10 to 11 CET

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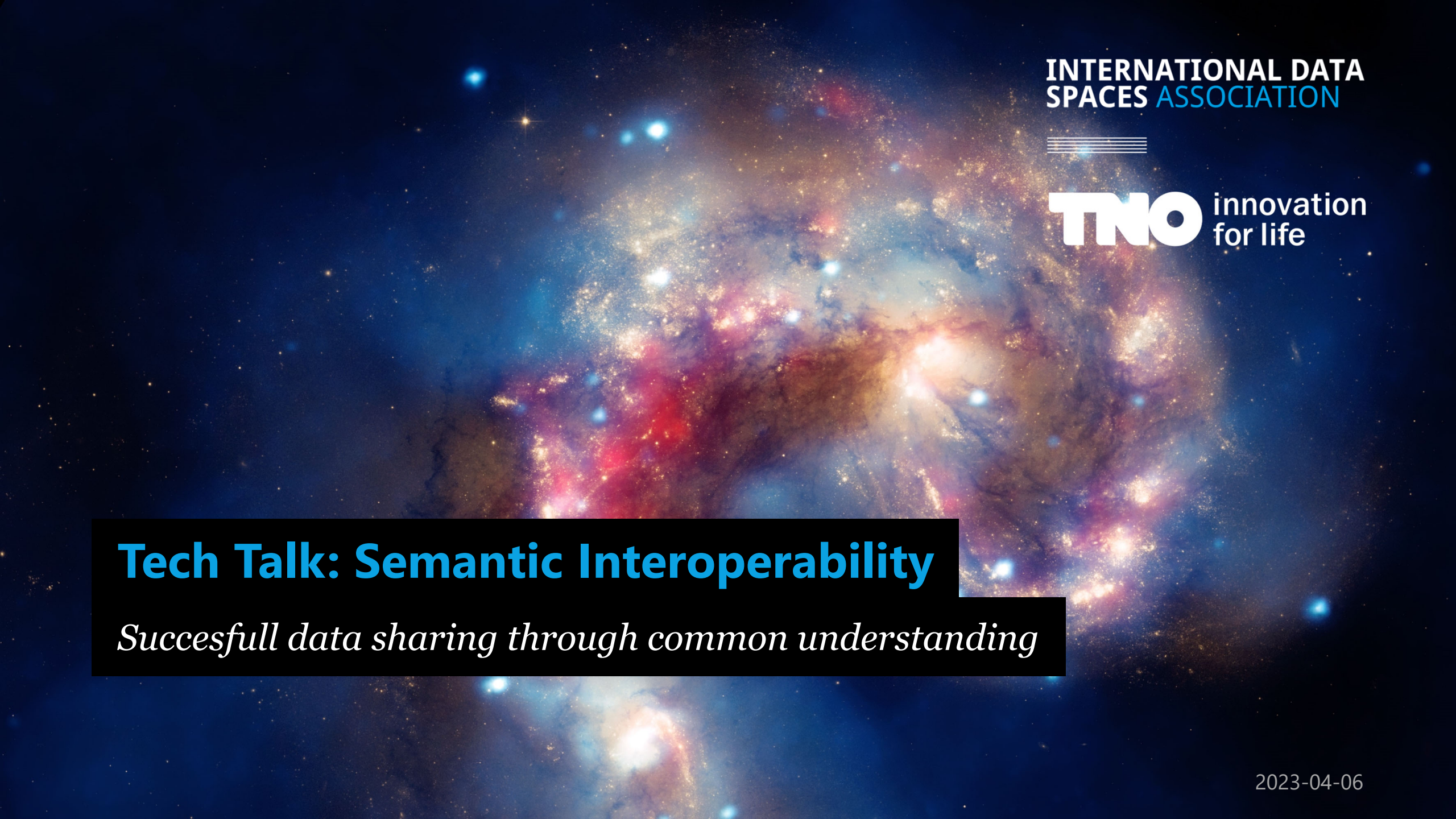
INTERNATIONAL DATA
SPACES ASSOCIATION
TNO innovation
for life
Tech Talk: Semantic Interoperability
Succesfull data sharing through common understanding
2023-04-06

Agenda

How do you get data space participants to use a common language?

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1. Why semantic interoperability is important
2. The role of vocabularies in IDS
3. The purpose of the IDS Vocabulary Hub
4. Q&A

Recent developments

IDS Vocabulary Hub working group

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Results:

- Numerous sections added to the IDS RAM about semantic interoperability, vocabularies and the IDS Vocabulary Hub..
- A new IDS white paper covering these subjects in a single document.

Join the conversation:

- Contact info@internationaldataspaces.org to receive invitations and updates on coming working group sessions
- Collaborate and give feedback on parts of the IDS RAM: https://github.com/International-Data-Spaces-Association/IDS-RAM_4_0

Why semantic interoperability is important

01

International Data Spaces Approach

Self-Determined Control Of Data Flows

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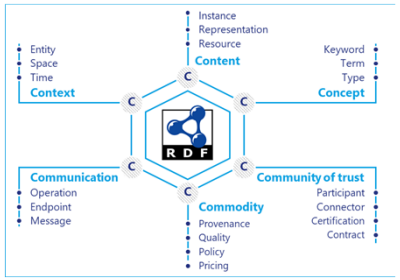
Unlimited **Interoperability**

Enabled by semantic data descriptions



Information Model

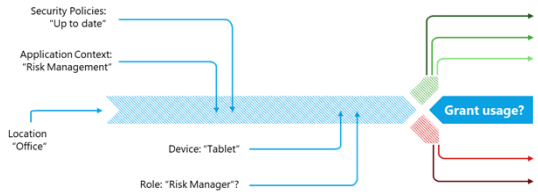
Trust between different security domains

Certified, comprehensive security functions providing a maximum level of trust

Certification Scheme

Governance for the data economy

Usage control and enforcement for data flows



Concept of usage control

Mechanisms for technical interoperability

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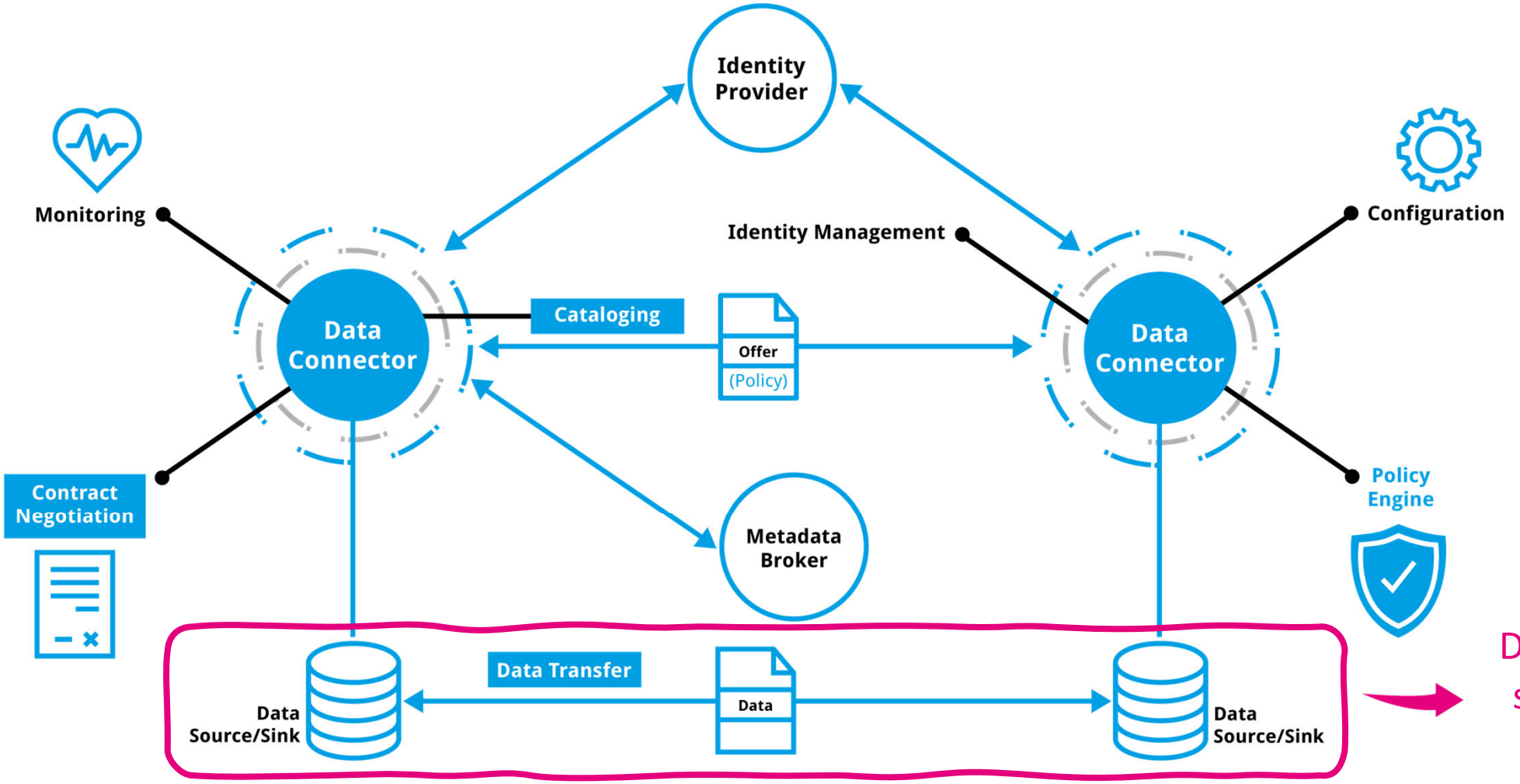

Data sharing successful!
Or is it?

Successful data sharing requires semantic interoperabiltiy

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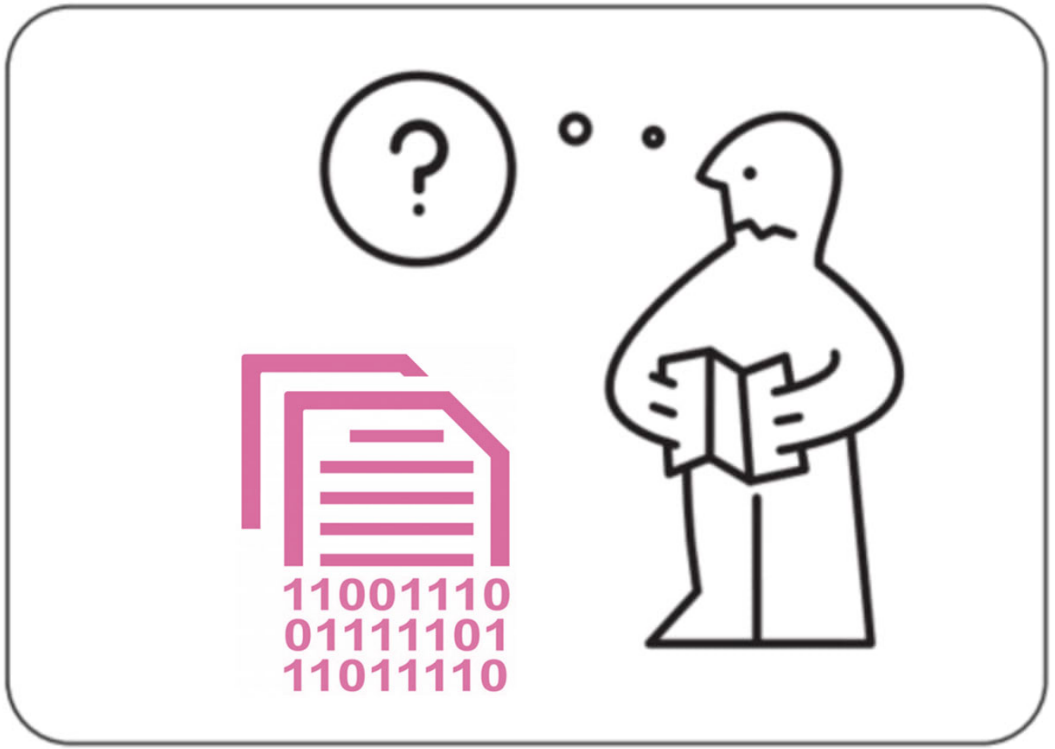

Successful data sharing requires semantic interoperabiltiy

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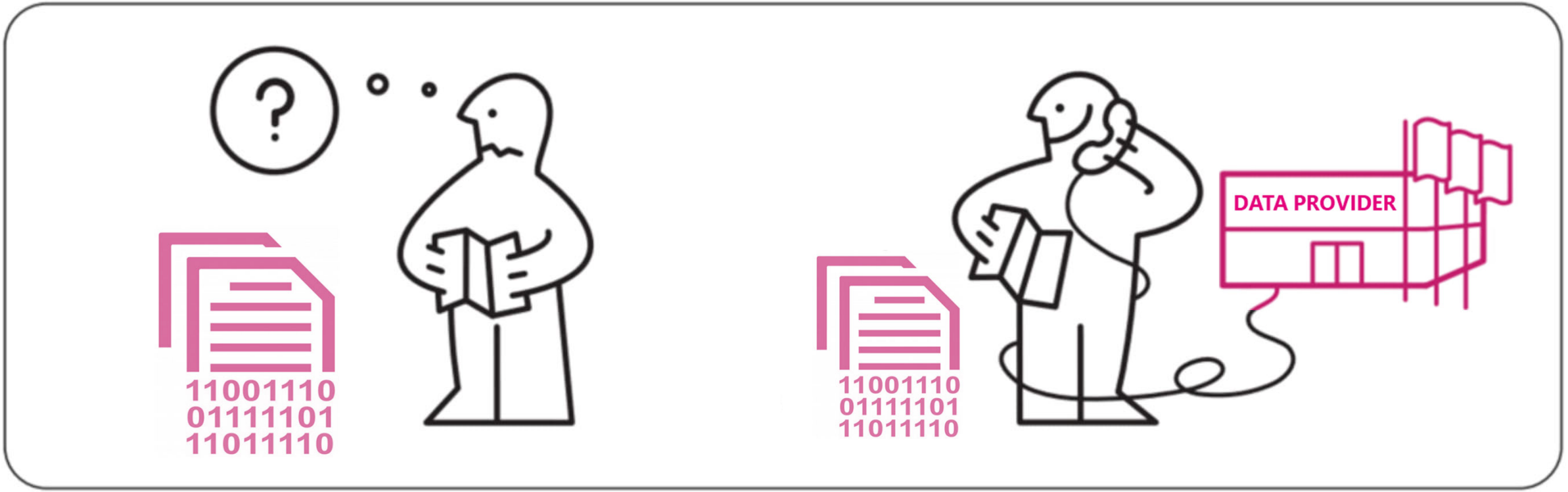

European Interoperability Framework (EIF)

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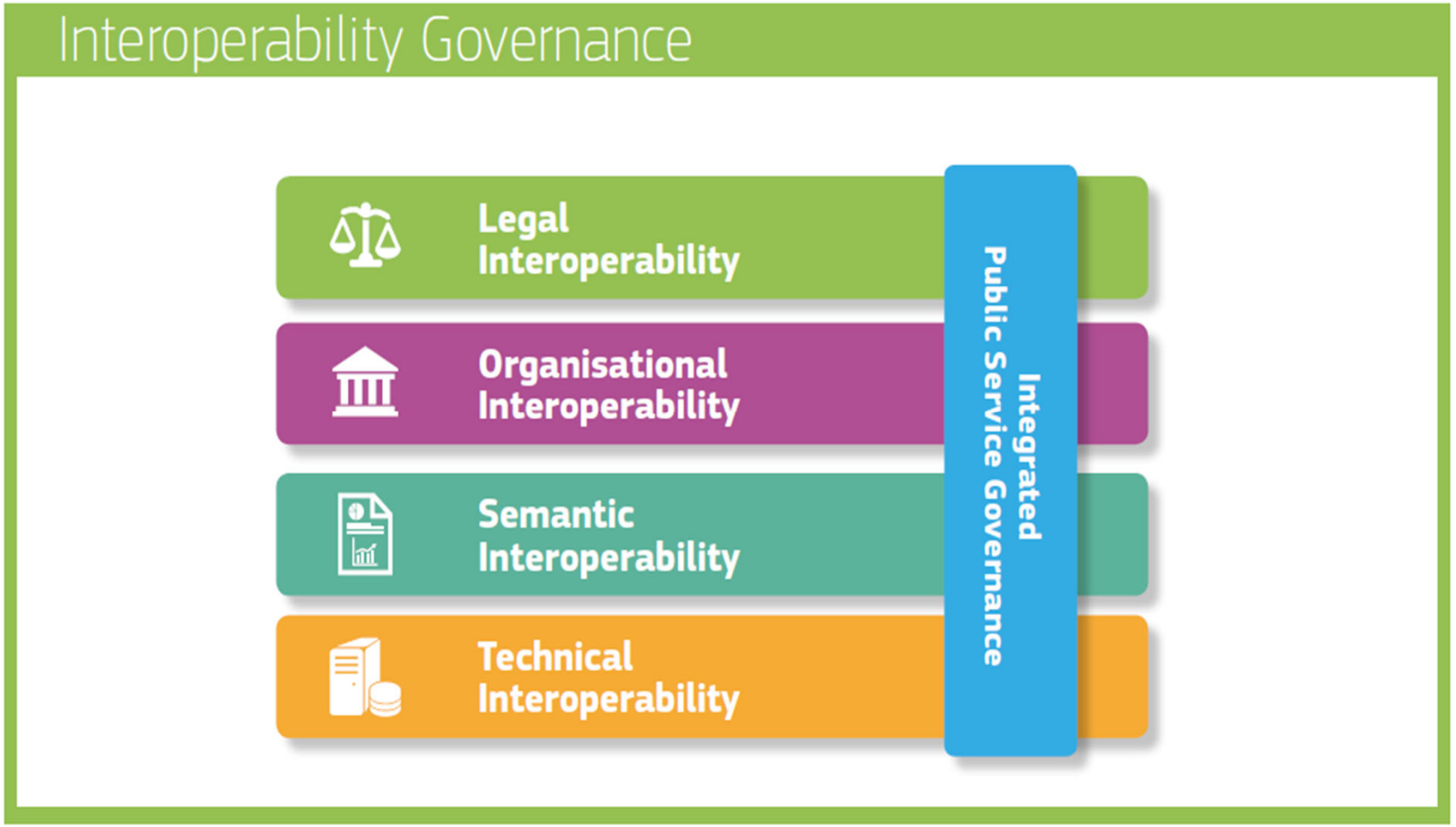

https://ec.europa.eu/isa2/eif_en/

Common European data spaces

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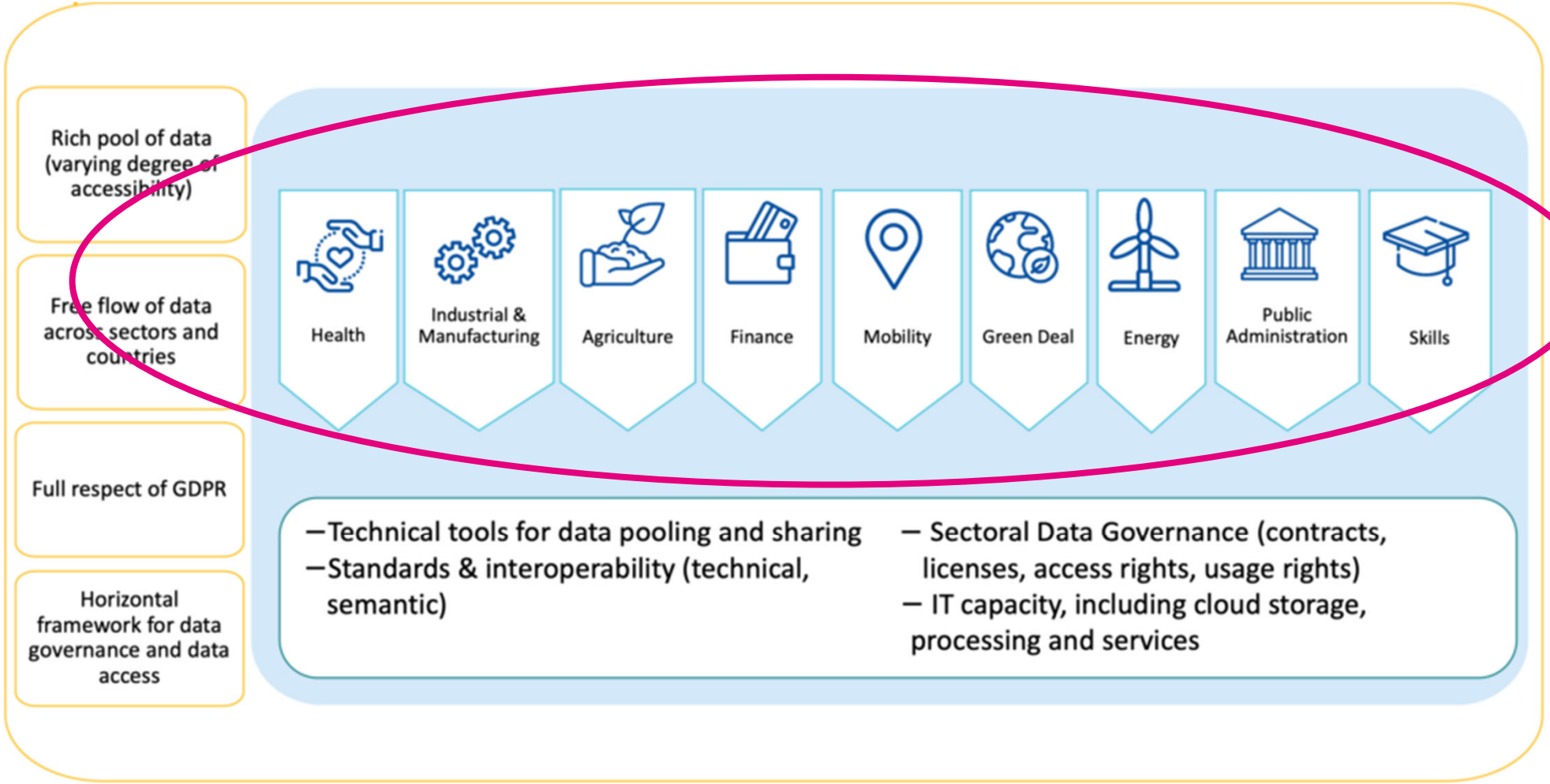

https://ec.europa.eu/isa2/eif_en/

Summing up

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Establishing semantic interoperability will prove beneficial in multiple ways.

On a **technical level**:

- it enables a clearer understanding of the data.
- It permits to quickly connect with other participants

On an **organizational level**:

- Data as a product: the added knowledge increases the data's value/quality.
- Reduced innovation lead times: data-driven solutions can be developed more efficiently from concept to implementation

The role of vocabularies in data spaces

02

Mechanisms for technical interoperability

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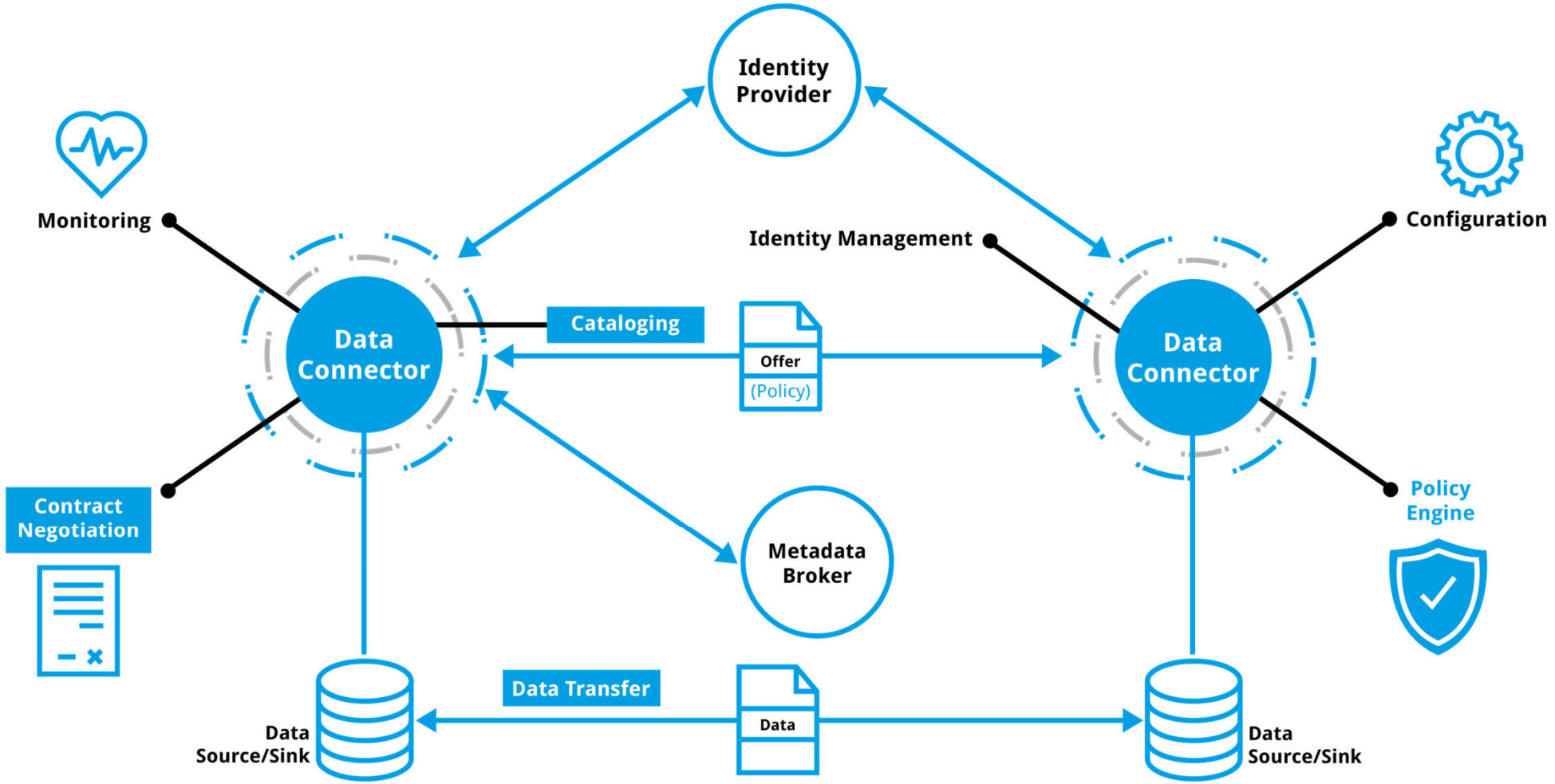

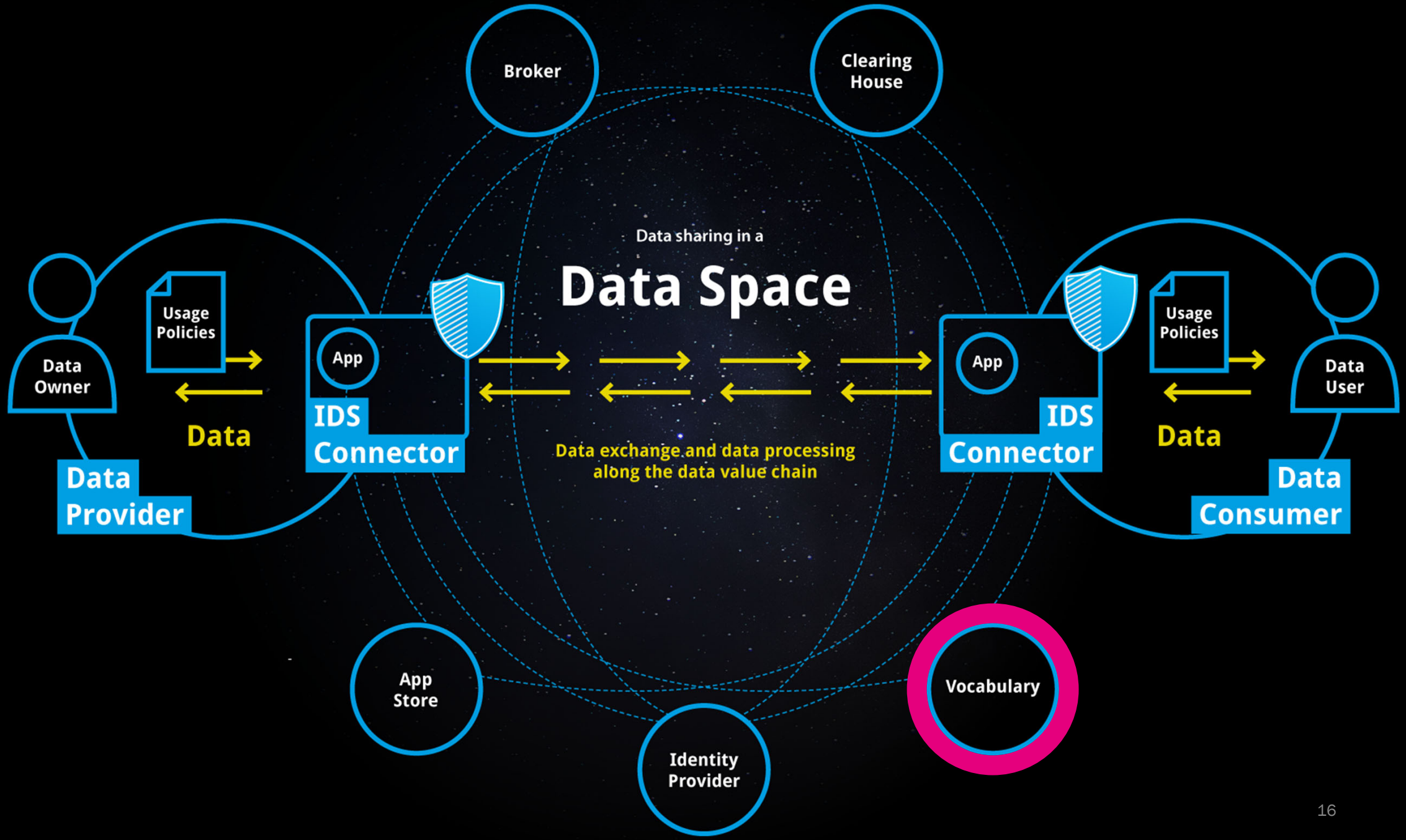
Broker
Clearing House
Data sharing in a
Data Space
Usage Policies
Data Owner
Data
App
IDS Connector
Data exchange and data processing along the data value chain
App
IDS Connector
Usage Policies
Data User
Data
Data Provider
Data Consumer
App Store
Identity Provider
Vocabulary

Vocabularies

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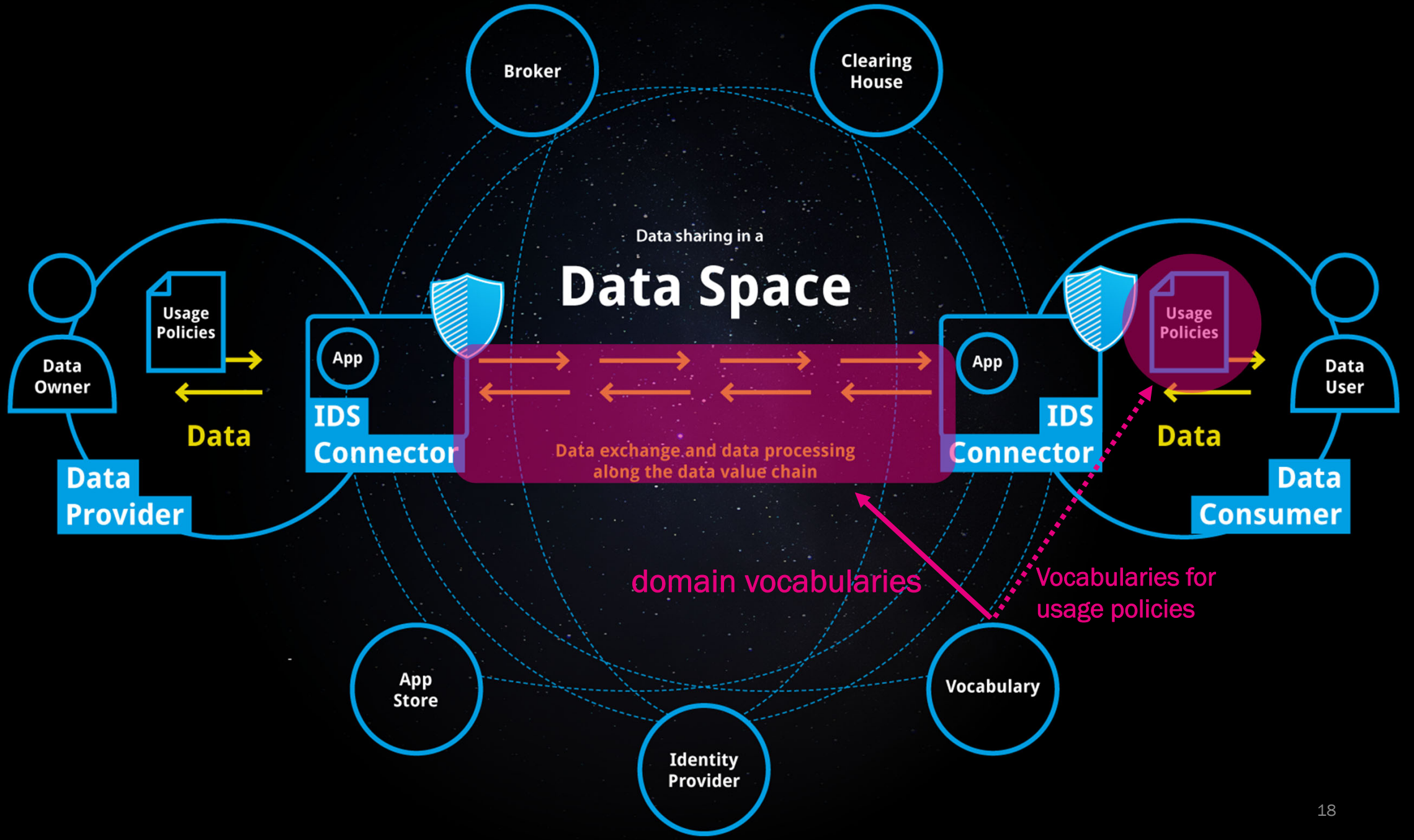
- I use the term '**vocabulary**' in a very broad and inclusive sense
  - no distinguishing between ontologies, schemata, lightweight vocabularies, etc.

- At least three roles for vocabularies in IDS:
  1. The **IDS Information Model**, which is the basis for the description of data sources
  2. The **domain-specific vocabularies**, used to clarify the semantics of the data (service) in question
  3. The **legal terms**: vocabularies to describe usage policies in a machine-readable and -understandable manner.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domain vocabularies
Vocabularies for usage policies
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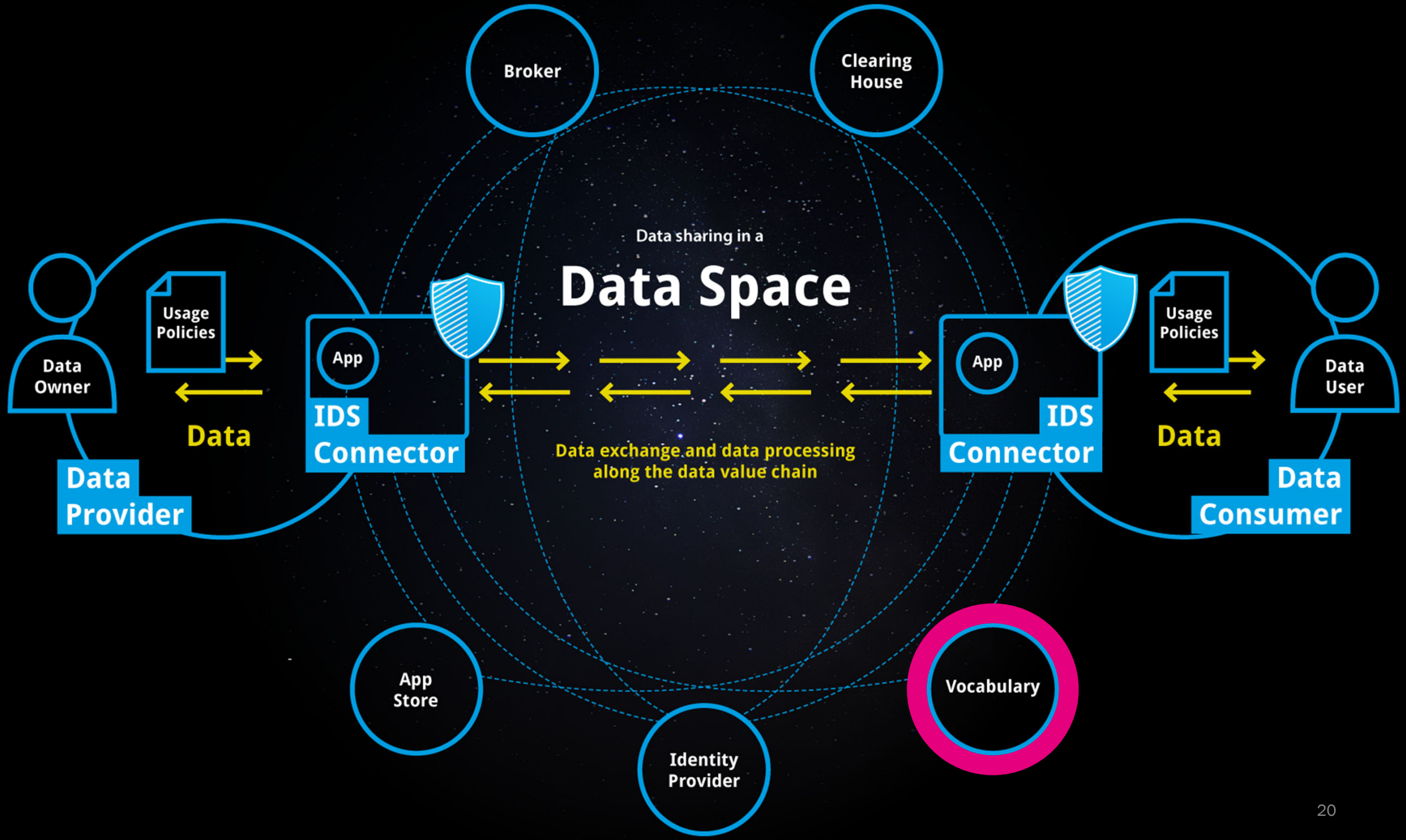
Identity Provider
Vocabulary

The purpose of the IDS Vocabulary Hub

03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Vocabulary

IDS Vocabulary hub

Where vocabulary users and vocabulary providers meet

A place for **Vocabulary Providers** to:

- offer common domain vocabularies
- offer implementation support, e.g. documentation, validation artifacts, etc.
- gather feedback from users
- organize maintenance and further development of their vocabularies
- offer other semantic management data services that boost vocabulary use, e.g. creating mappings

A place for **Vocabulary Users** to:

- *Learn* about available vocabularies and how to use them
- *Edit* or customize their own vocabulary based on an existing (standardized) vocabulary
- *Publish* said vocabulary for reuse by others

Data offering process (‘design time’)

Register Vocabulary at IDS Vocabulary Hub

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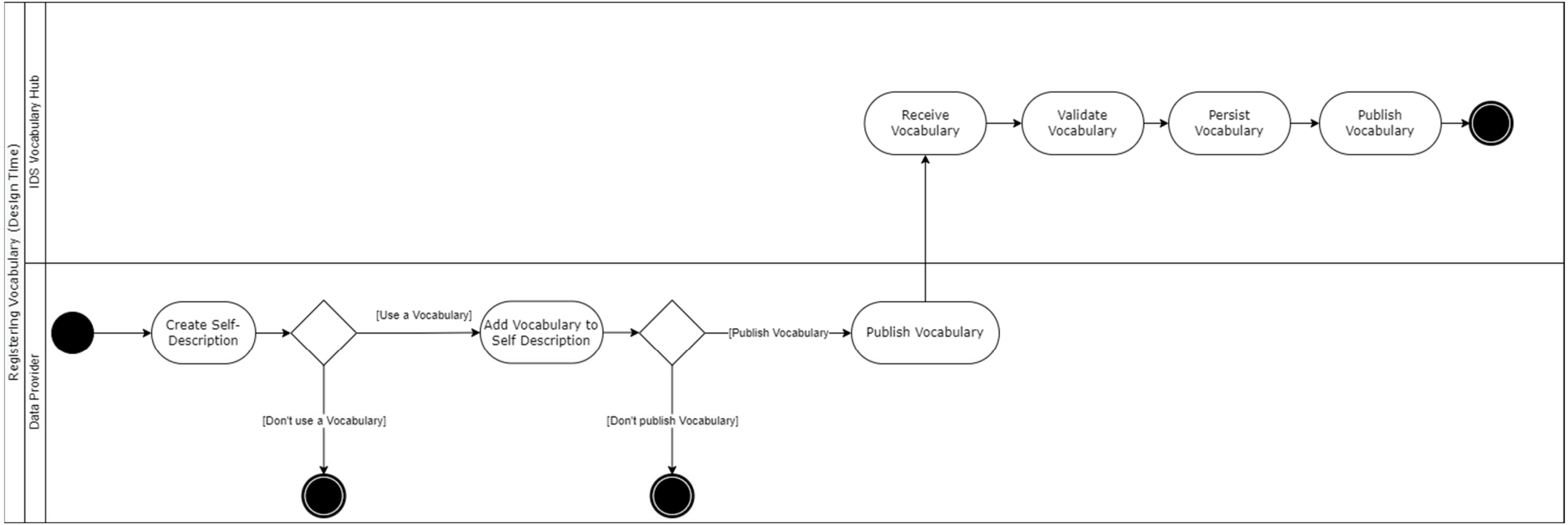

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Data offering process (‘design time’)

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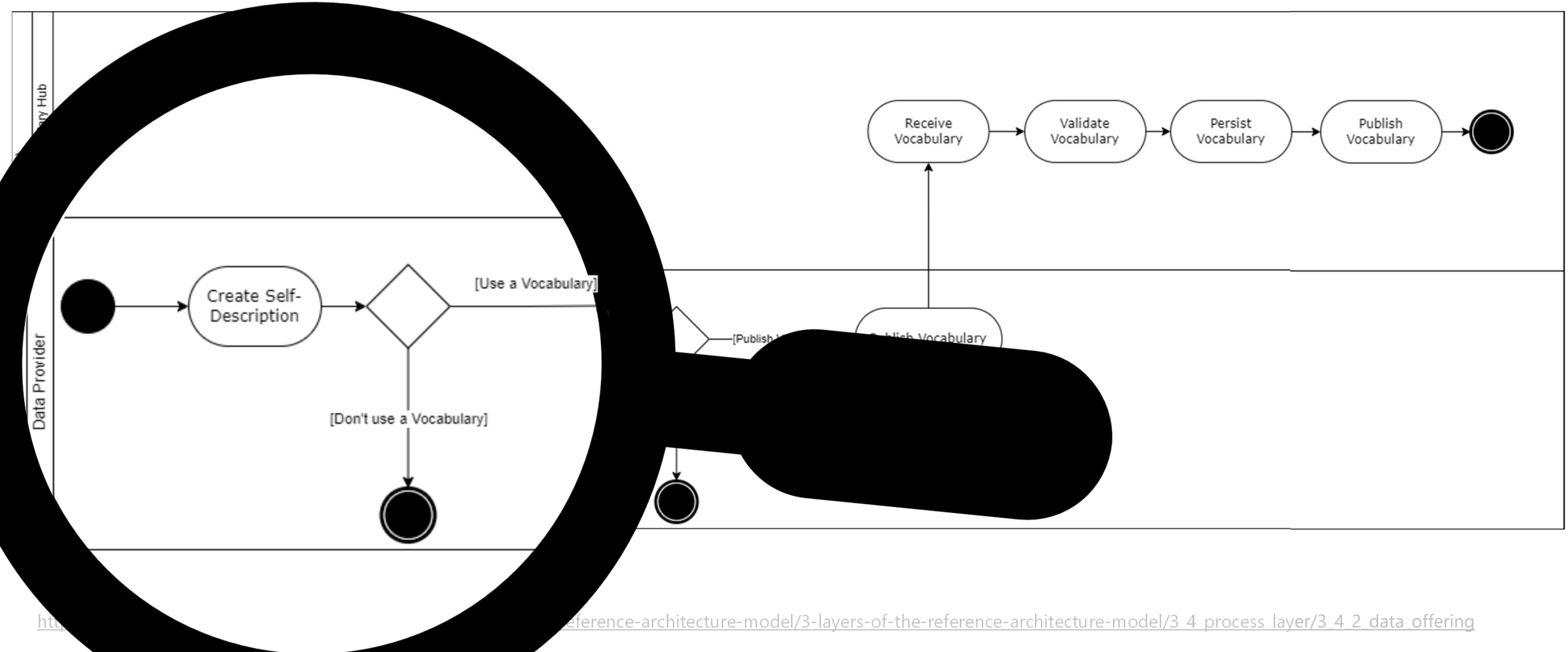

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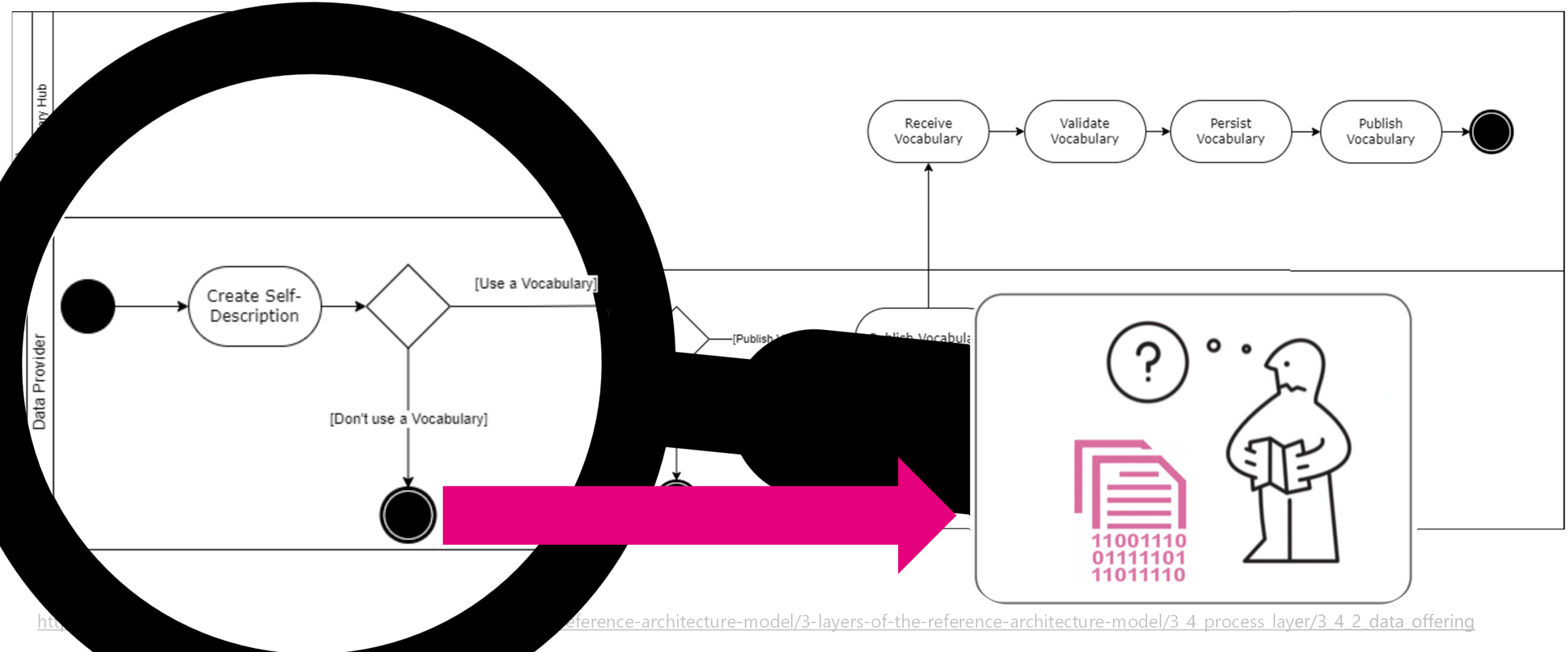

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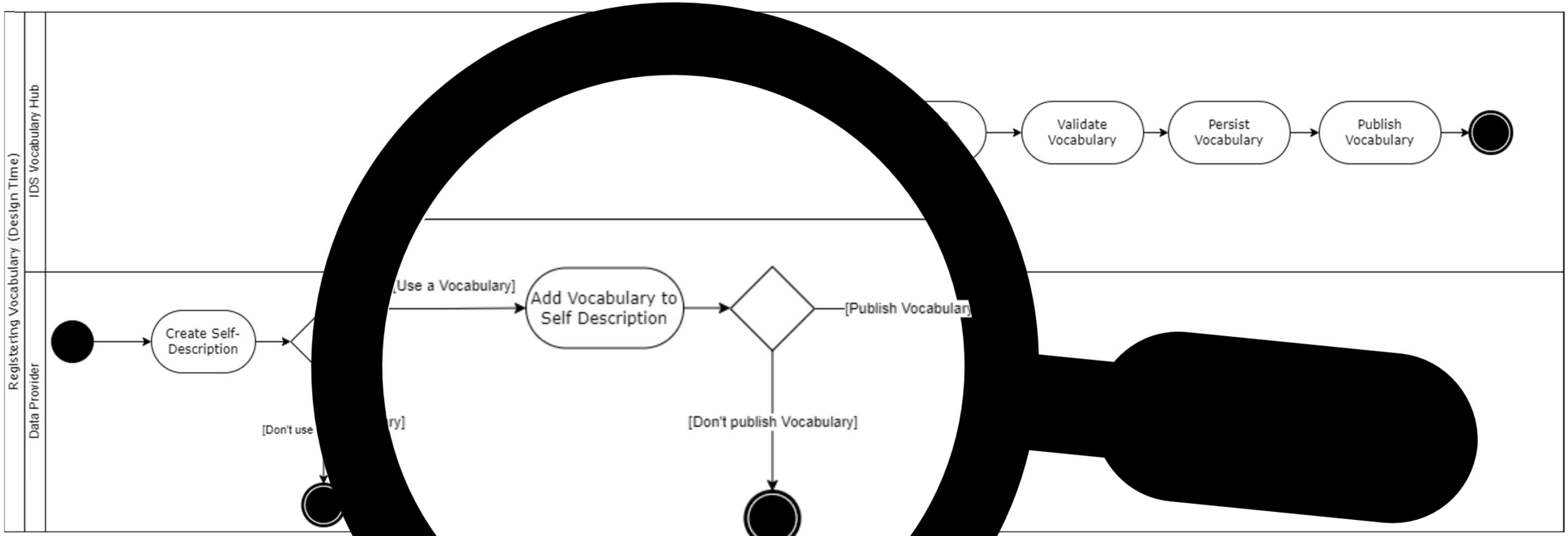

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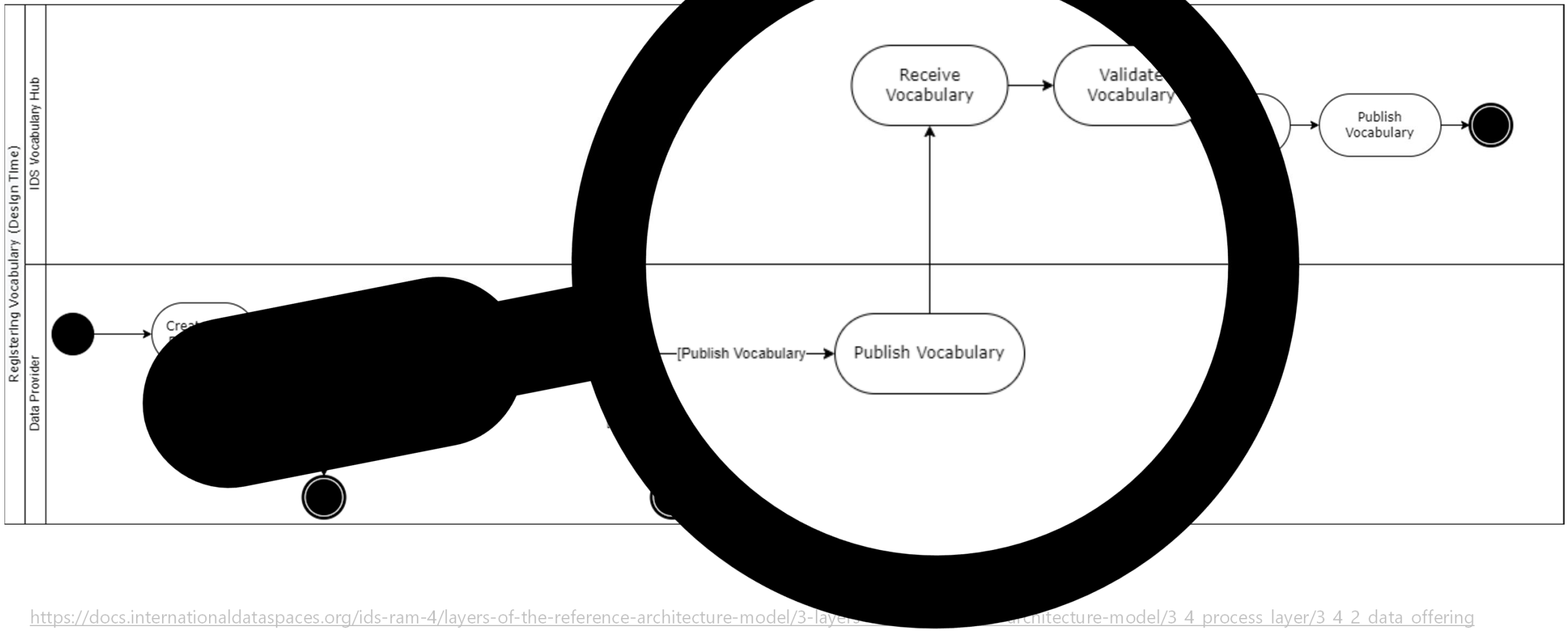

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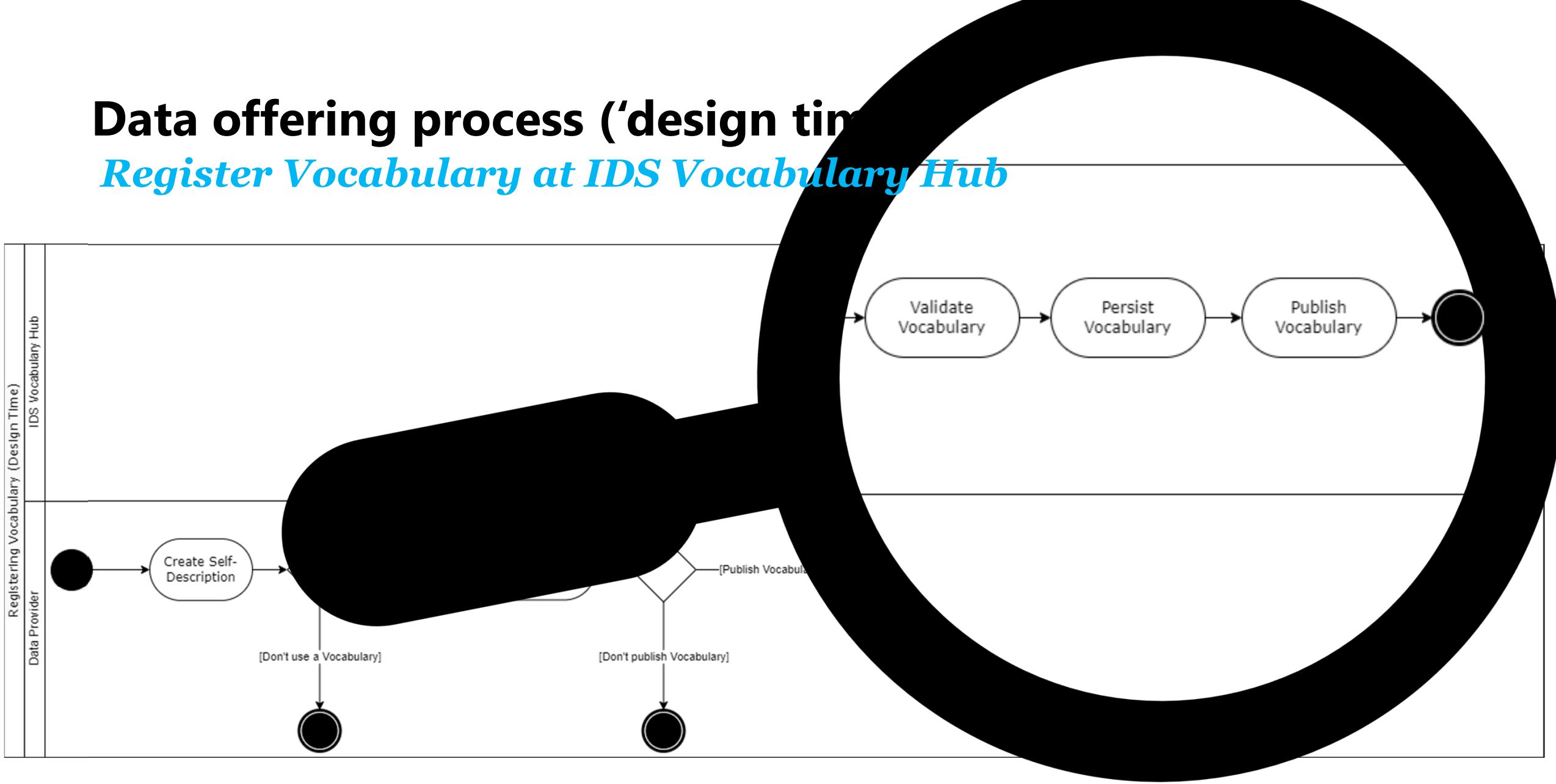

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Summing up

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- The IDS Vocabulary Hub provides a platform to host, maintain, publish, and document the domain vocabularies required for semantic interoperability.

- For the most part, the IDS Vocabulary Hub functions during **design time**

- For **Vocabulary Providers**, it provides the opportunity to maximize use of their vocabularies and collaboration with users

- For **Vocabulary Users** (e.g. Data Providers), the platform enables them to correctly and comprehensively describe their data assets to maximize the amount of interested Data Consumers.

Innovation and technology

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Plenty of innovation challenges to better serve data space participants:

1. How can we boost vocabulary use by participants, in particular vocabulary re-use?
2. How do we harness the power of Linked Data without introducing too much unfamiliar technology?
3. What does new technology like large language models (LLMs) have to offer?

Q&A

04

Thank you for your time!

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More info

- Join the conversation on Vocabularies & IDS Vocabulary Hubs: contact info@internationaldataspaces.org
- Stay informed with the updates in the IDS RAM: https://github.com/International-Data-Spaces-Association/IDS-RAM_4_0
- Want to learn more about Semantic Treehouse? Visit https://semantic-treehouse.nl (or reach out to me!)

Demonstration of Semantic Treehouse

TNO's IDS Vocabulary Hub implementation

05

Semantic Treehouse

TNO's implementation of the IDS Vocabulary Hub concept

Purpose: semantic interoperability by driving impact & adoption of vocabularies

Designed for Vocabulary Providers

- 1 online platform for:
  - Publication
  - Collaborative maintenance and development
  - Data validation and other implementation support

- Made with open standards for open standards
- Open source before the end of Q2 2022
- We host ~10 STH environments, attracting ~1000 unique monthly visitors

https://www.semantic-treehouse.nl/

Publication

Goal: providing clarity and insight about the available vocabularies (i.e. semantic data models)

- View models in your browser
- Everything in 1 place and inter-linked
- ‘Tree view’ keeps things simple
- Supports for example and usage notes
- Control releases/versions

Community

Goal: collaborative maintenance through user involvement

Grow a knowledge base with:

- Track issues and change requests
- Comment sections
- Usage notes
- Overview of working group activities
- Meeting notes
- F.A.Q’s

Supports styling options for branding purpses

Validation

Goal: provide implementation support

Have I implemented this vocabulary correctly?

- Supports multiple syntaxes: XML, JSON, CSV, RDF
- Checks for well-formedness, and adherence to schema's and business rules (e.g. Schematron)
- Provides extensive validation reports for any trouble shooting.