TEADAL

Towards Serverless Data Exchange Within Federations

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26/06/2023

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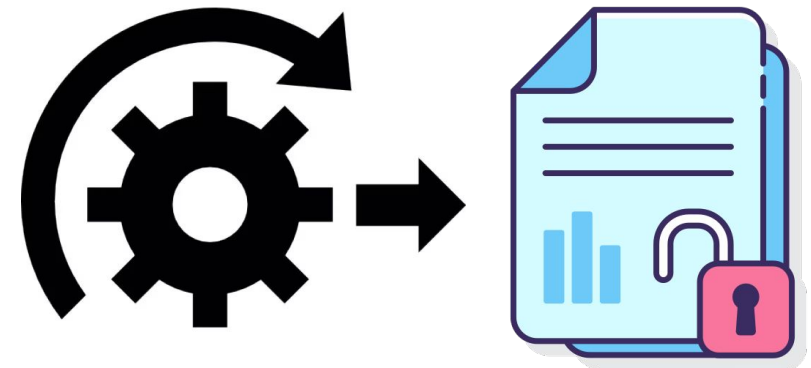- Contains **confidential** or **private** information

- Transformations introduce **data friction**

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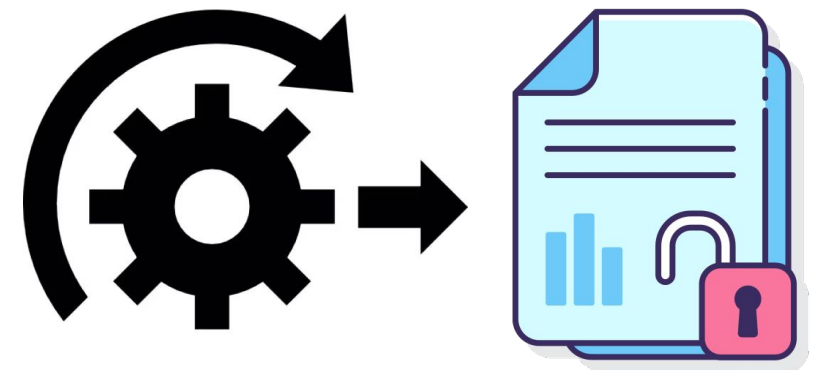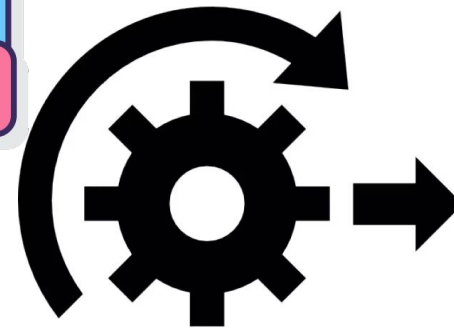- Consumers require tailored data sets

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- Study promoter / hospital wants to conduct a **joint study**
- Cumbersome to retrieve data from multiple providers
  - General norms (e.g., **GDPR**), incompatible data formats, etc
  - **Manual negotiation** of usage agreements
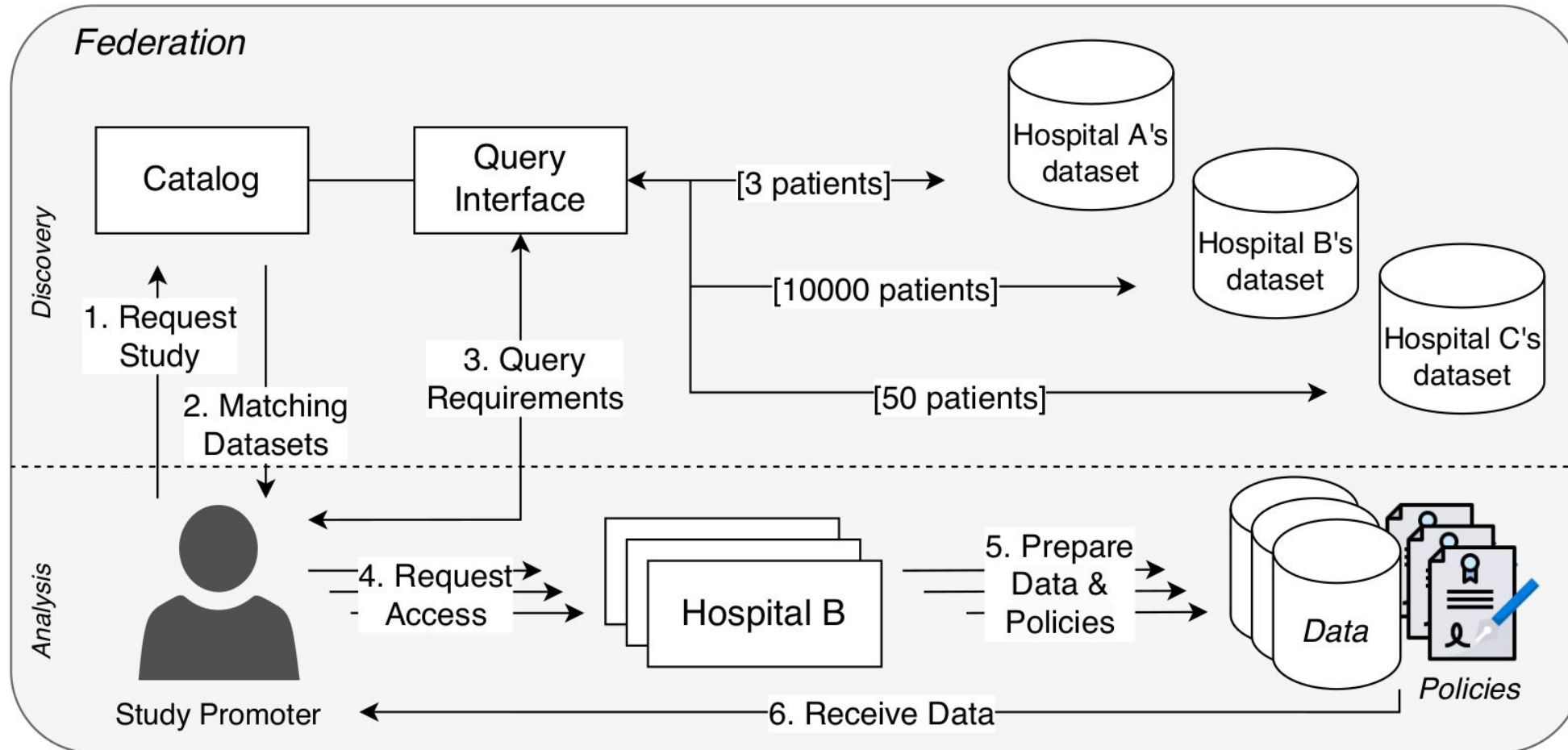
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- Study promoter / hospital wants to conduct a **joint study**
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- Lack a mechanism to *discover* data sets and *agree* on their provision

Envisioned Solution - Use Case

Envisioned Solution - General

- Automatic matching of requirements for owner and consumer
- Data transformed according to agreements
- Provisioning of storage / computing resources (e.g., ad hoc or premises)

- For **data providers**, alleviate the burden of data sharing
- For **data consumers**, ensure that data is served as desired

Contributions

- ## Federated Data Products
  Identify five **lifecycle phases** that data products pass through when sharing them within a federation

- ## Serverless Data Exchange
  Apply serverless principles for **processing** and **storage** of data

Federated Data Product

- Data product as self-served data set (**data mesh**)
- Domain experts <--> Platform providers
- Described with **usage policies** and shared

- Cross-enterprise sharing opens issues (e.g., **identity**, resources)
- Must be supported by a **underlying platform**
- But first, let's focus on the federated data product!

Federated Data Product - Lifecycle (1/2)

1. Data onboarding
    - Persist the data product according to storage policies
    - Domain experts supply general policies (e.g. privacy transformations)

2. Publishing
    - Register the data product in the federation-wide catalog
    - Support consumer-aware policies (e.g. # records)
    - Sync catalog information (incl. policies) with data product

3. Sharing
    - Agree how data is served to consumers
    - Include constraints (e.g. policies, transformations, time, # access)
    - Sign contract and provide to all parties

Federated Data Product - Lifecycle (2/2)

4. Consumption
   - Run compulsory operations (e.g. transformations)
   - Document all interactions with the dataset (audit)
   - Optimize processing by moving data and/or processing

5. Discontinue
   - Remove data product from catalog, (inform consumers)
   - Delete data product (and all copies) from all locations

Serverless Data Exchange

- Supports the exchange of federated data products

- **Serverless functions** – can be included as part of agreements, supplied by domain experts which can define multiple implementations
- **Serverless processing** – happens somewhere in the federations, based on serverless functions, can be optimized by moving processing
- **Serverless data** – is stored somewhere in the federation, it can be fragmented from a storage perspective, but is offered as one logical product to the consumer. Can be optimized by moving (copies of) data
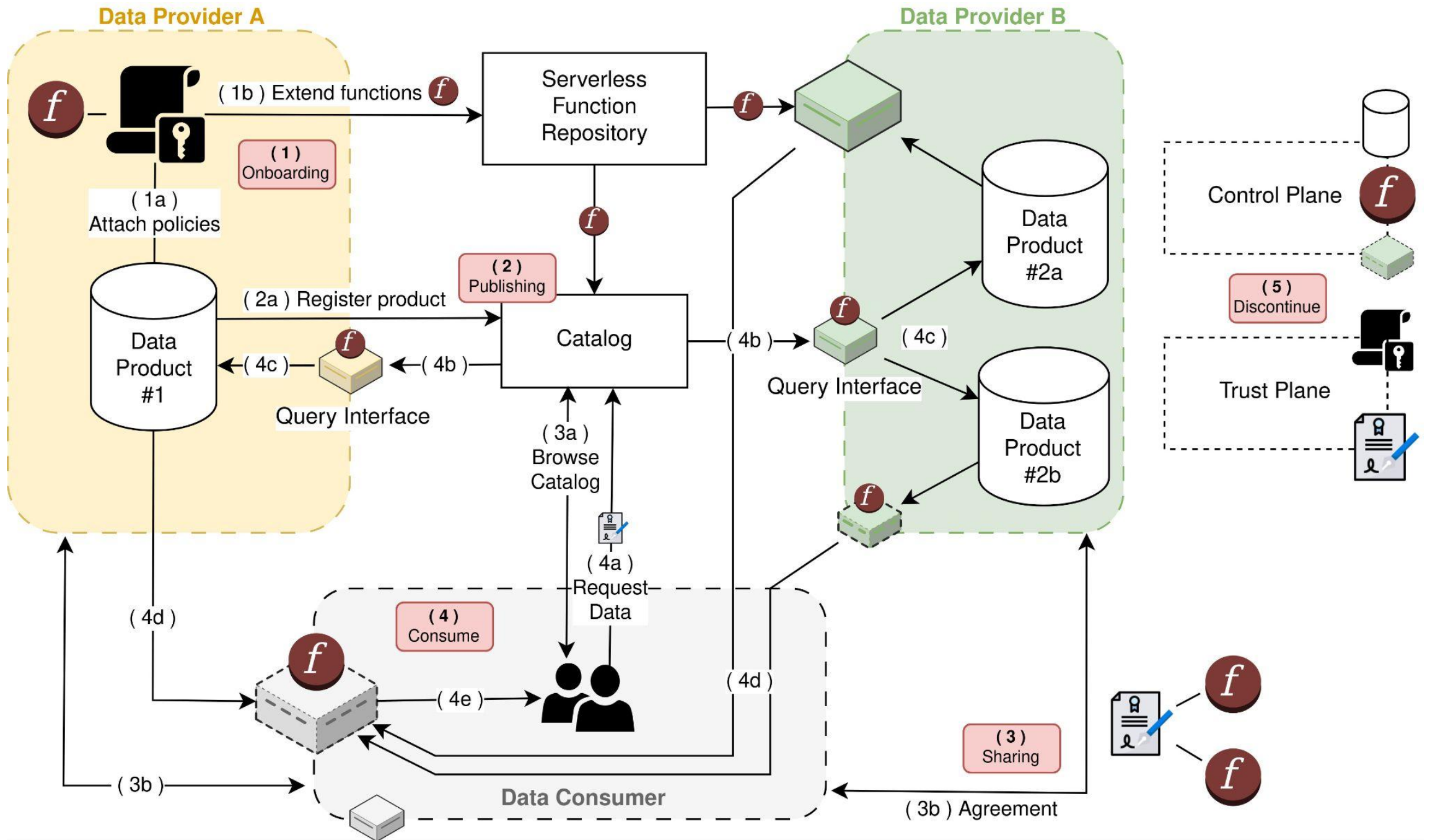
Possible Issues

- Very dependent on *Control plane* and *Trust plane*
  - CP – How to allocate **resources** (i.e., storage, processing, functions)?
  - TP – How to technically ensure **trust** between parties?
- So far very agnostic in terms of tools and technologies

Summary

- Data sharing is **impeded** by constraints and semantics
- Transformations introduce excessive **data friction**

- Data is exchanged as **federated data products**
  - Domain experts define policies (i.e. **serverless functions**) in upfront, or supply them in agreements

- Serverless data exchange supports this exchange
  - **Control plane** provides resources (i.e. processing, storage, functions)
  - **Trust plane** assures identities and that policies are respected
  - Data is **transformed** ad hoc according to policies attached to it (Though this can be optimized)

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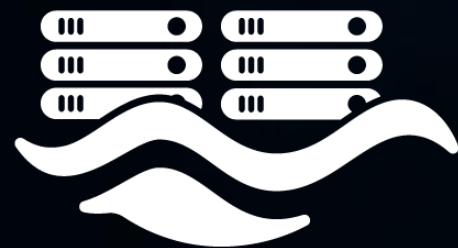
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TEADAL project is funded by the EU's Horizon Europe programme under Grant Agreement number 101070186