



Real-Time “RDFization”

Leveraging Linked Data Fragments for enhanced data publication: the Share-VDE case study

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I, Andrea Gazzarini



Software Engineer (1999-)



“Hermit” Software Engineer (2010-)



Programming Passionate



Information Retrieval Passionate



Author of “Apache Solr Essentials”



Apache Qpid (past) Committer



Founder of [SpazioCodicé](#)



[Share-VDE](#) Lead Architect



Husband & Father



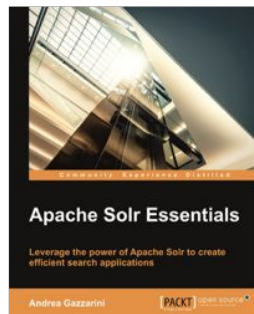
Bass Player



Freetime cyclist



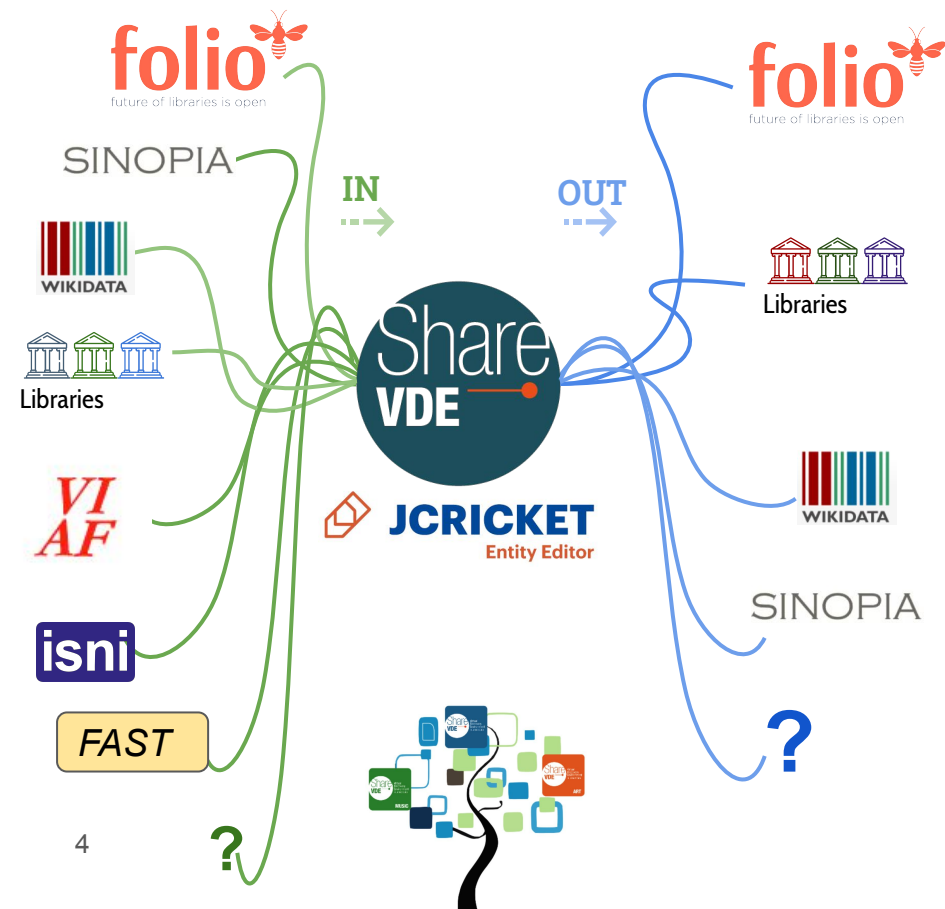
Chapman Stick (aspiring) Player



The Share-VDE Initiative



Share-VDE: Share Virtual Discovery Environment



In a Nutshell

Share-Virtual Discovery Environment is a **library-driven** initiative which brings together, in a shared discovery environment, the **bibliographic catalogues** and **authority files** of a growing number of leading **academic** and **national libraries** from across **North America** and **Europe**.

<https://svde.org>



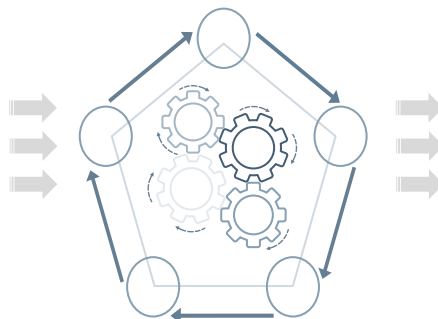
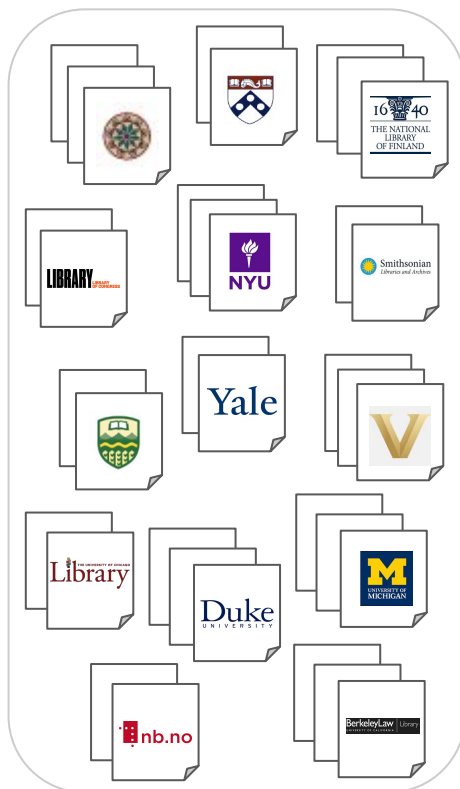
Sapientia: The Share-VDE Knowledge Base



Sapientia: Genesis



Data



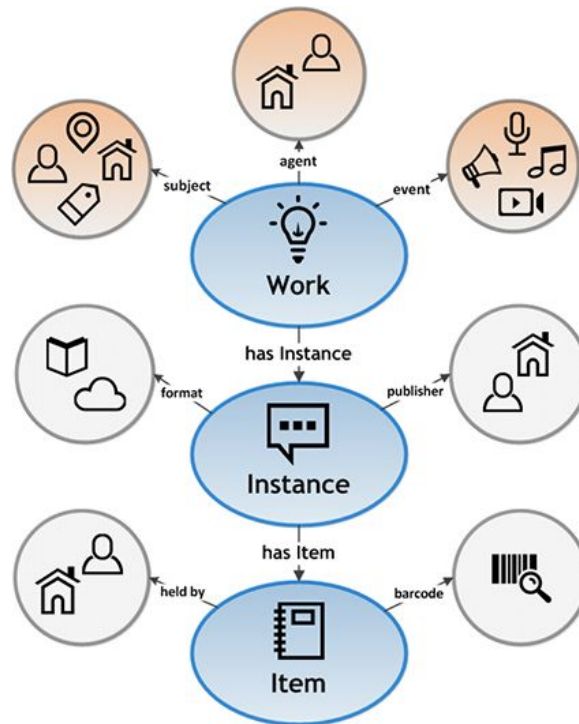
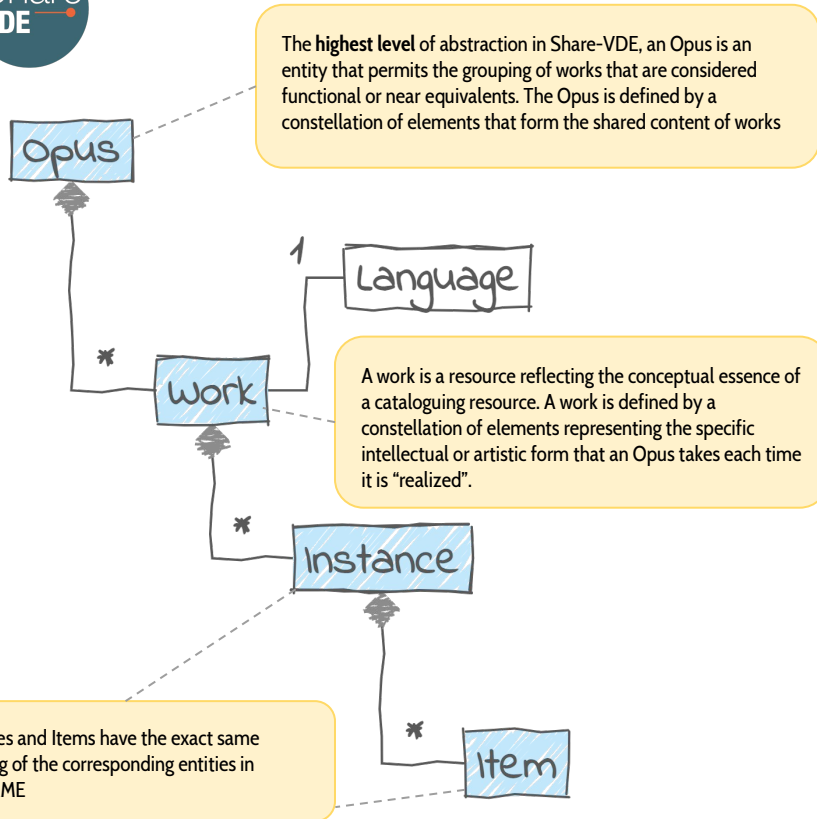
Knowledge Base (Sapientia)



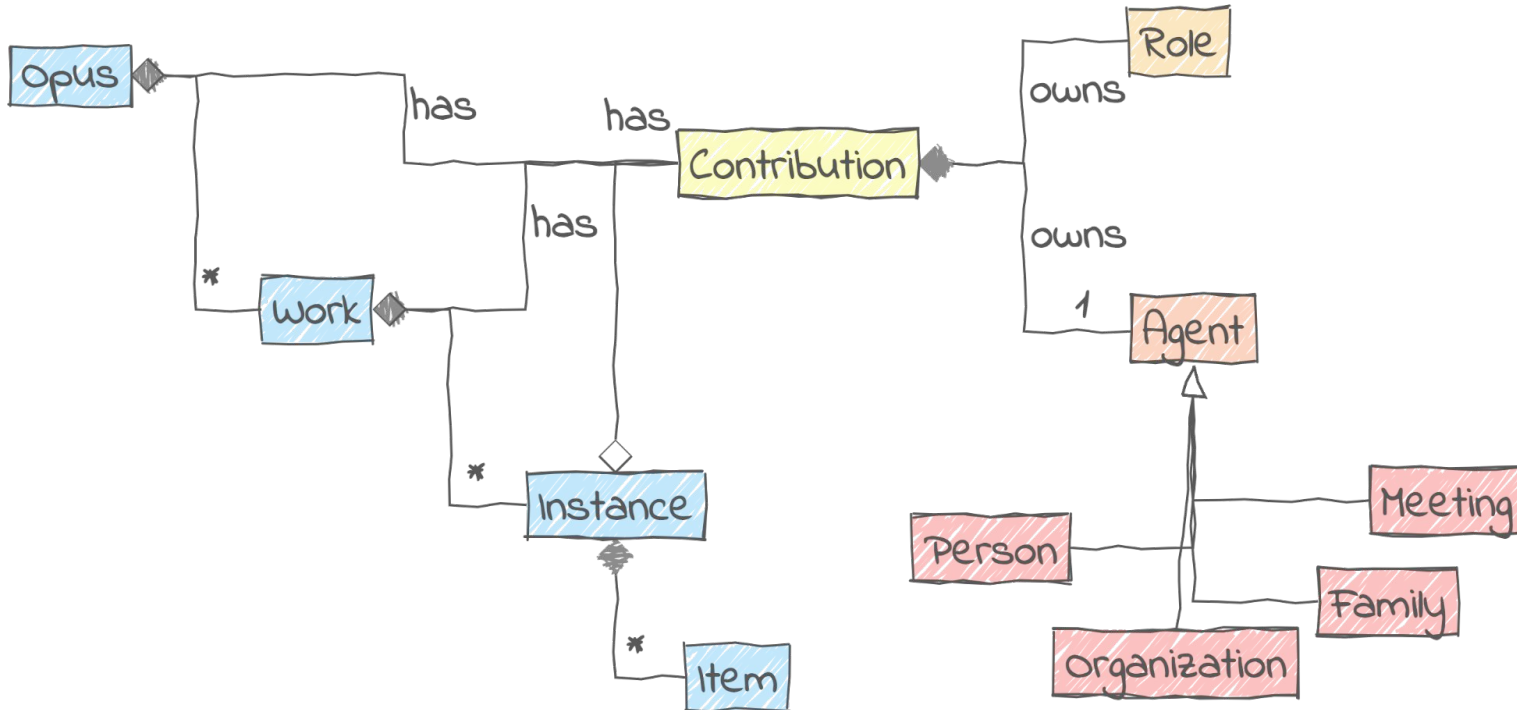
The Domain Model



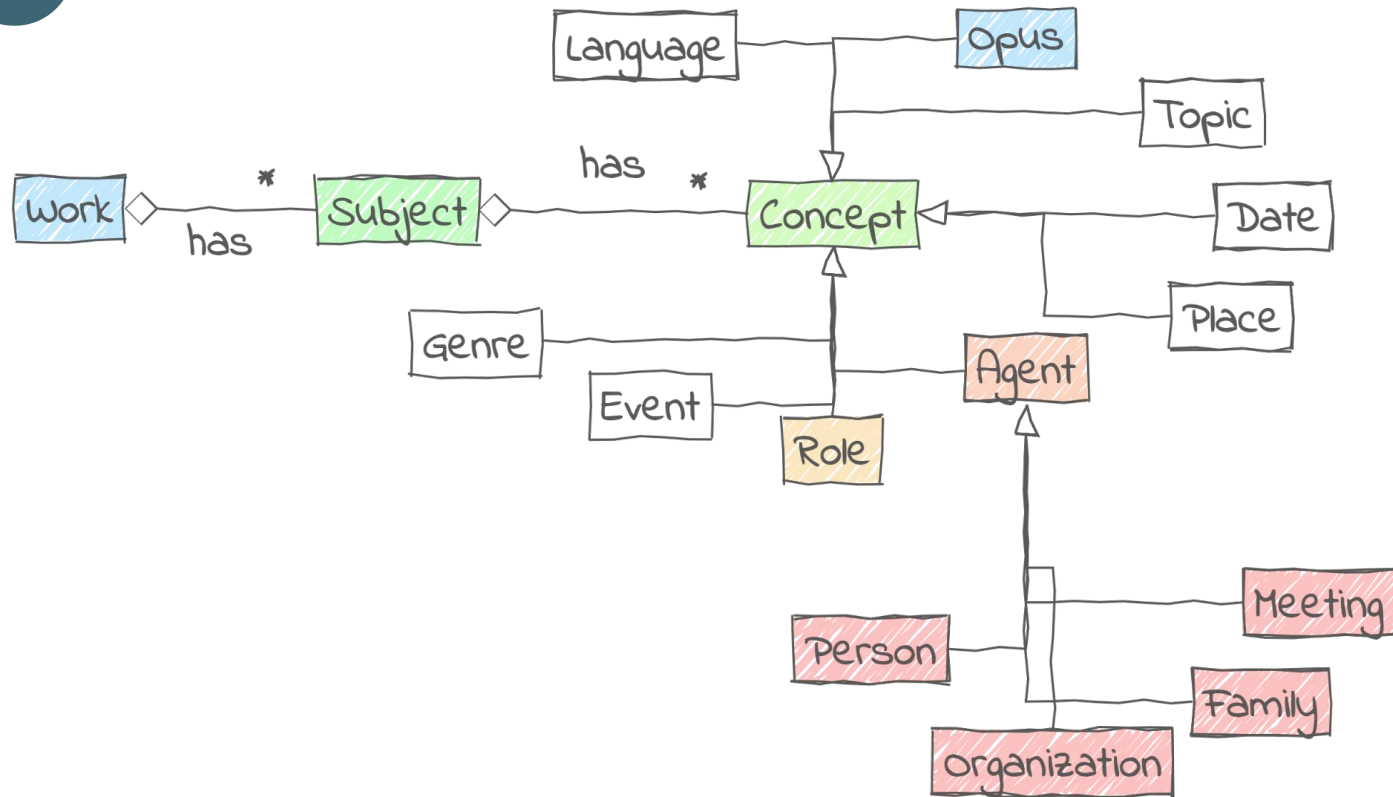
Core entities



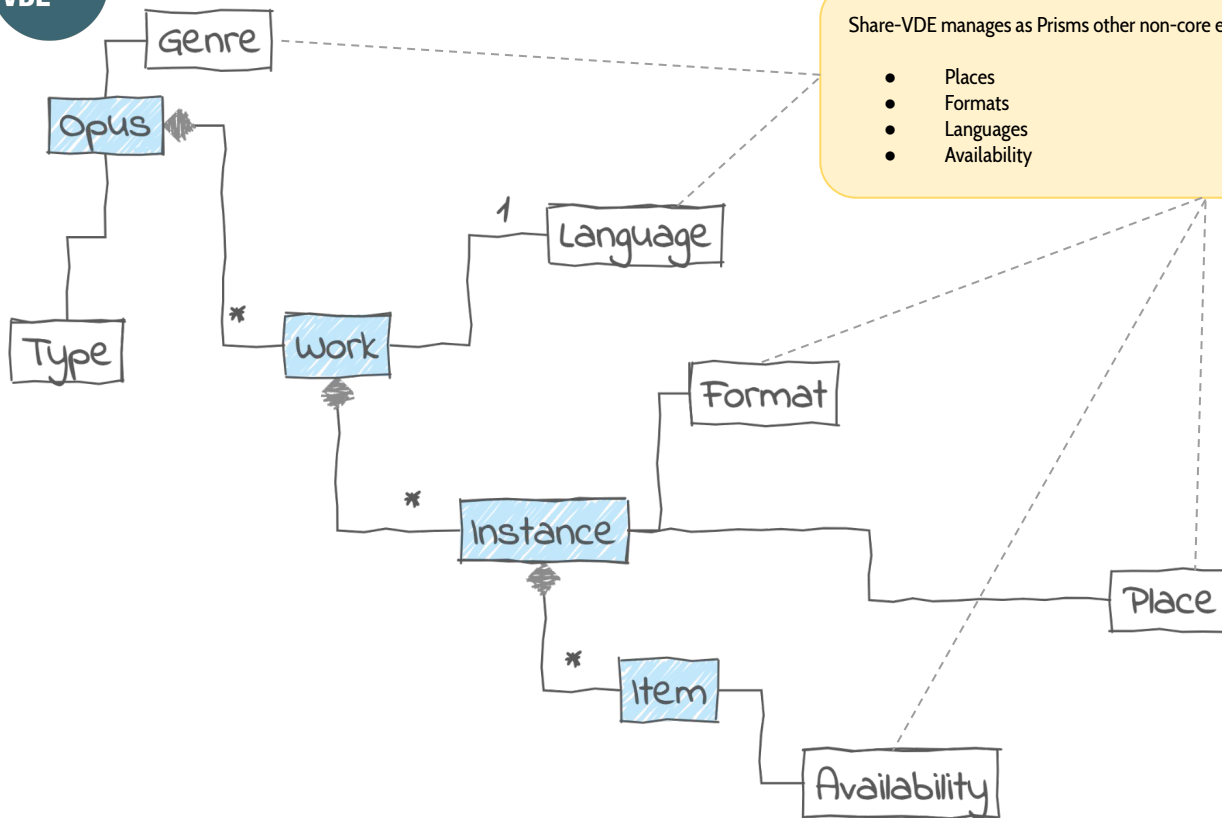
Agents, Contributions



Subjects



Non-core Entities



Share-VDE manages as Prisms other non-core entities, too. Some example

- Places
- Formats
- Languages
- Availability

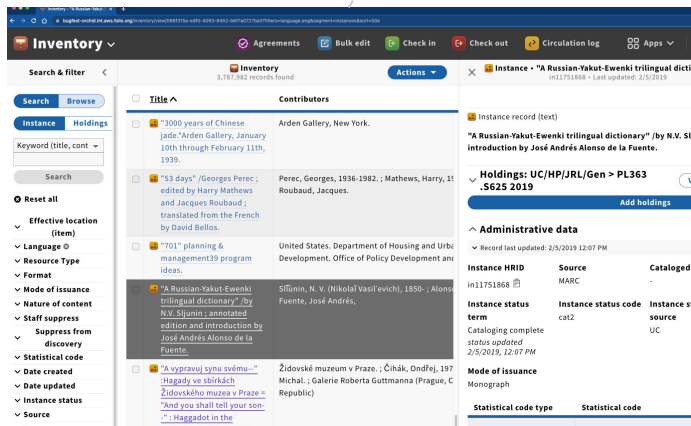


The Entity as a “Prism”



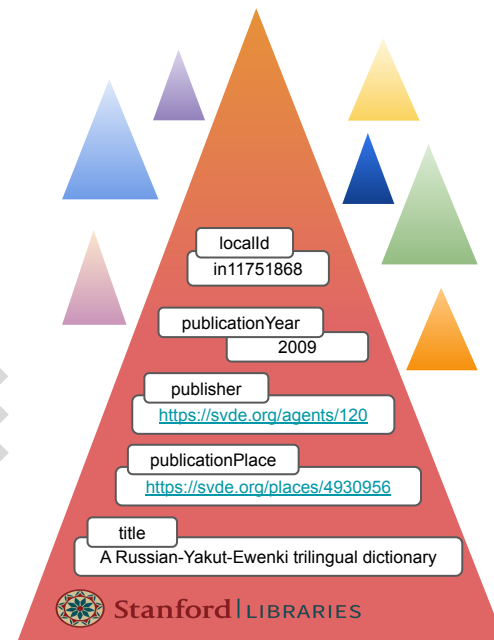
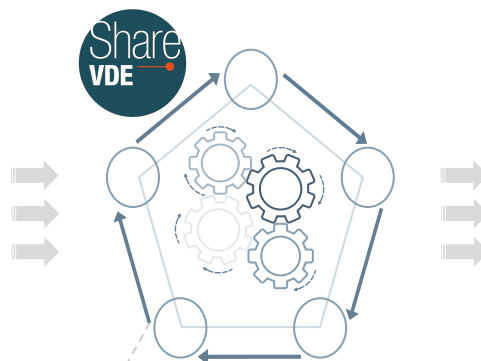
From Library Data to Sapientia

A Share-VDE member uses an ILS for managing its data.



The screenshot shows a library inventory interface. On the left, there's a sidebar with filters like 'Search & filter', 'Instance', 'Holdings', 'Effective location', 'Language', 'Resource Type', 'Format', 'Mode of issuance', 'Nature of content', 'Staff suppress', 'Suppression from discovery', 'Statistical code', 'Date created', 'Date updated', 'Instance status', and 'Source'. The main area displays a list of books. One book is selected, showing its details: 'A Russian-Yakut-Ewenki trilingual dictionary' by N.Y. Si. The details include the title, contributors, publication year (2009), publisher (Stanford University Press), and publication place (Stanford, CA). The interface also shows administrative data like HRID, MARC, and cataloged status.

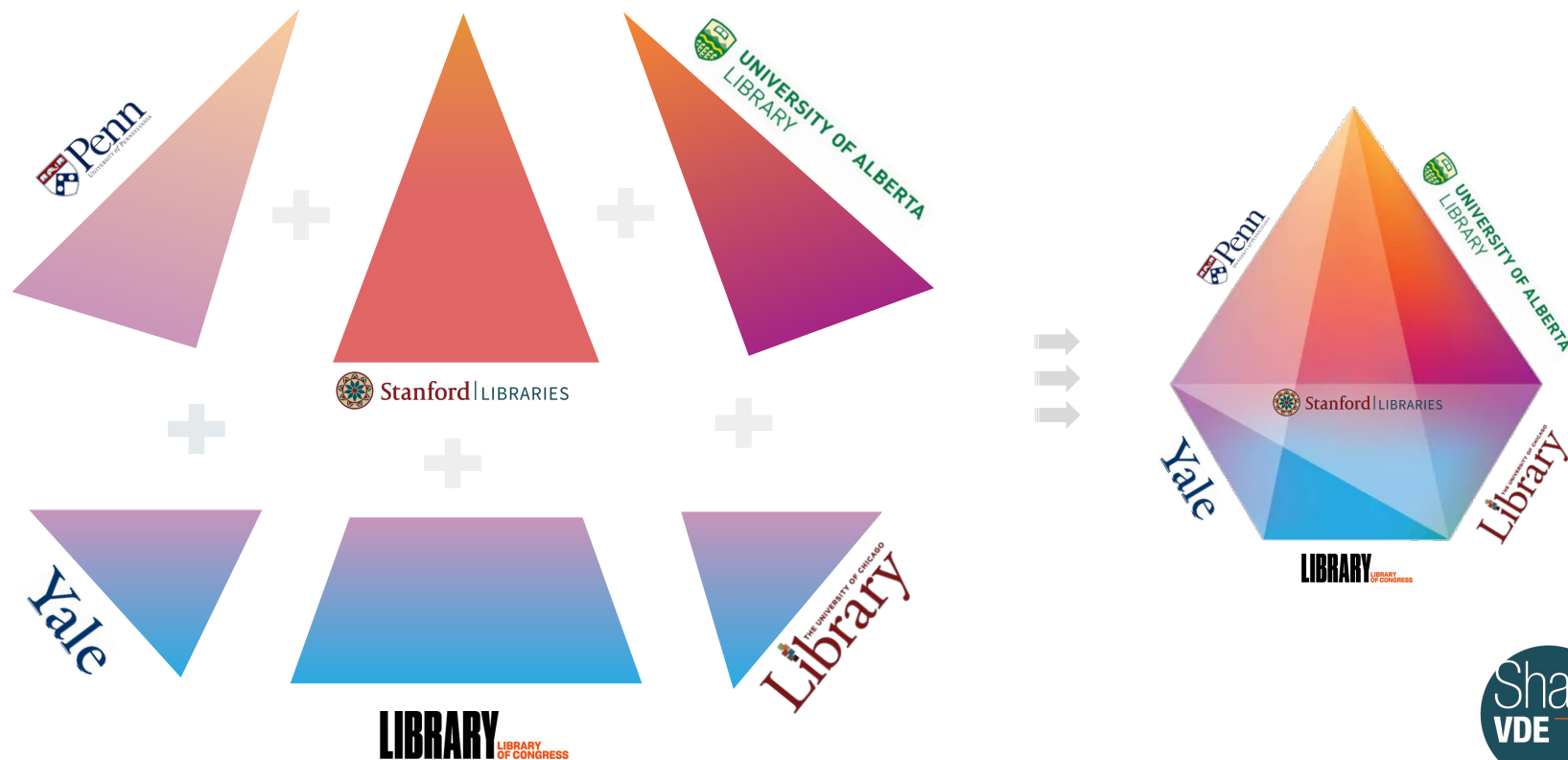
Title	Contributors
2000 years of Chinese jade "Arden Gallery, January 10th through February 11th, 1939.	Arden Gallery, New York.
"53 days" / Georges Perec ; edited by Harry Mathews and Jacques Roubaud ; translated from the French by David Bellos.	Perec, Georges, 1936-1982. ; Mathews, Harry, 1919- ; Roubaud, Jacques.
"701" planning & management 39 program ideas.	United States. Department of Housing and Urban Development. Office of Policy Development and Research.
"A Russian-Yakut-Ewenki trilingual dictionary" / by N.Y. Si. Stanford annotated edition and introduction by José Andrés Alonso de la Fuente.	Sifunin, N. V. (Nikolai Vasil'evich), 1850- ; Alonso de la Fuente, José Andrés.
"A vypravay synu svému..." Haggady ve sbírkách Židovského muzea v Praze = "And you shall tell your son..." Haggadat in the...	Židovské muzeum v Praze. ; Cihák, Ondřej, 1971- ; Michal, ; Galerie Roberta Guttmanna (Prague, C Republic)



Library data is sent to Share-VDE, through API or offline batches.

Source data is split across the entities that form the Share-VDE domain model. In this example we focus on the properties that are assigned to a Share-VDE instance (red triangle above)

Prism, faces: the Share-VDE Entity



Linked Data Fragments

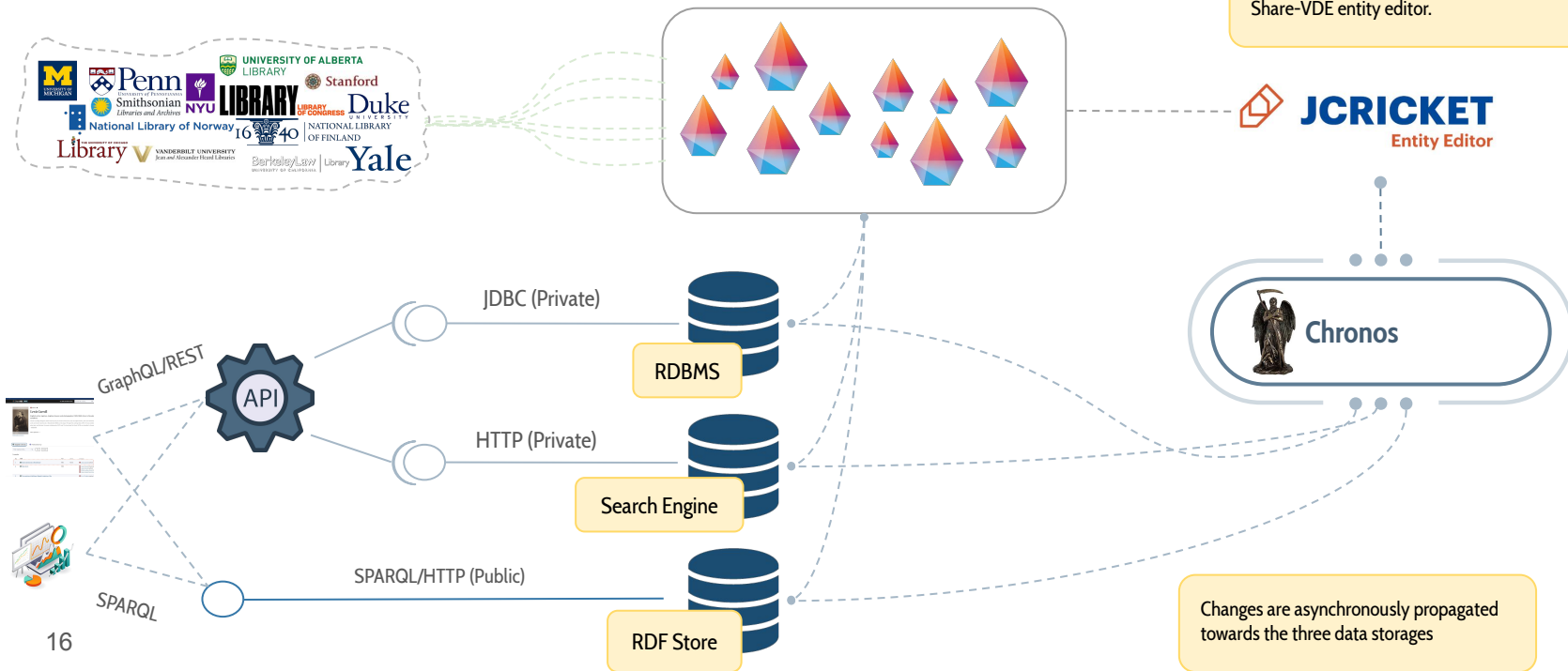


Share-VDE: The Big Picture

Data flows into Share-VDE from libraries, institutions and third-party sources (e.g. VIAF, ISNI, FAST)

The Share-VDE knowledge base (**Sapientia**) contains the integrated/clustered/enriched entities.

Data is mainly edited through JCricket, the Share-VDE entity editor.



Let's analyze a (simple) SPARQL Query

PREFIX opuses: <https://svde.org/opuses/>
PREFIX works: <https://svde.org/works/>
PREFIX instances: <https://svde.org/instances/>
PREFIX items: <https://svde.org/items/>
PREFIX bf: <http://id.loc.gov/ontologies/bibframe/>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

Prefixes: useful for associating a (long) URI to a short mnemonic code in the query.

SELECT ?barcode
WHERE {

A variable called **?barcode** referenced in the query below, whose value(s) will compose the output results

opuses:401 bf:hasExpression ?work .

?work bf:hasInstance ?instance .

?instance bf:hasItem ?item .

?item bf:isIdentifiedBy ?uri .

?uri rdf:value ?barcode

Query statements, composed by a subject, a predicate and an object, ending with a dot.

The three parts can be an explicit value (e.g. bf:hasExpression) or a variable, eventually bound with another statement (see the ?work variable). For that reason they are also referred as **Triple Patterns**



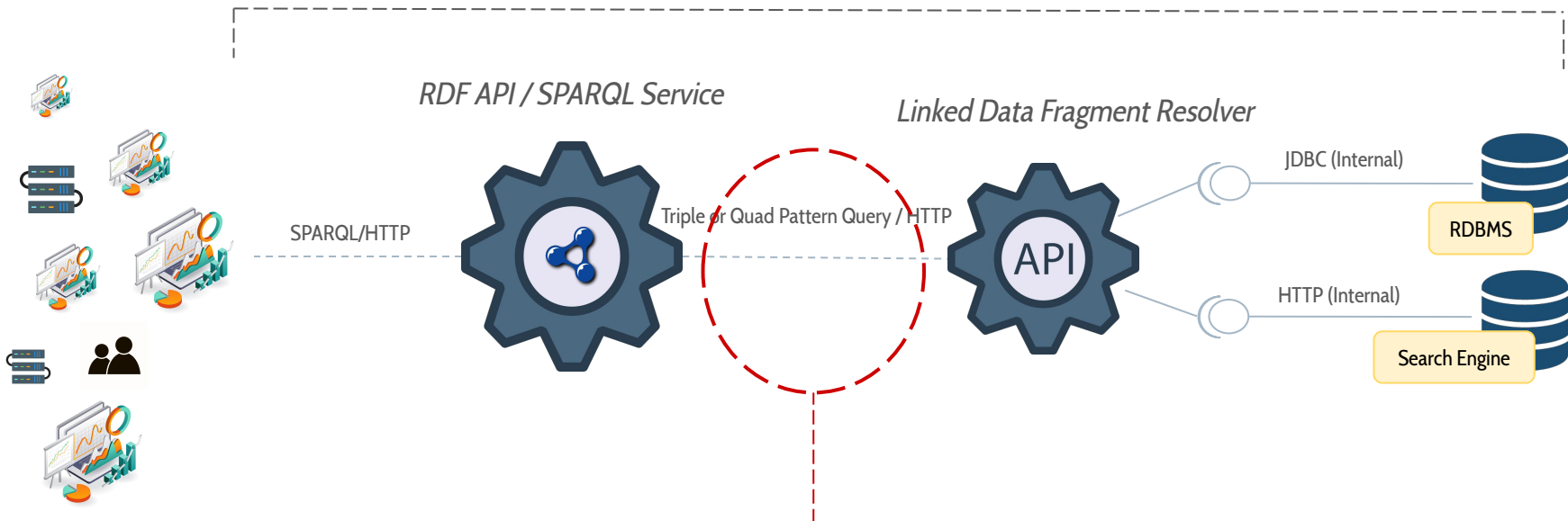
Simplifying, we could say a SPARQL query is a set of multiple triple patterns, potentially independent and executable as an atomic computation units.

Their execution offers a partial view of the whole SPARQL result, a **Fragment**, a **Linked Data Fragment**

Linked Data Fragments: Participants

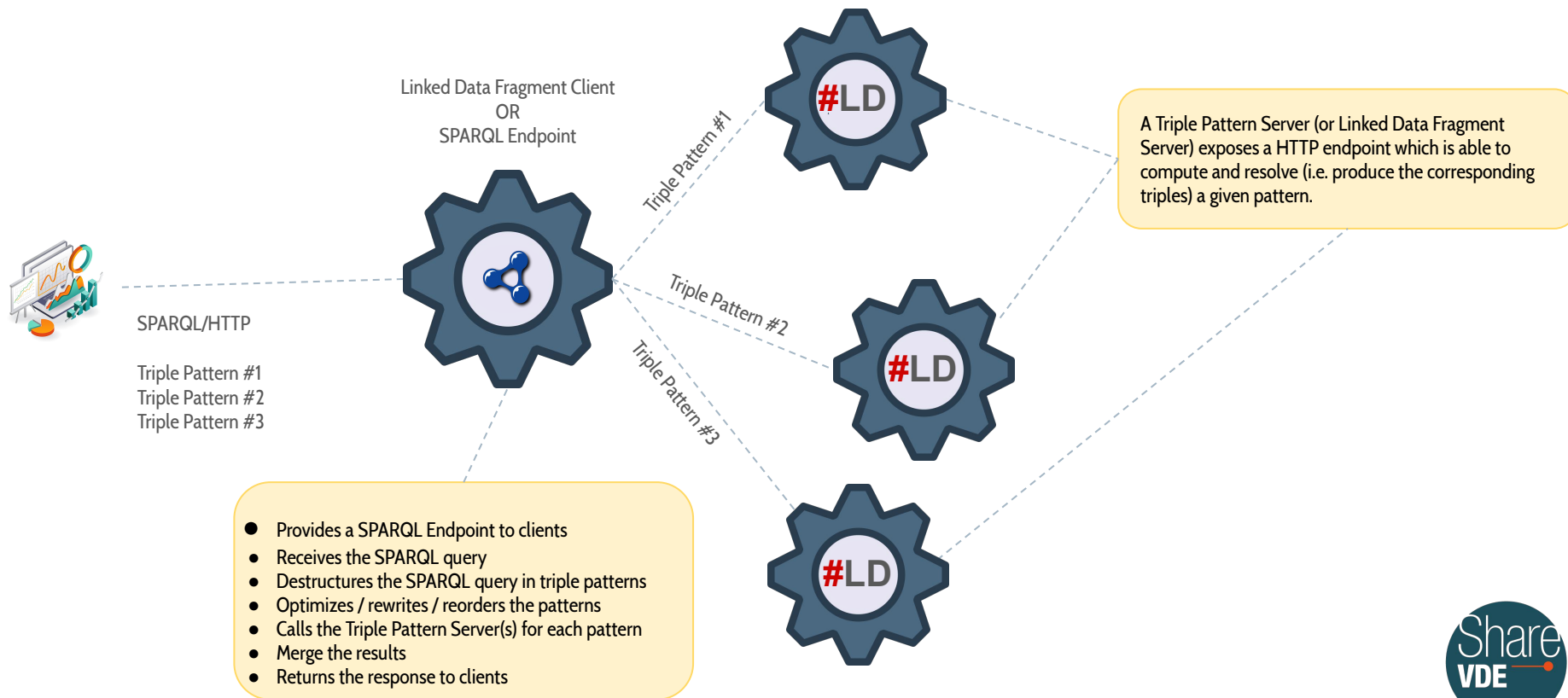
Clients

Real-time

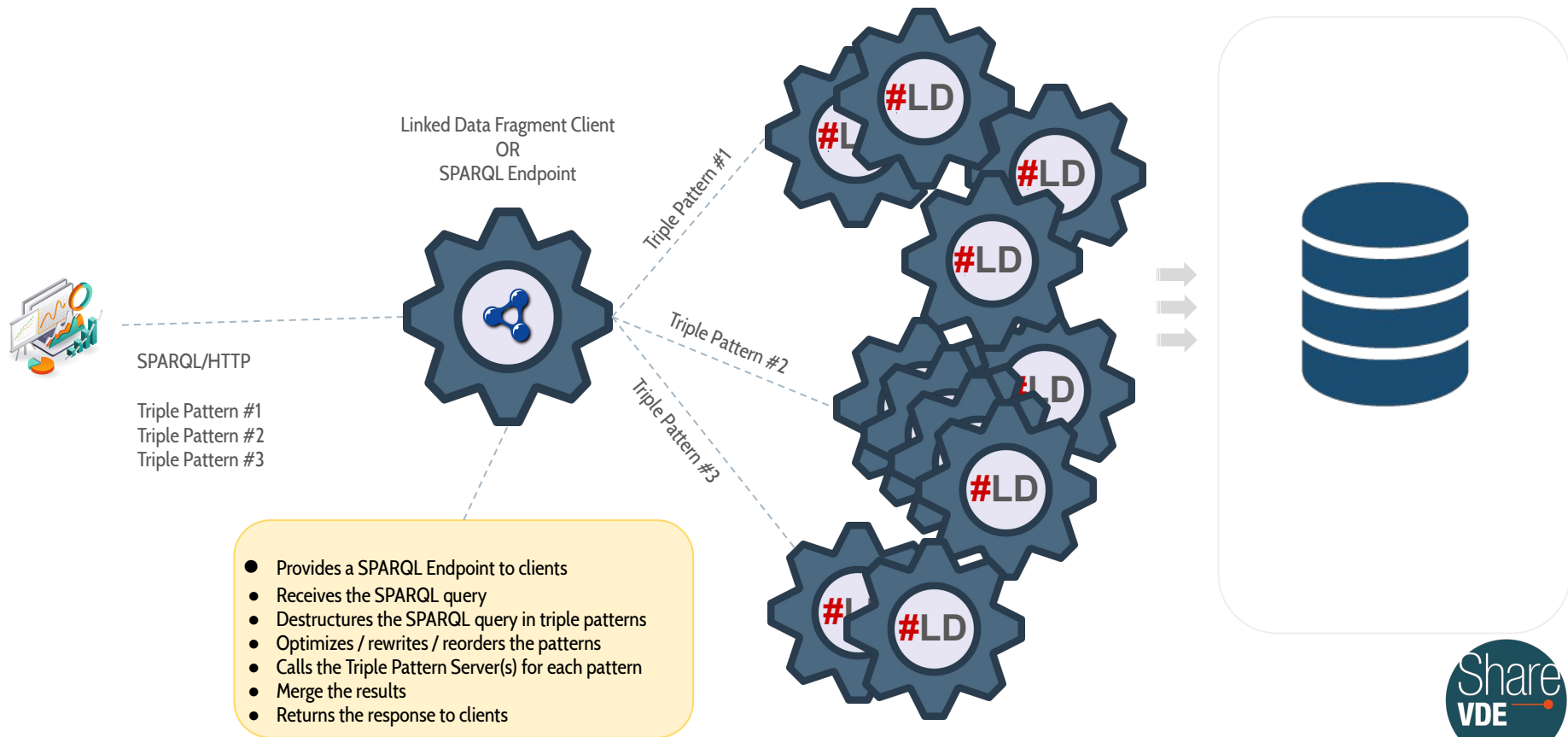


The **RDF representation** of the requested data is **created on the fly**, according to **one or more ontologies** that can be indicated in the request, as well.

Linked Data Fragments In Action



Scaling up Linked Data Fragment Resolvers...





(Let's Simplify The) Architecture

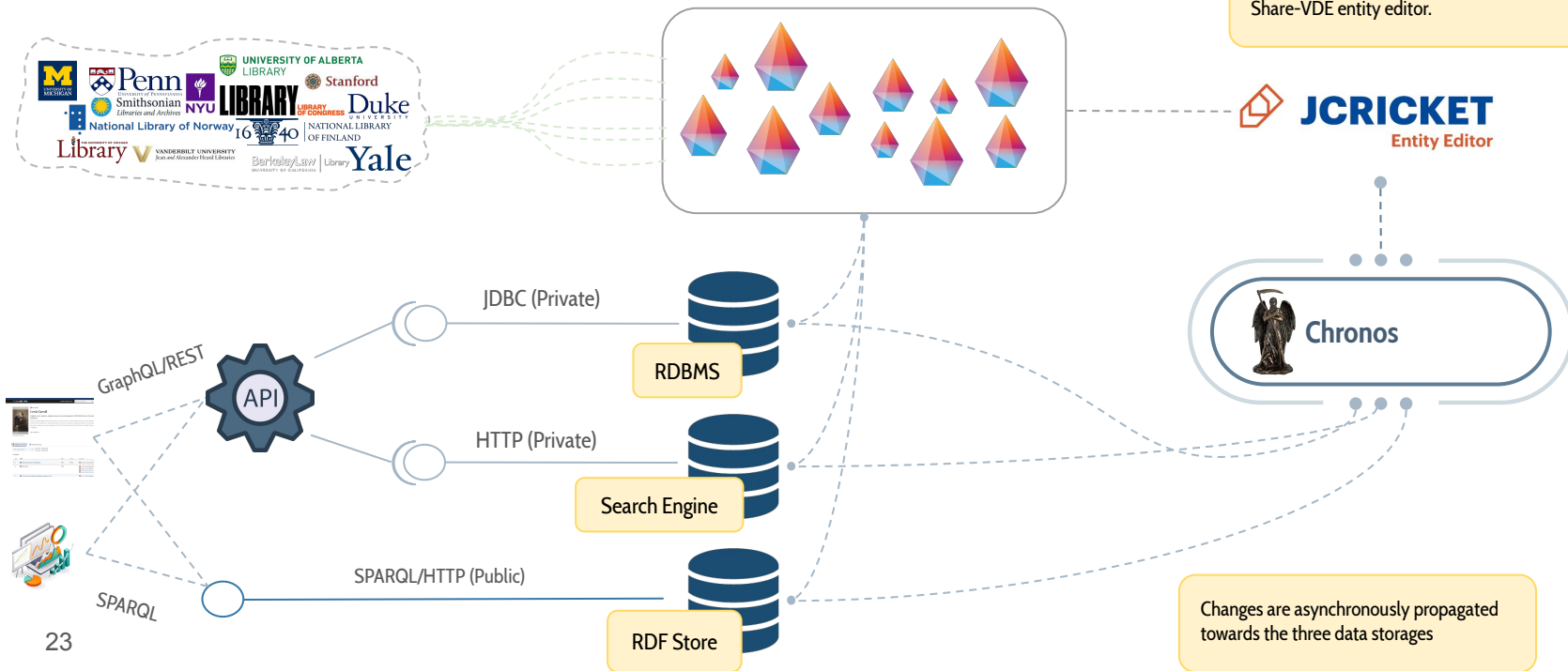


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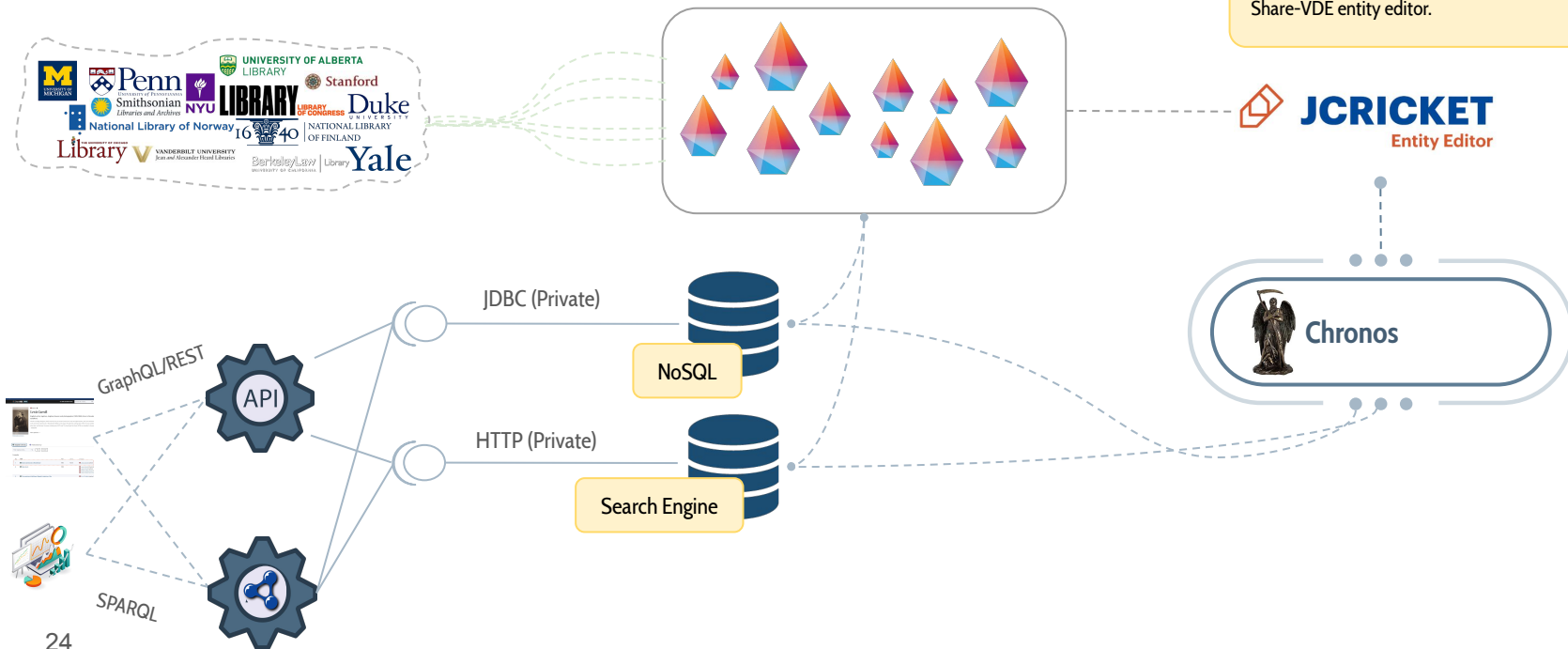


Share-VDE: The Big Picture

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Linked Data Fragments in Share-VDE: benefits

No RDF Storage

- RDF Data is translated/generated on demand.

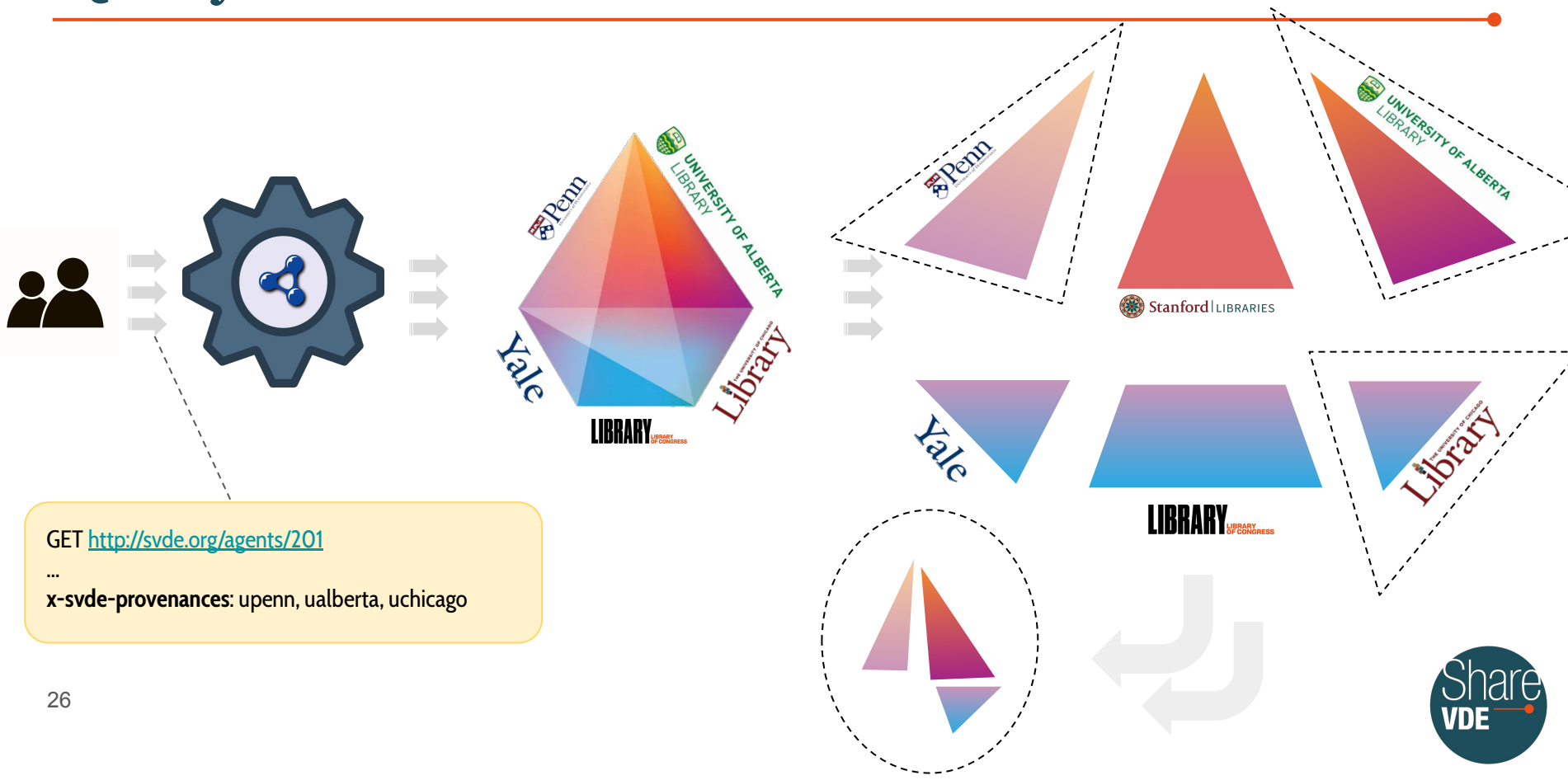
Distributed Computation

- **Computation is distributed** across the **Linked Data Client** (the SPARQL endpoint) and the **Triple/Quads Pattern Server**
 - The **destruction**, the **optimization/rewriting** of the SPARQL query is done in the **Linked Data Client**
 - The **execution** of each single **triple/quad pattern** is done at **Linked Data Fragment Server** level
- The CKB is required to answer to a **lot of small and simple requests**, instead of dealing with **one huge query**

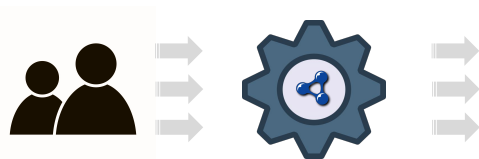
Query Time

- **Request-driven approach benefits.**
 - (Example) No fixed mapping, **different queries** can request a **different mapping** in results
 - (Example) using the same query, requesters can **selectively ask for specific prism faces**
- **Federated search** is natively enabled

Query Time: Provenance-based de-structuration



Query-Time Response “Shaping”



GET <http://svde.org/agents/201>

...
x-svde-mapping: xbf

GET <http://svde.org/agents/201>

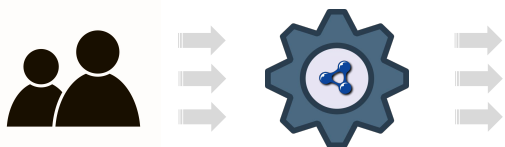
...
x-svde-mapping: xdc

```
<bf:Agent rdf:about="http://svde.org/agents/201">
  <rdf:type rdf:resource="http://id.loc.gov/ontologies/bibframe/Person"/>
  <wkd:P569>27 January 1832</wkd:P569>
  <wkd:P570>14 January 1898</wkd:P570>
  <wkd:P735>Carroll</wkd:P735>
  <wkd:P734>Lewis</wkd:P734>
  ...
</bf:Agent>
```

xbf = BIBFRAME + Wikidata

xdc = DublinCore + schema.org

```
<rdf:Description rdf:about="http://svde.org/agents/201">
  <rdf:type rdf:resource="http://xmlns.com/foaf/0.1/Person"/>
  <dc:name>Carroll, Lewis</dc:name>
  <schema:birthDate>1832-01-27</schema:birthDate>
  <schema:deathDate>1898-01-14</schema:deathDate>
  ...
</rdf:Description>
```



Thank you!



Virtual
Discovery
Environment

Thank you!

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