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Hatch Risk Knowledge Graph

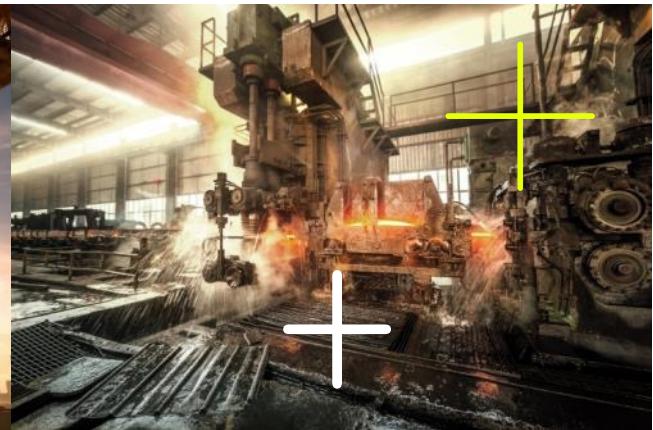
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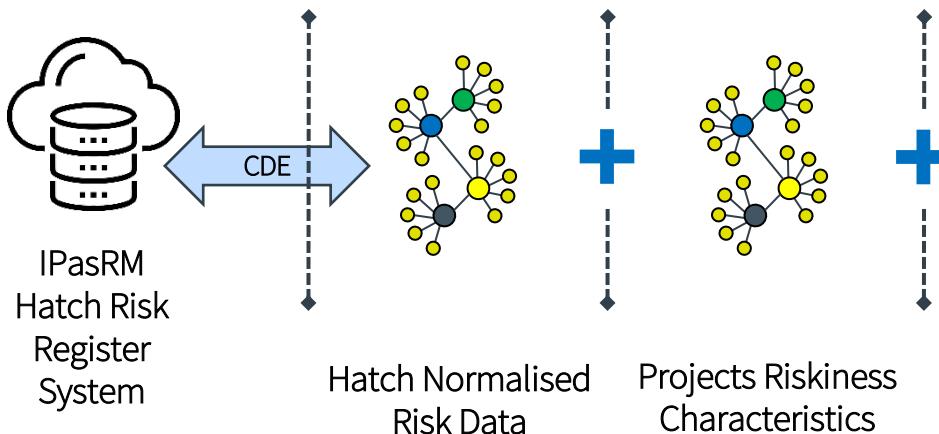
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NKOS 2021

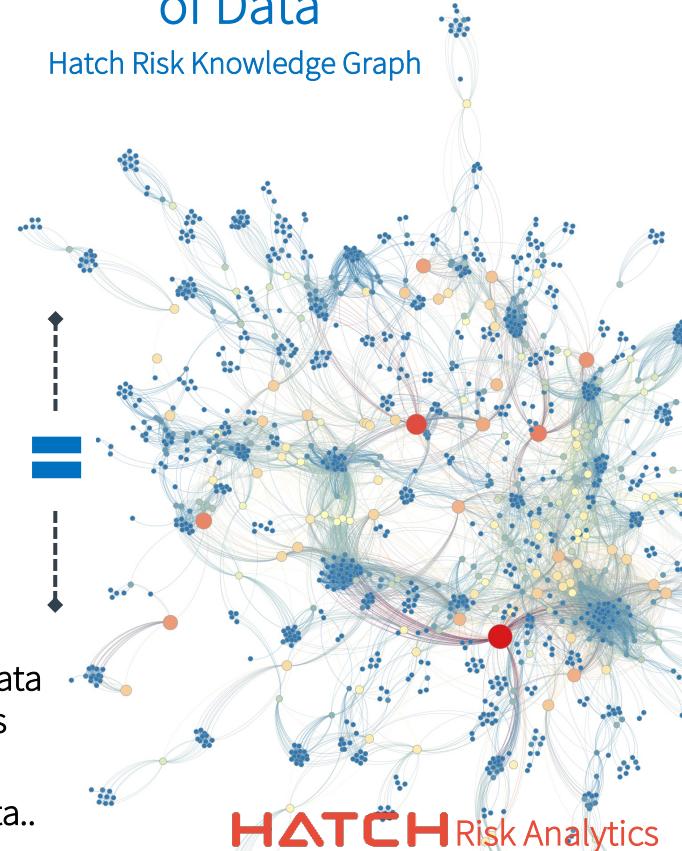
VRM Virtual Risk Memory

- ✓ Risk Knowledge Graphs & Context Aware Risk Identification
- ✓ Risk Pattern Recognition Against Project Tendencies & Characteristics
- ✓ Supply Chain Risk Analysis of Redundancies and Resilience

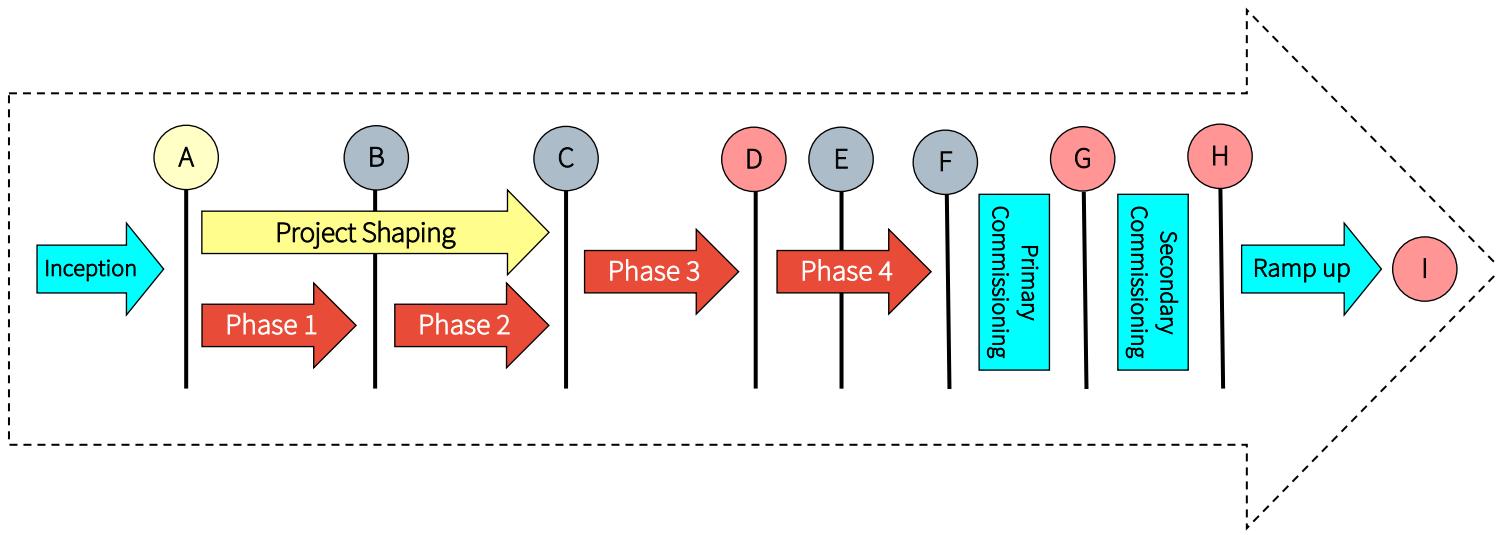


Melting Pot of Data

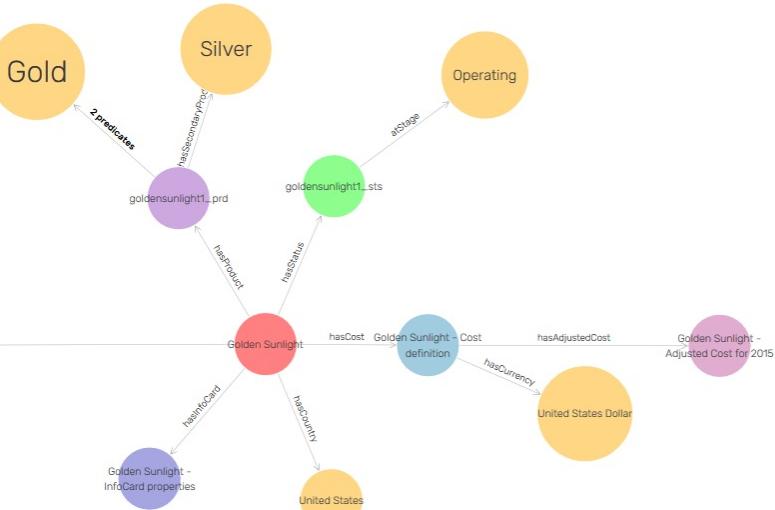
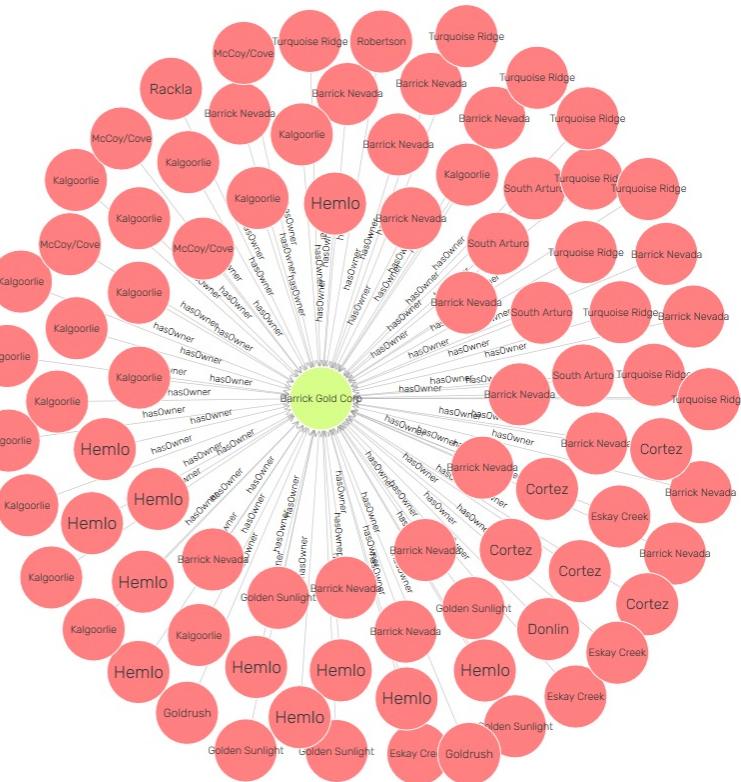
Hatch Risk Knowledge Graph



Unit of Analysis: Project



Linked Data, Semantic Web, and Ontology Engineering



Through use of Ontologies

- Class hierarchy
- Domain and range restrictions
- Deduction and inference reasoning
- Activities and processes

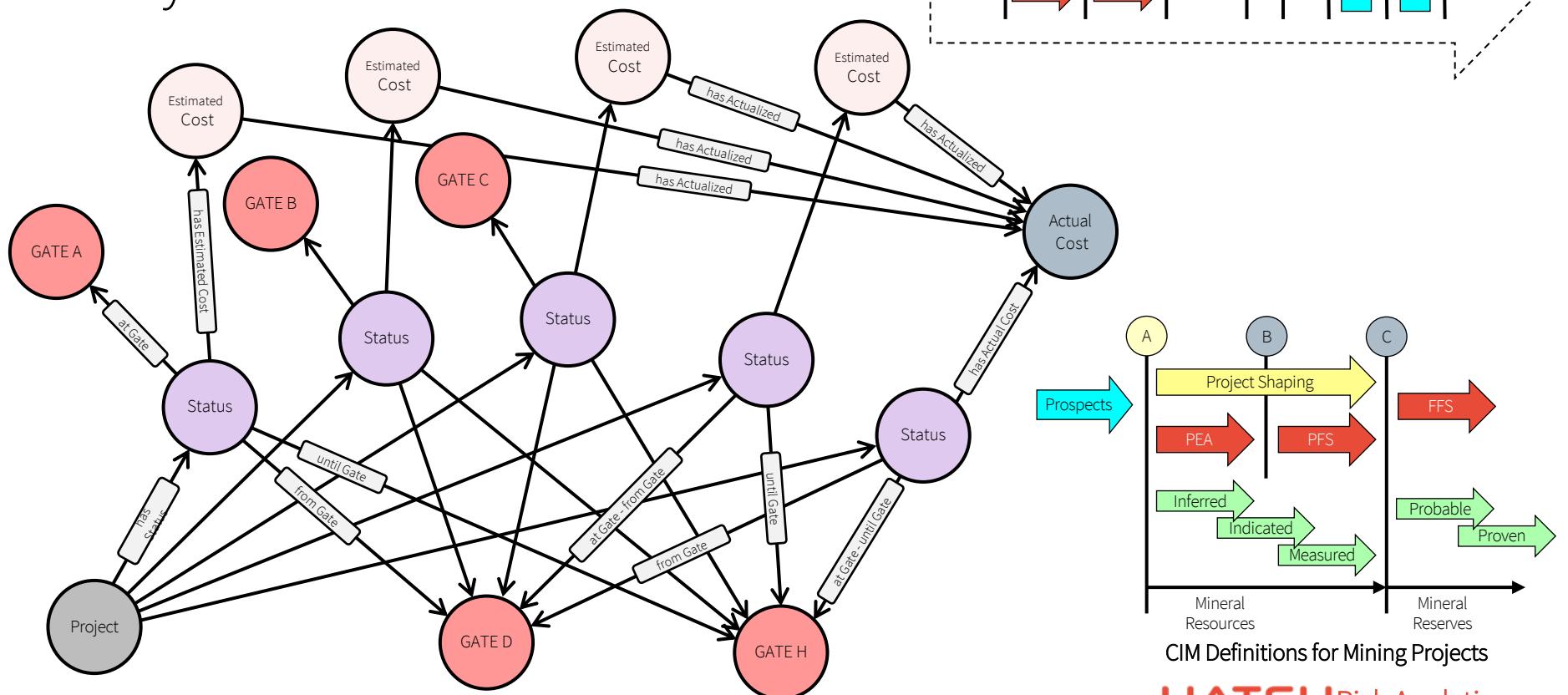
Through use of Linked Data

- Interoperability
- Reusability
- Discoverability
- Process-ability

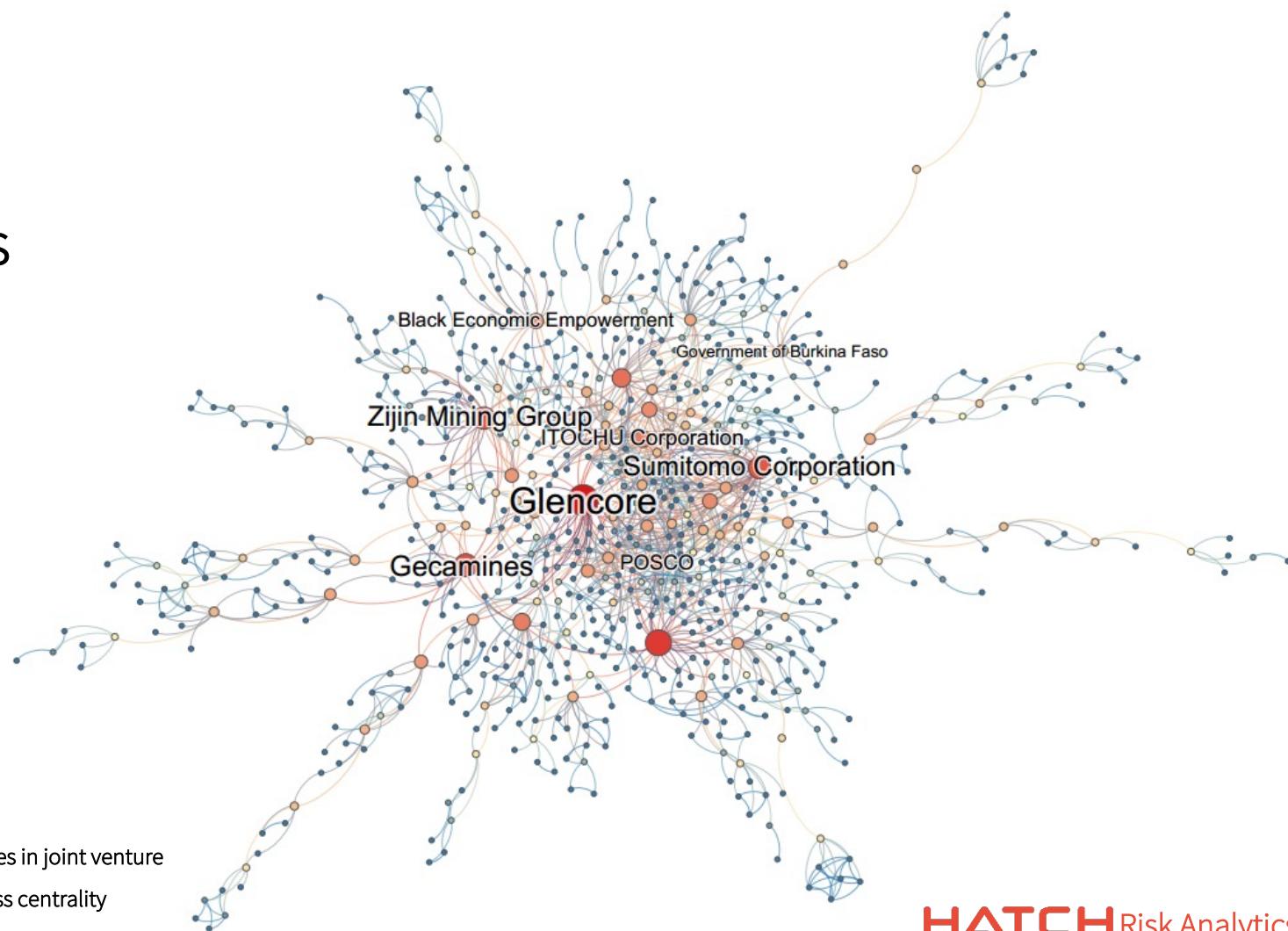
Ontology Competencies

- Lifecycle Data Analytics
Capture historical project data and allow for logical deductions and aggregation across different data levels (overall and lifecycle) for risk analytics.
- Cost Normalization
Define and track cost estimates and corresponding scopes during the lifecycle of the project and allow for cost normalization processes.
- Network Analysis
Allow network analysis of collaborations, projects, organizations, and products.
- Universal Semantics
Define universal semantics for projects data, risk factors and characteristics.

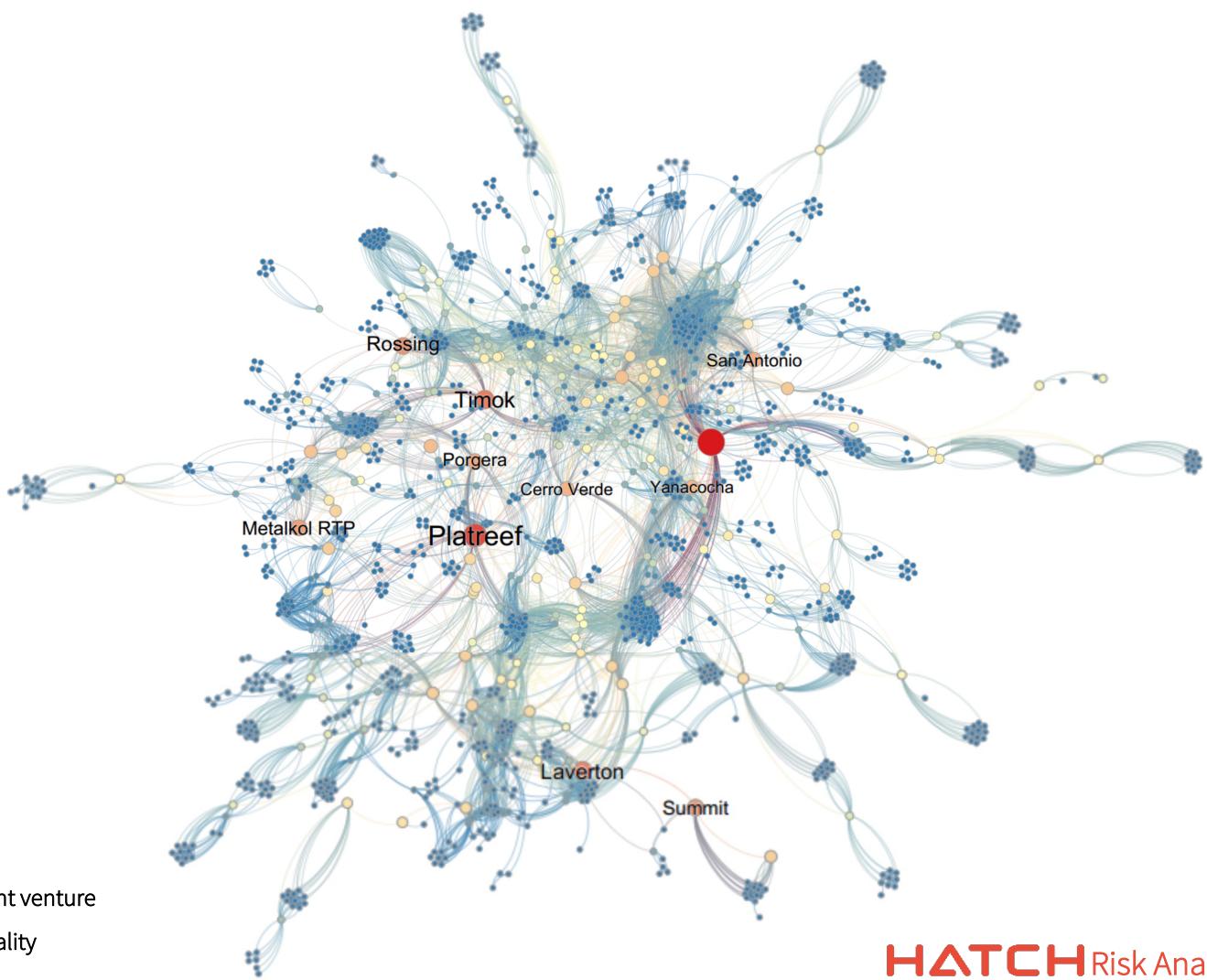
Representing Lifecycle Data



Network of Company Partnerships

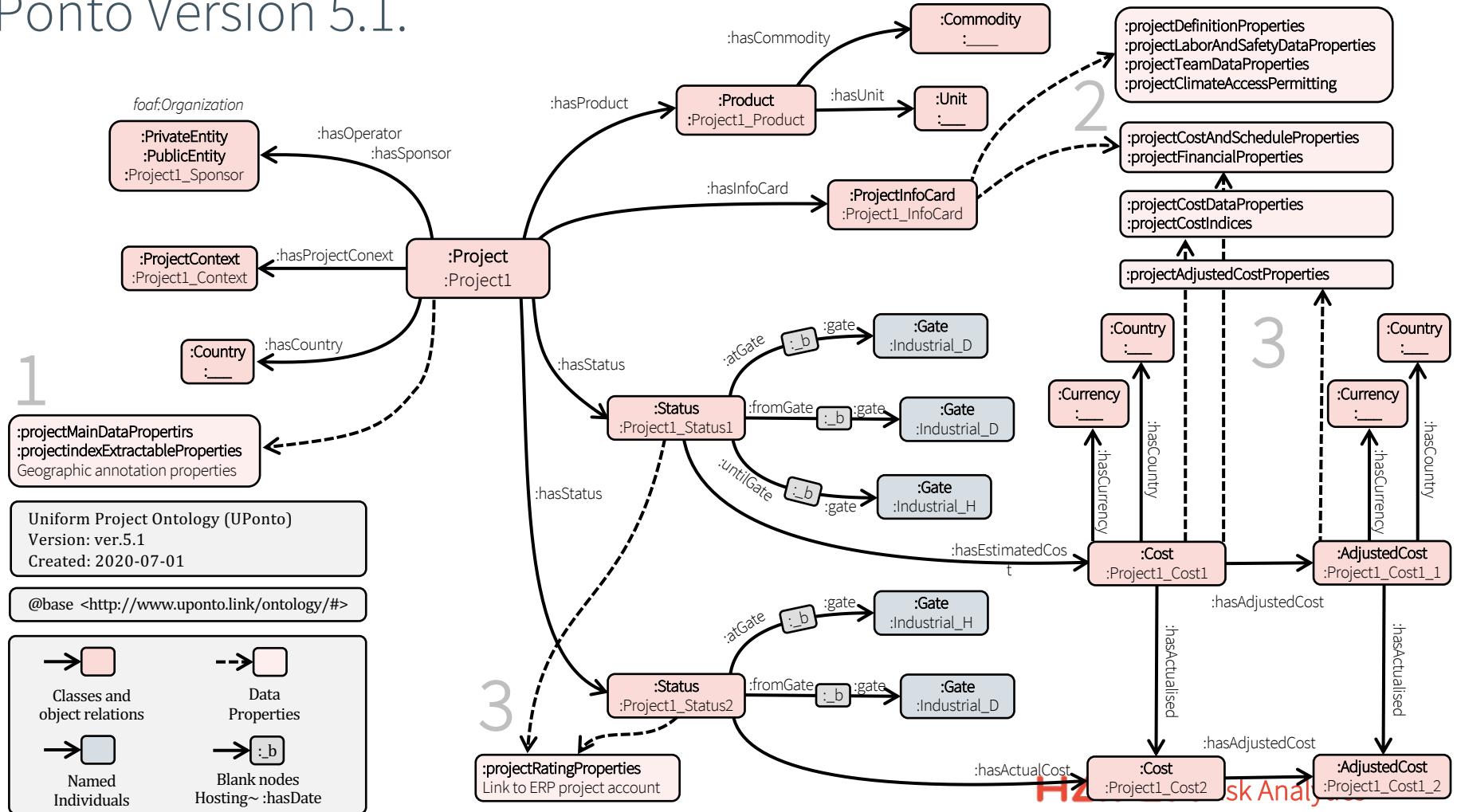


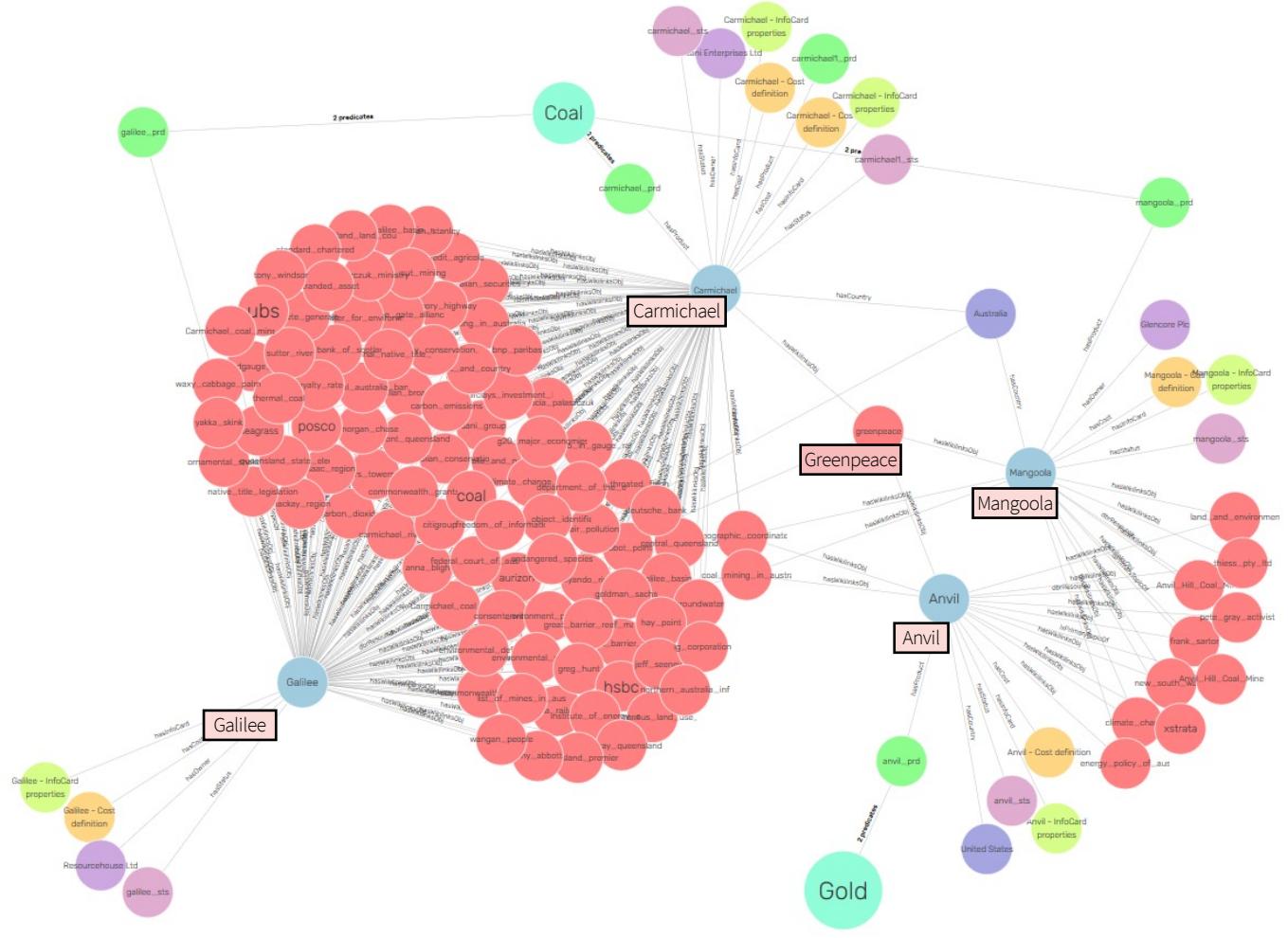
Network of Project Partnerships

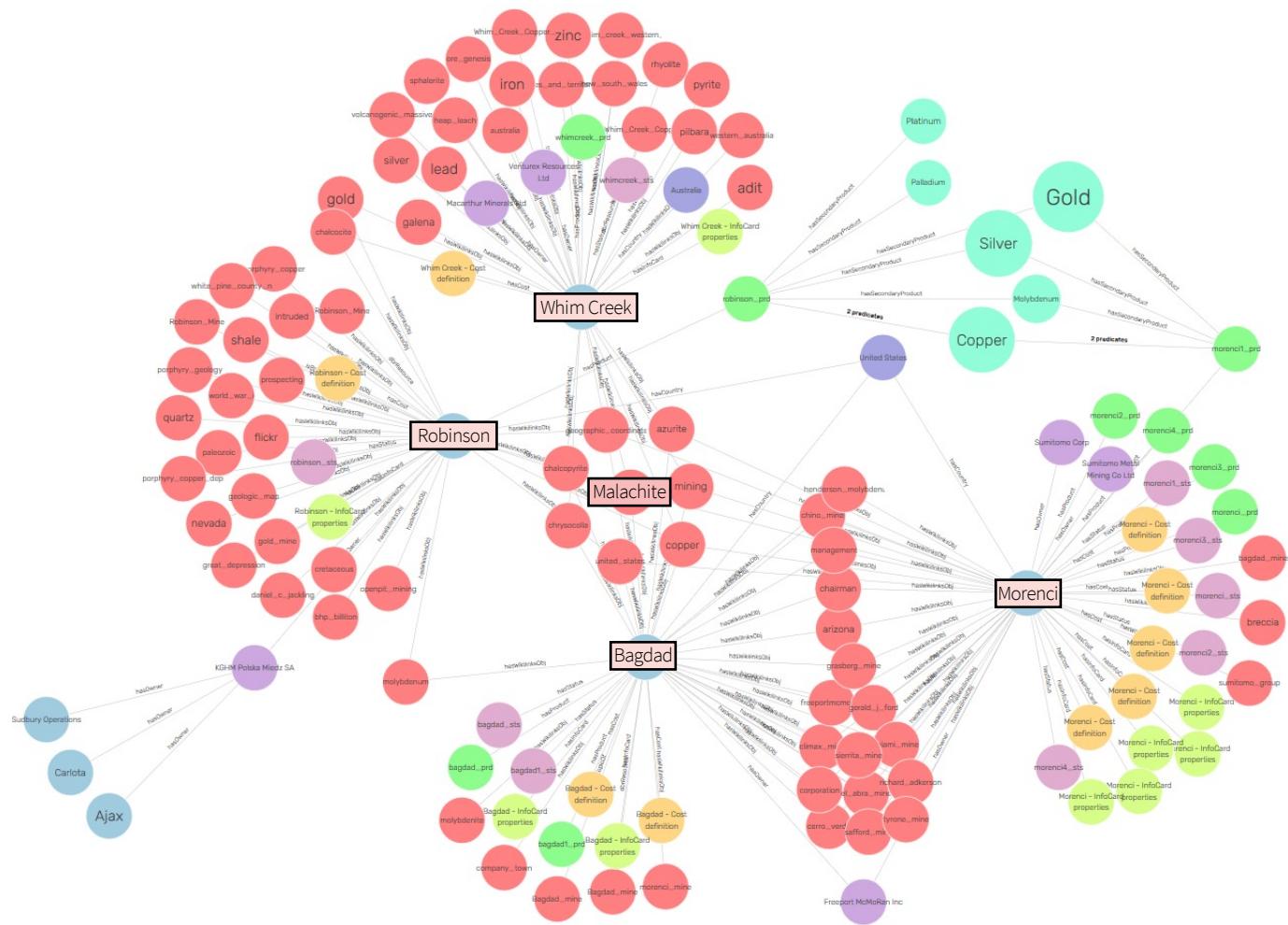


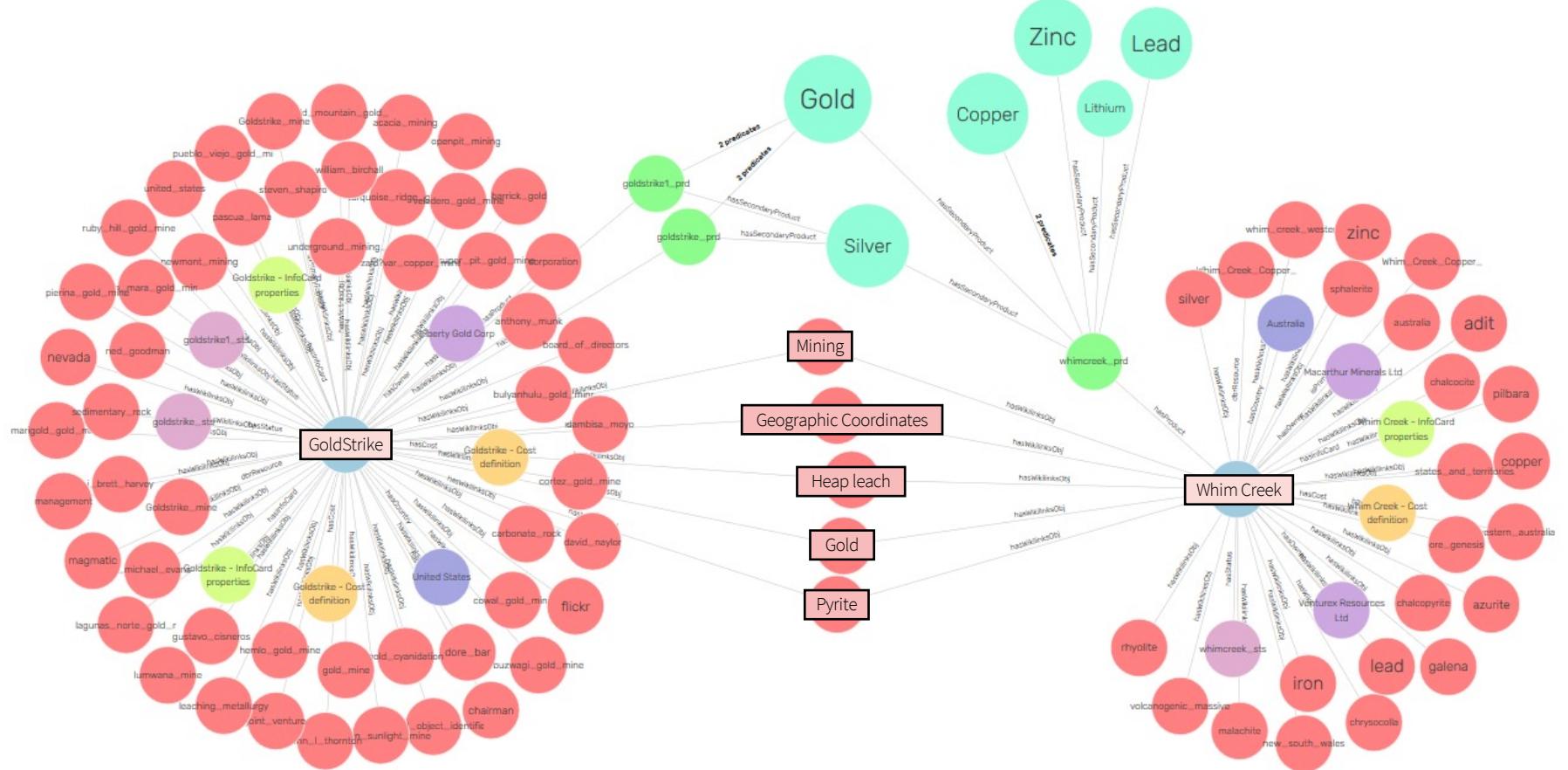
- 1-partite mapping of companies in joint venture
- Node's size reflect betweenness centrality

UPonto Version 5.1.



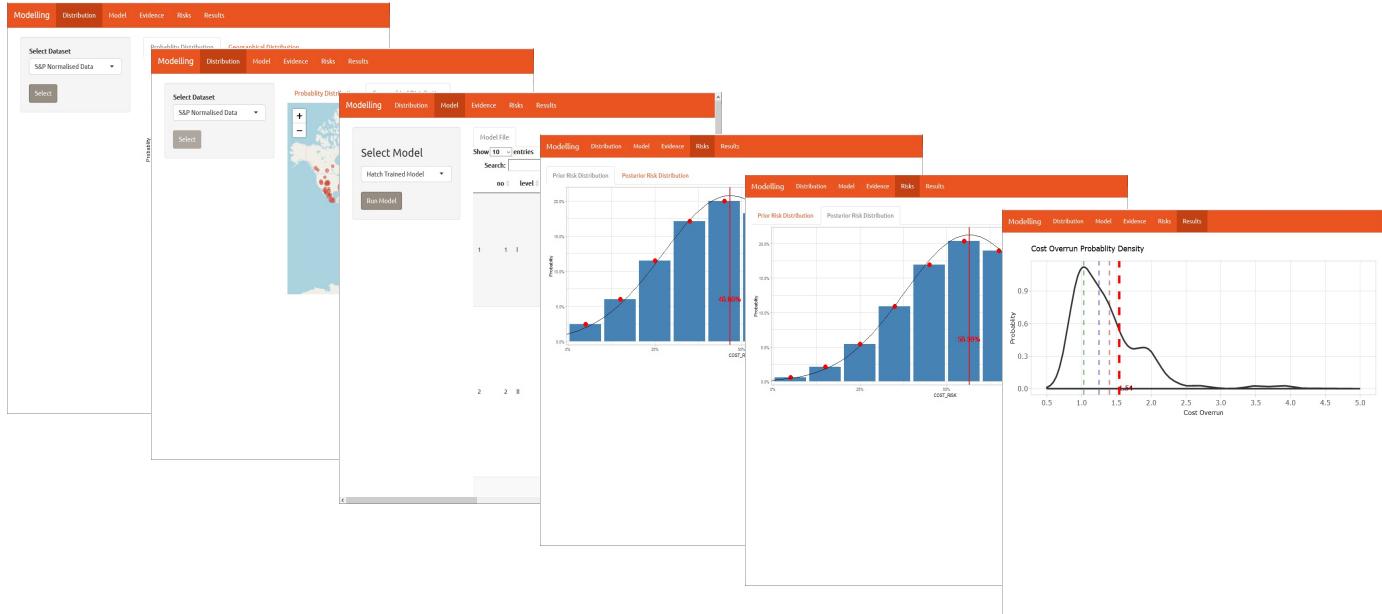






Implementation of STRM & GBNRM Using R-Shiny

- ✓ Inference module
- ✓ Next step: GeoSPARQL



Mining Disclosures

- The project was carried out as a visiting scholar semester in Columbia Law school.
- Extractive Industries Transparency Initiative (EITI) is a global standard for the good governance of oil, gas and mineral resources.
- Proposed in 2002 by the UK government at the World Summit on Sustainable Development in Johannesburg.
- Voluntarily adopted by 52 countries.
- Is developed and overseen by an international multi-stakeholder board, consisting of representatives from:
 - Governments,
 - Extractives companies,
 - Civil society organisations, such as *Natural Resource Governance Institute (NRGI)*
 - Financial institutions, and,
 - International organisations.



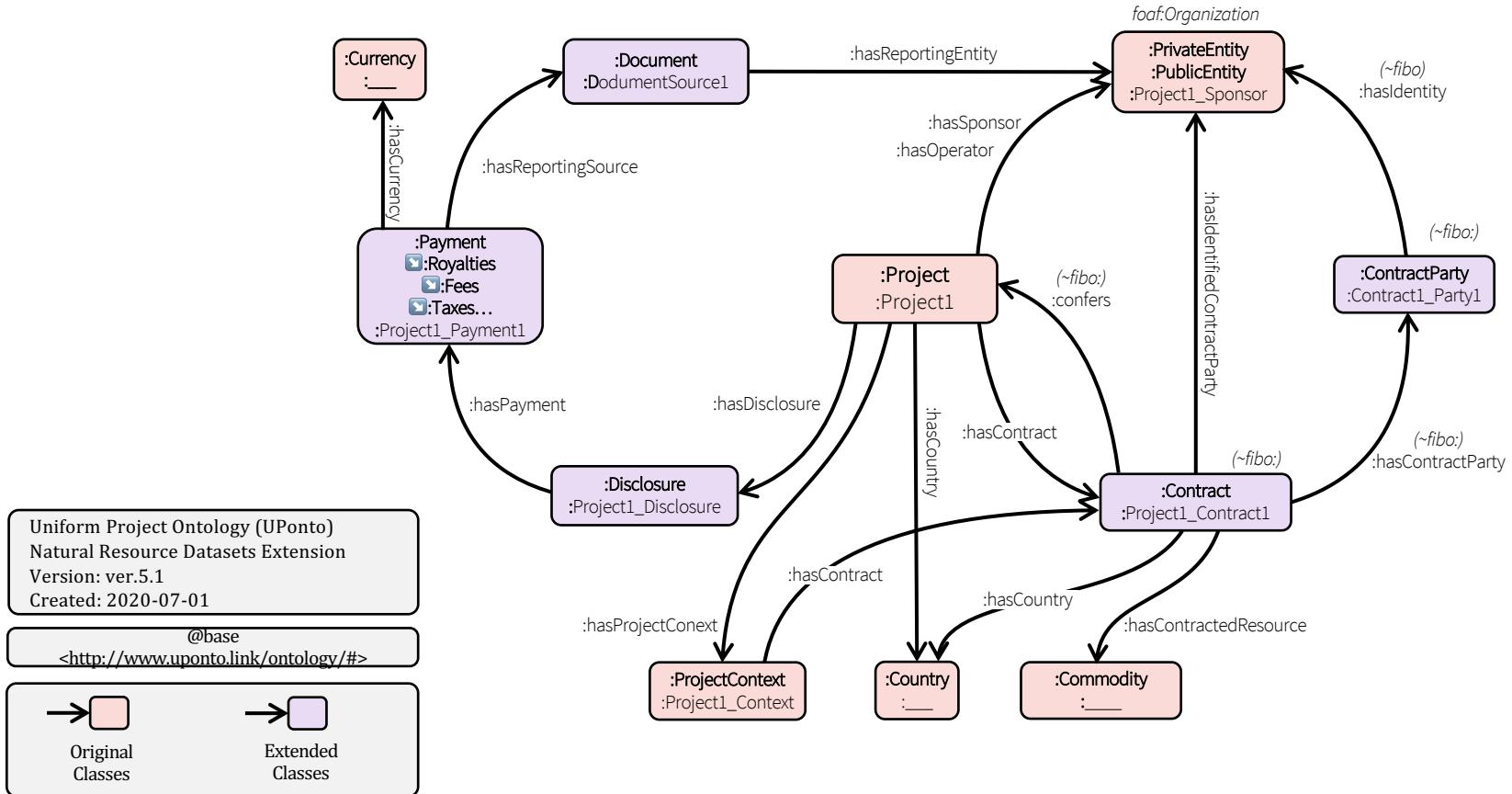
Resource Contracts

A screenshot of the Resource Contracts website. The top navigation bar includes links for "HOME", "DATA", "PROFILES", "ANALYSIS", "ABOUT", and "ALERTS". Below the navigation is a banner with a background image of a mining site. The banner text reads: "A directory of Petroleum & Mineral Contracts". It displays statistics: "2308 Documents", "95 Countries", and "50 Resources". On the right side, there is a sidebar with sections titled "Explore contract terms:" followed by "Environmental impact assessment", "Income tax exemptions", and "Local employment", each with a right-pointing arrow. At the bottom left is a search bar with the placeholder "Search 2308 contracts and associated documents" and a red "Search" button.

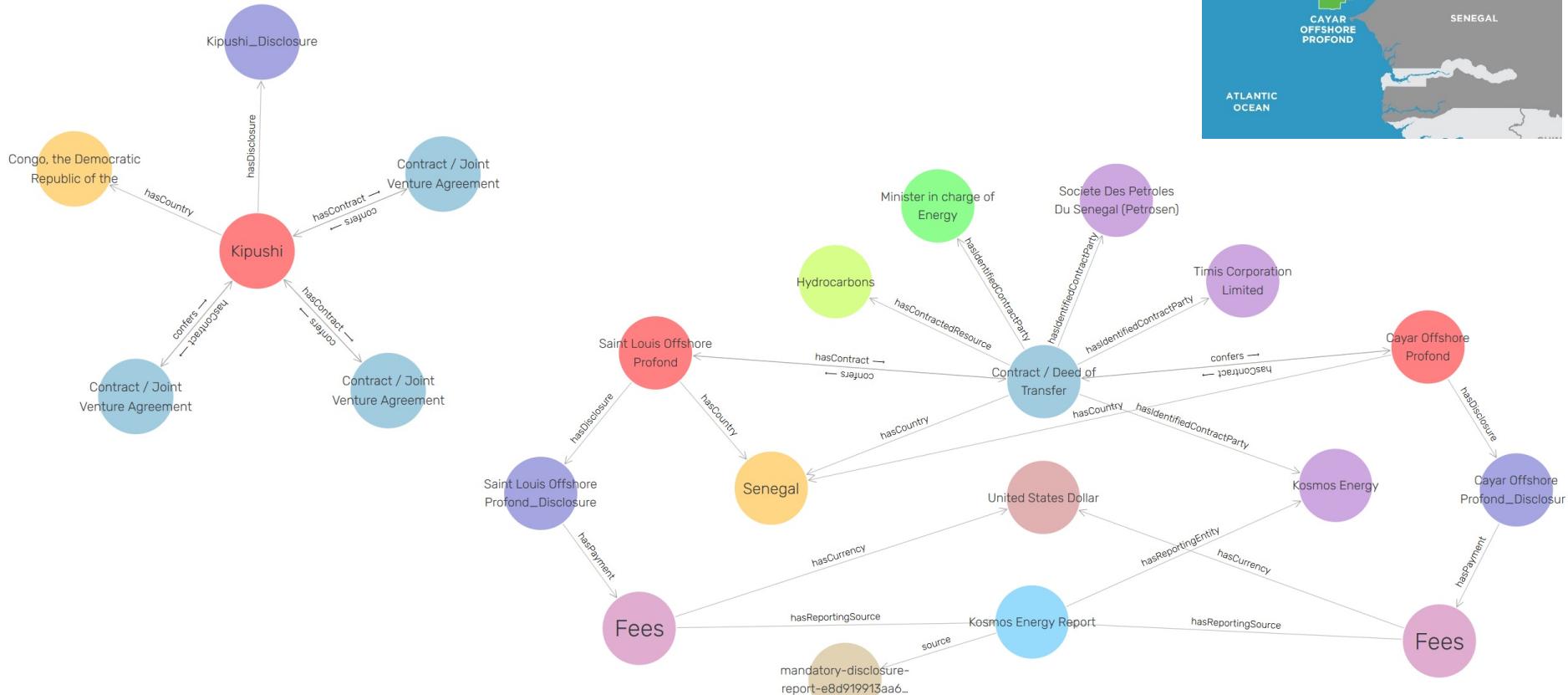
Resource Projects



Natural Resource Datasets Extension



Example: Kipushi, Saint Louis Offshore Profond



Knowledge Graphs

Open Linked Data

- Opportunity to collaborate with Dbpedia.
- Currently working on mapping entities with Dbpedia and federated queries to justify an open endpoint.
- Decoding beneficial ownership issues.

```
SELECT ?Country ?Population (sum(?e) AS ?Total)
  (sum(?e)/?Population AS ?PerCapita)
WHERE {
  ?y a :HeavyIndustrial. ?y :hasDisclosure ?q.
  ?q :hasPayment ?w. ?w a :Royalties.
  ?w :hasPaymentValue ?e.
  ?y :hasCountry ?x. ?x rdfs:label ?Country.
```

```
SERVICE <http://dbpedia.org/sparql> {
  ?x dbp:populationCensus ?Population.
}
GROUP BY ?Country ?Population
```

Website and Documentation

uponto.link/

UPonto:
Uniform Project Ontology

Is an open-source machine-readable graph data ontology to facilitate project analytics and data exchange for capital projects.

[Learn more](#) [Ontology](#)

uponto.link/ontology/

Uniform Project Ontology (UPonto)

made by PILODE 1.1

IRI <http://www.uponto.link/ontology/#>

Creator Pouya Zangeneh, Department of Civil and Mineral Engineering, University of Toronto.
Brenda McCabe, Department of Civil and Mineral Engineering, University of Toronto.

Contributor(s) Murray Pearson, Hatch Ltd.

Created 2020-07-01

Version Information ver 5.1. Issued for Review. [Raise an issue](#).

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Ontology RDF [RDF \(turtle\)](#)

Description

UPonto is an open-source machine-readable graph data ontology to facilitate project analytics and data exchange for capital projects.

github.com/Pzangeneh/UPonto/

Pzangeneh / UPonto

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About Uniform Project Ontology

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Pouya Zangeneh committed [8ae077a](#) 2 days ago · 16 commits · 1 branch · 0 tags

- [_config.yml](#) Set theme jekyll-theme-slate 10 days ago
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- [upontover.5.1.ttl](#) Add files via upload 2 days ago
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Paper

Advanced Engineering Informatics
Volume 46, October 2020, 101164

Ontology-based knowledge representation for industrial megaprojects analytics using linked data and the semantic web

Pouya Zangeneh, Brenda McCabe

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<https://doi.org/10.1016/j.aei.2020.101164> Get rights and content

The background of the slide features a vast, dark blue sky filled with thousands of small, silhouetted birds forming a massive V-shaped formation. Below them, a warm, orange and yellow gradient of a sunset or sunrise stretches across the horizon. In the foreground, there's a dark, indistinct landscape.

Thank you

For Questions, Comments and Further
discussion, please reach out to
Pouya.zangeneh@hatch.com

HATCH