Semantic Web data Integration for Australia

By Nicholas Car
For DAMA, 26 Nov 2025

https://kurrawong.ai

A bit about me and my goals…

- I’m a data modeller
- I’m keen on large-scale data integration initiatives

- I’m trying to build large data collections of enduring value for Australia
  - Because I see a lot of waste through data loss, unnecessary tool expenses

- I have a long but arms-length association with DAMA

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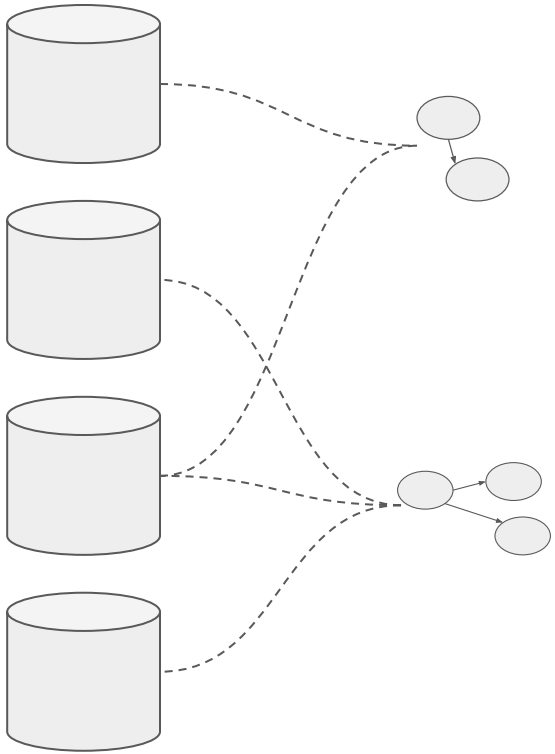
Outline

1. Recap: how to do data integration
2. What is the Semantic Web, really?
3. How SW does data integration
    - And how it's different/better than other systems
4. Large-scale Australian Knowledge Graphs

Recap: how to do data integration

General data integration approach



Reuse modelling patterns

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Recap: how to do data integration

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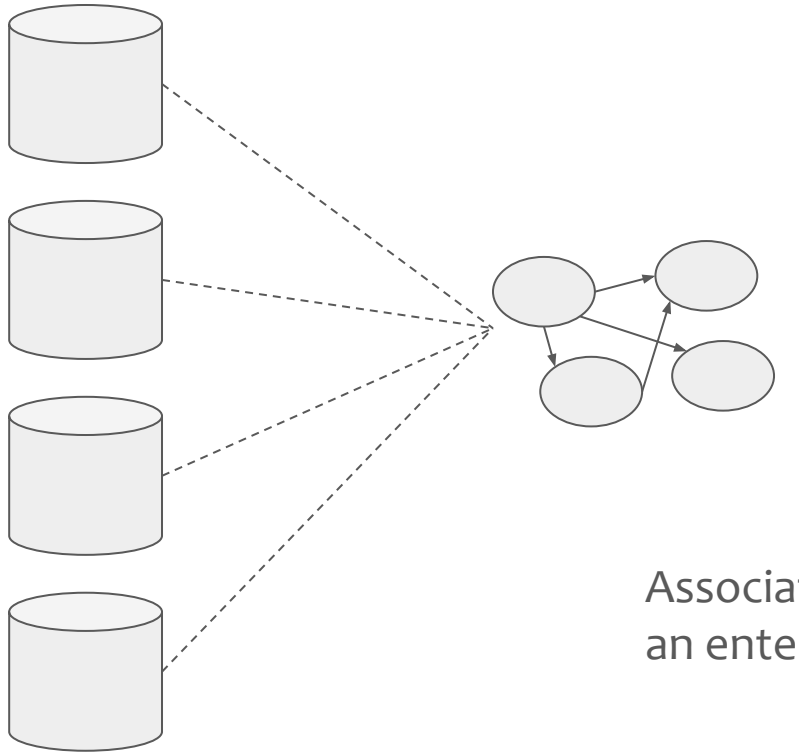

Associate dataset elements with an enterprise data model

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Recap: how to do data integration

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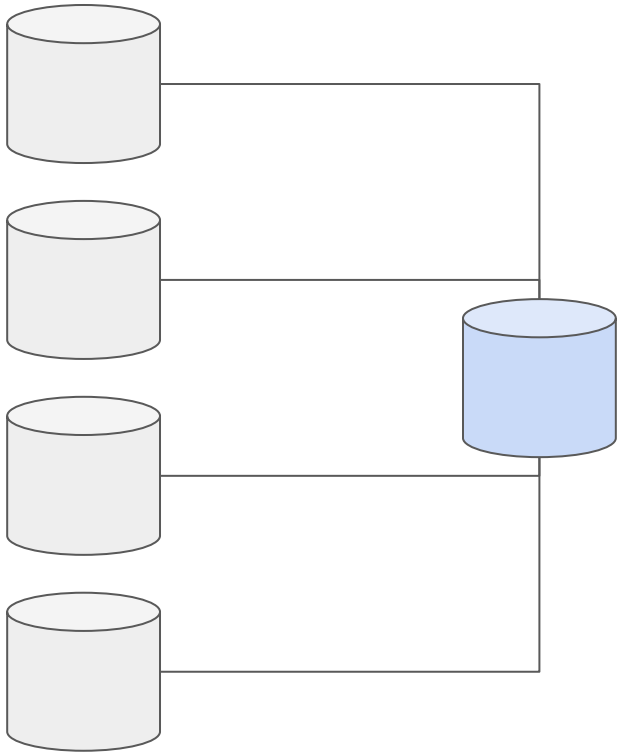

Use Reference Data

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Recap: how to do data integration

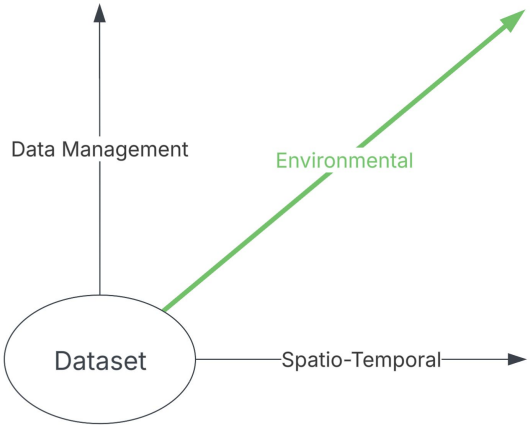
Assuming we have to make the enterprise data model:

- Where do we get the modelling patterns from?
- Are there any sources of general Reference Data?

Recap: how to do data integration

Imagine trying to integrate *Environmental Information Australia's* datasets…

Integration dimensions may look like this:



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- Use universal definitions for things - data, metadata, schema
- Allow universal lookups for more info

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There are a bunch of technical things required for this but we are keeping to the conceptual today, assume they all work…!

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Where do these definitions all come from?

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We now have a large body of SW models (ontologies)

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How are these different from other bodies of models?

- It's not (just) about the tech
- It's about the intention
  - universal, comprehensive, free

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Mention Linus Torvald's remark about the Linux licensing here

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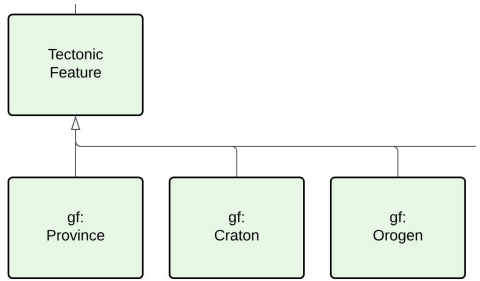
What is the Semantic Web, *really*?

The universality + comprehensive intention has lead to a fundamentals approach I don't think we see elsewhere:

"Upper" ontologies through to "domain" ones, to profiles

BFO → GeoSPARQL →



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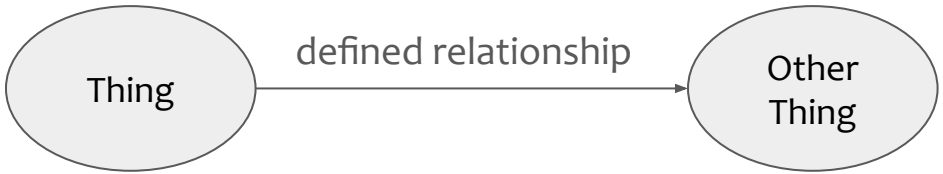
The "low cost" of model extension.



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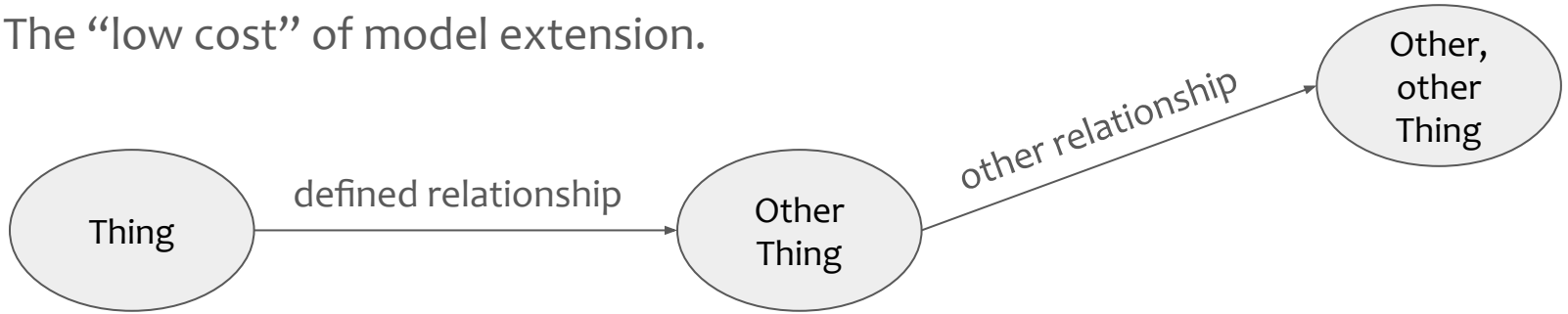

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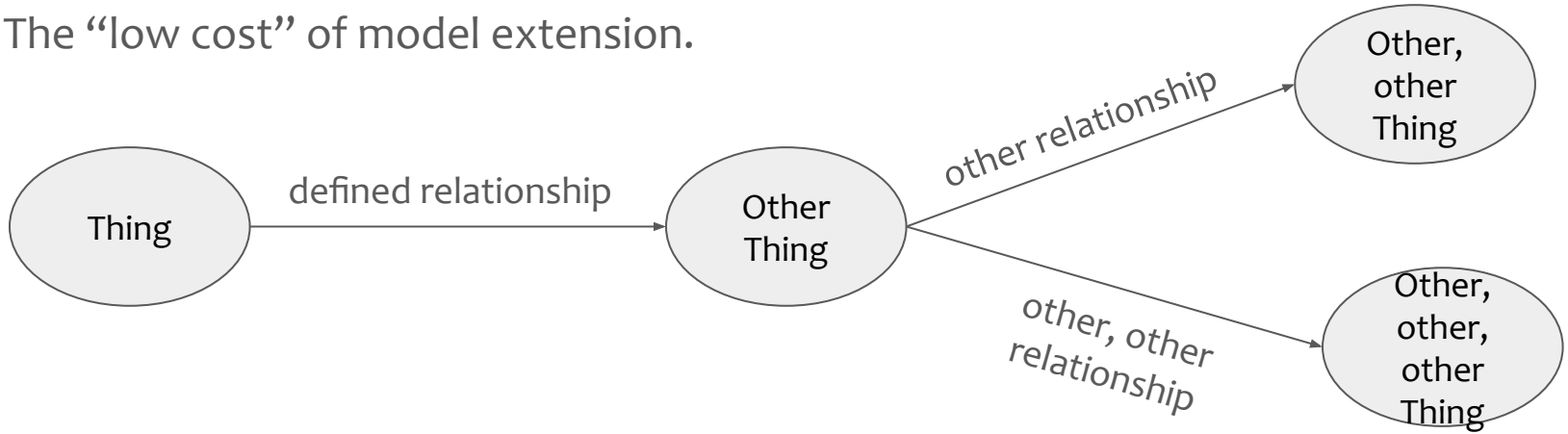

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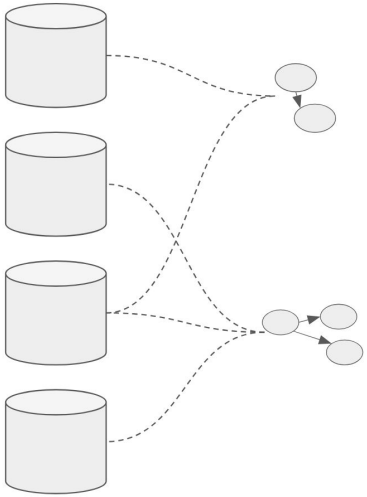
How SW does data integration



Modelling patterns

from

SNOMED International

ORG

SSN

DCA

PROV-O

GeoSPARQL

Schema.org

BFO

OBO Foundry

EarthPortal

Fundamental & integrated models

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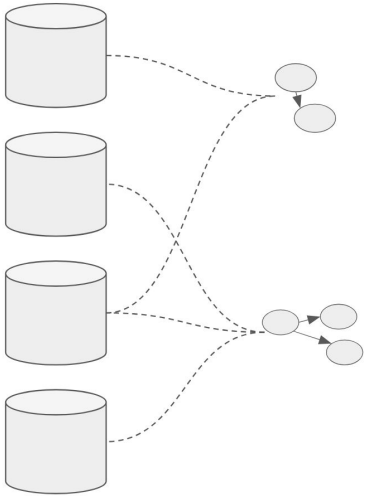

How are these models different from other collections of integrated models?

- e.g. ISO 19*, OMG standards…

Modelling patterns

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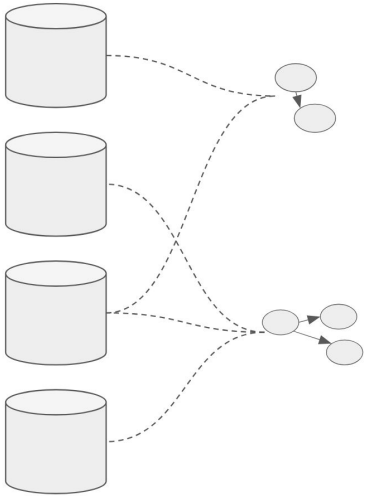

Modelling patterns

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Intention: … universal, comprehensive, free…

Tech:

- Tighter conceptual modelling → orderly implementation
- Validation

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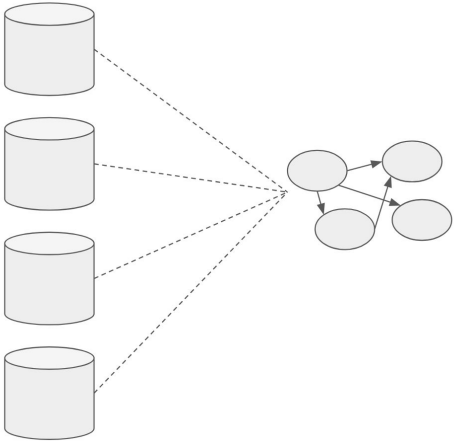
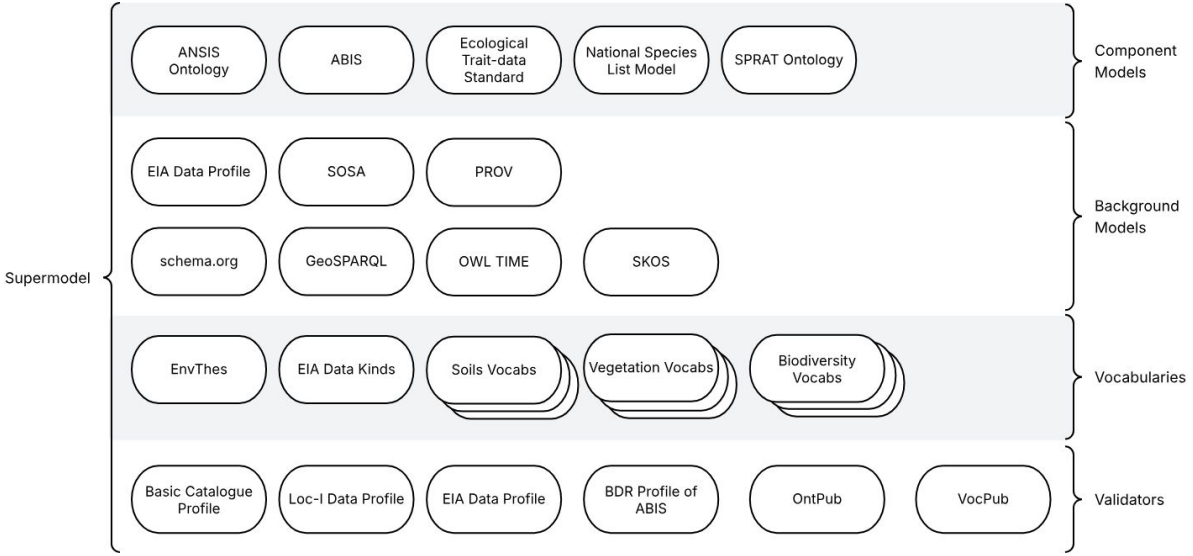


Enterprise data model



Independently-modelled data magically lines up, if using the same background models - EIA experience

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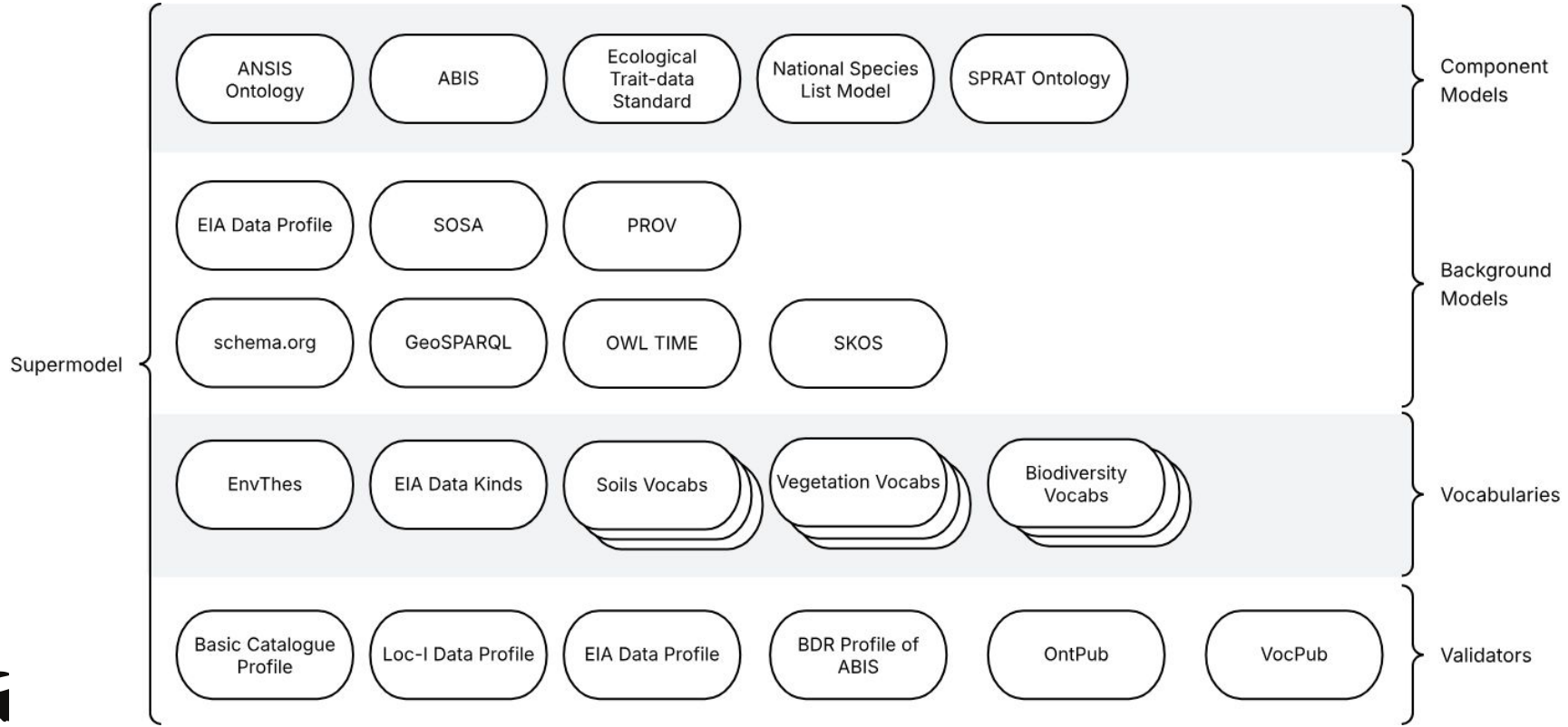
How SW does data integration



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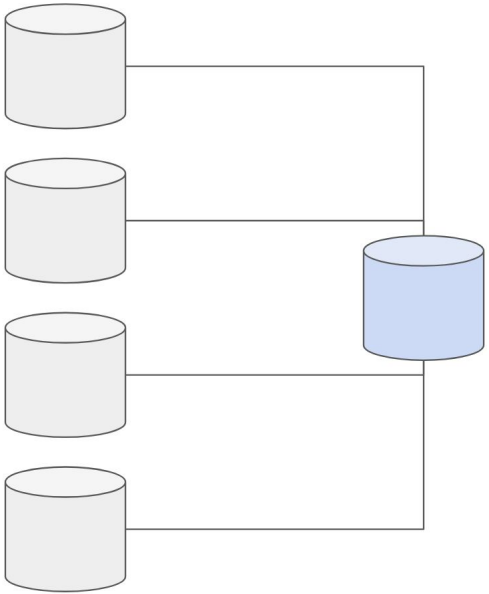
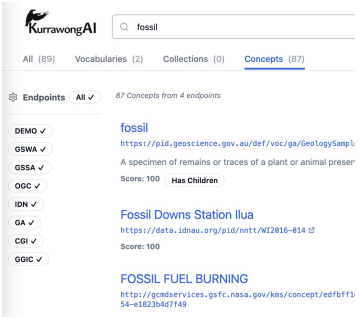
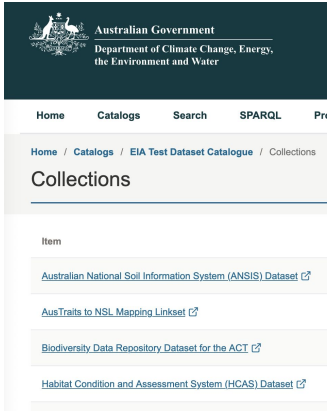


Use Reference Data

Mechanisms: Linked Data. You can go to it directly.

Instances:





The Indigenous Data Network

OGC RAINBOW

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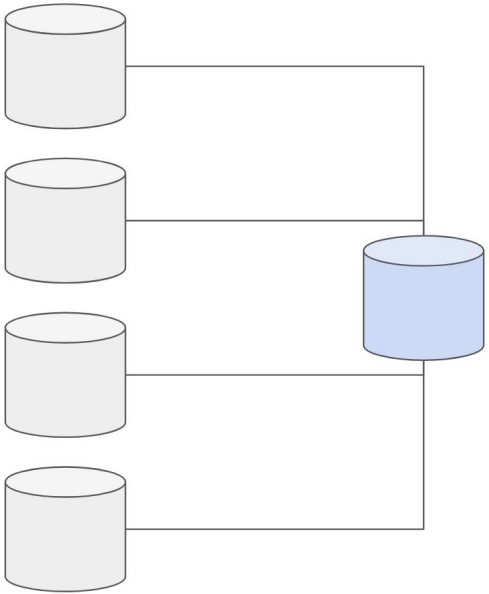
How SW does data integration



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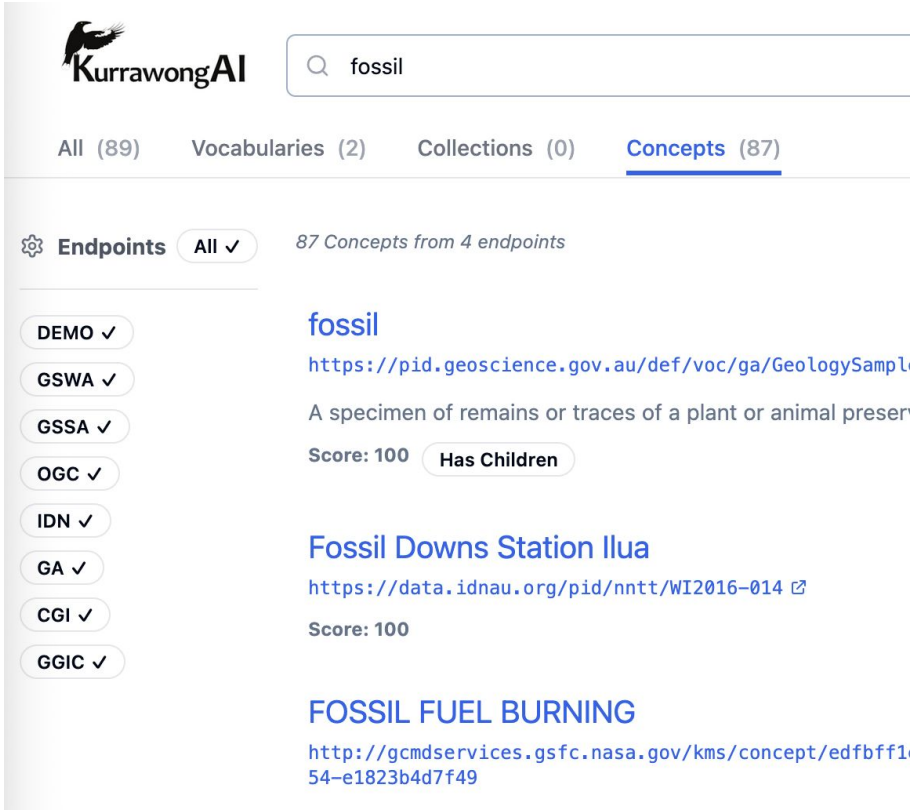

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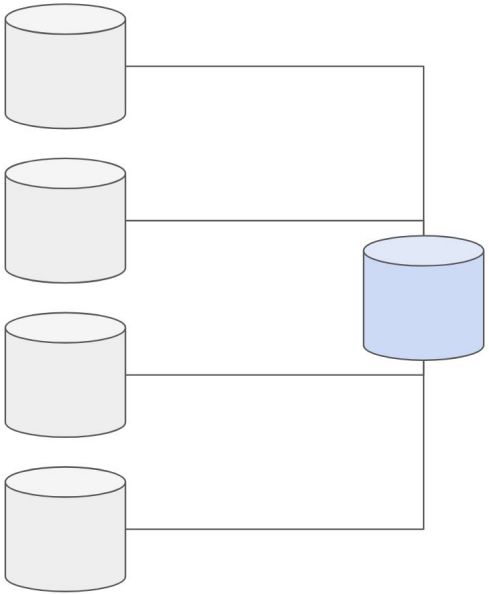

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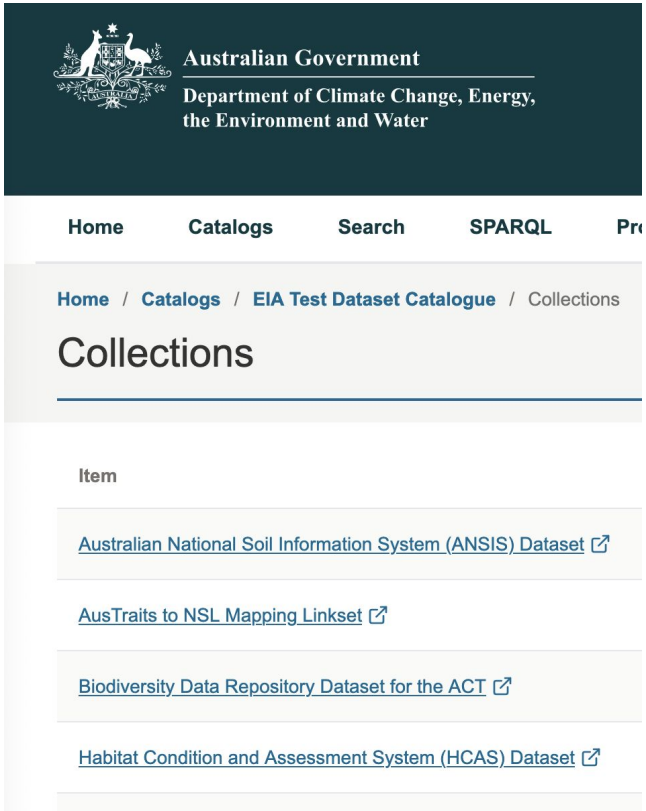

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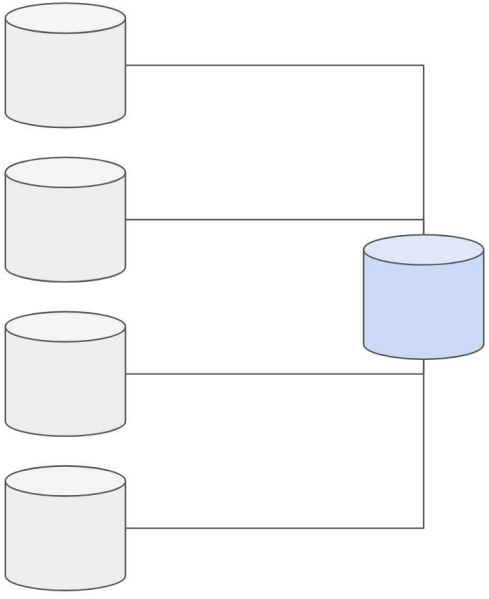

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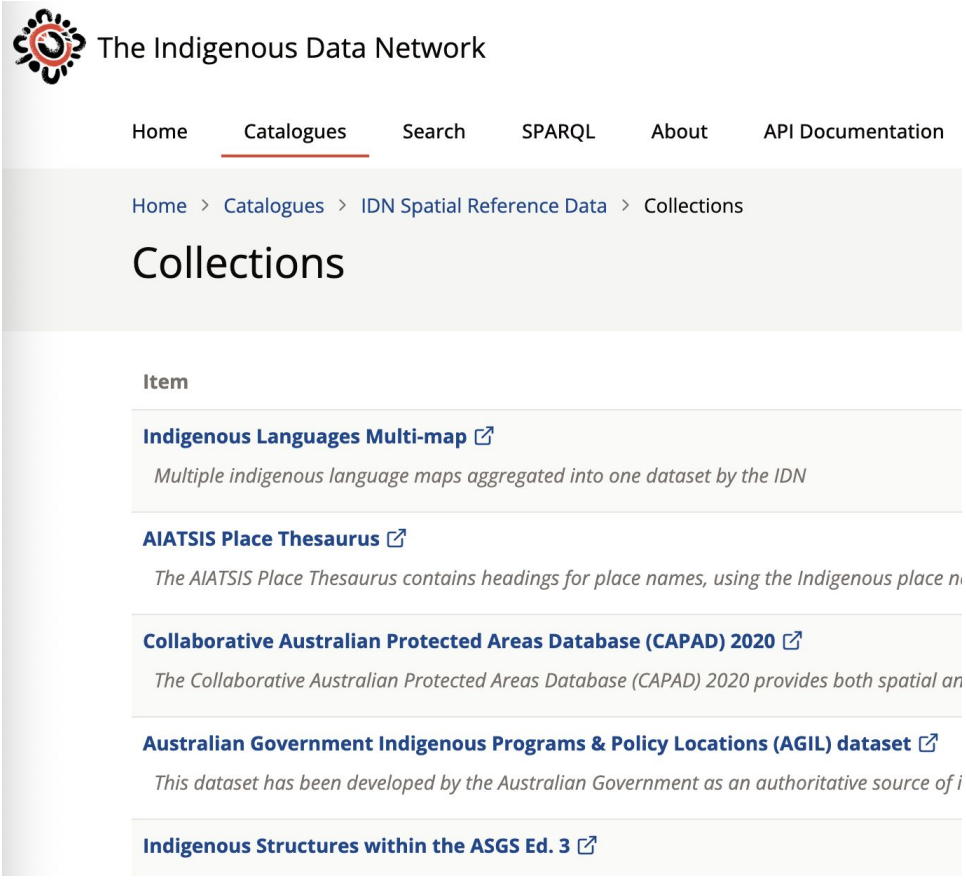

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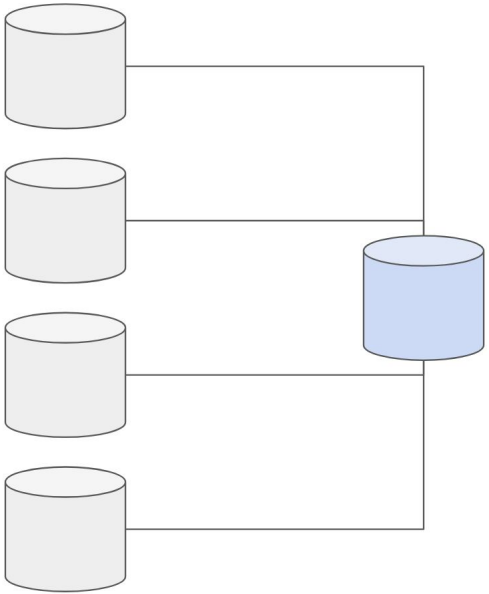

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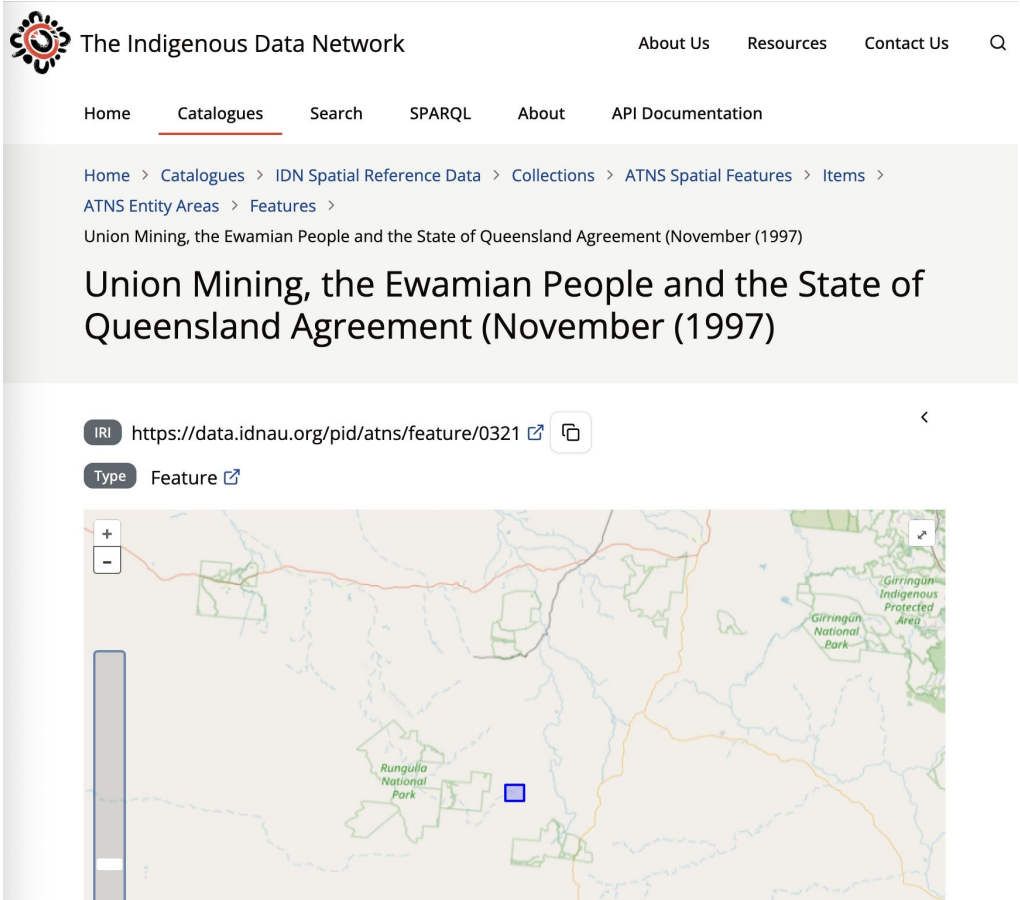

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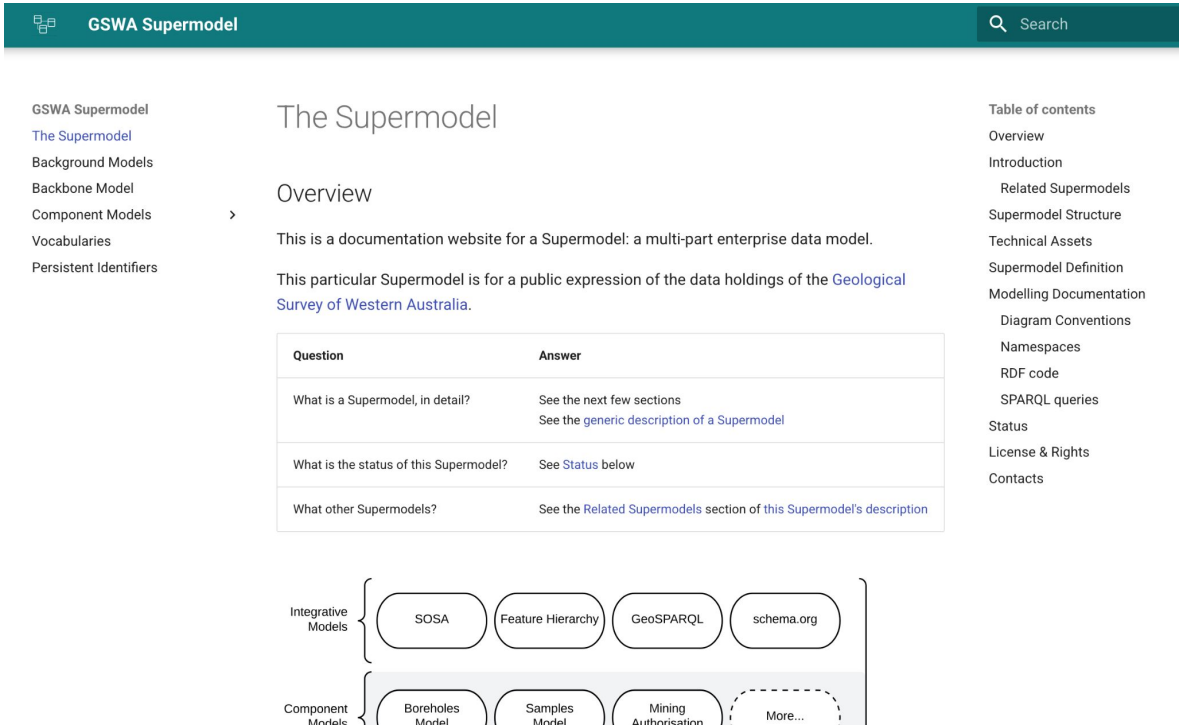
Large-scale Australian Knowledge Graphs



Geological Survey of WA

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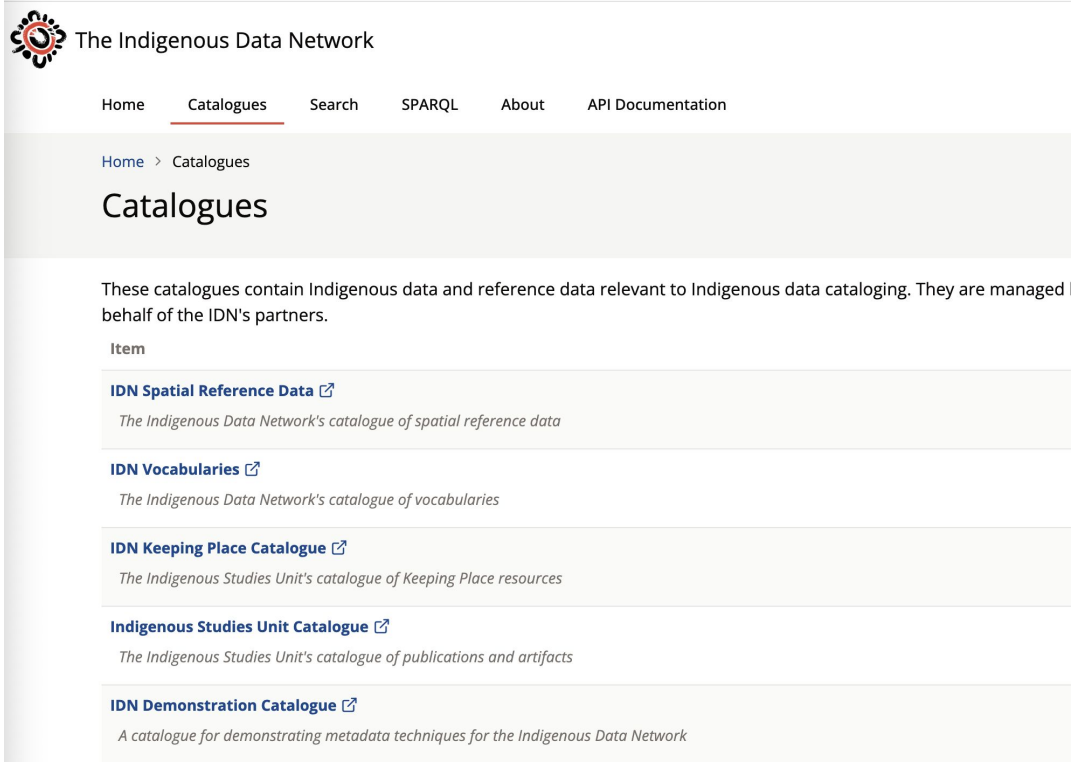
Large-scale Australian Knowledge Graphs



Indigenous Data Network

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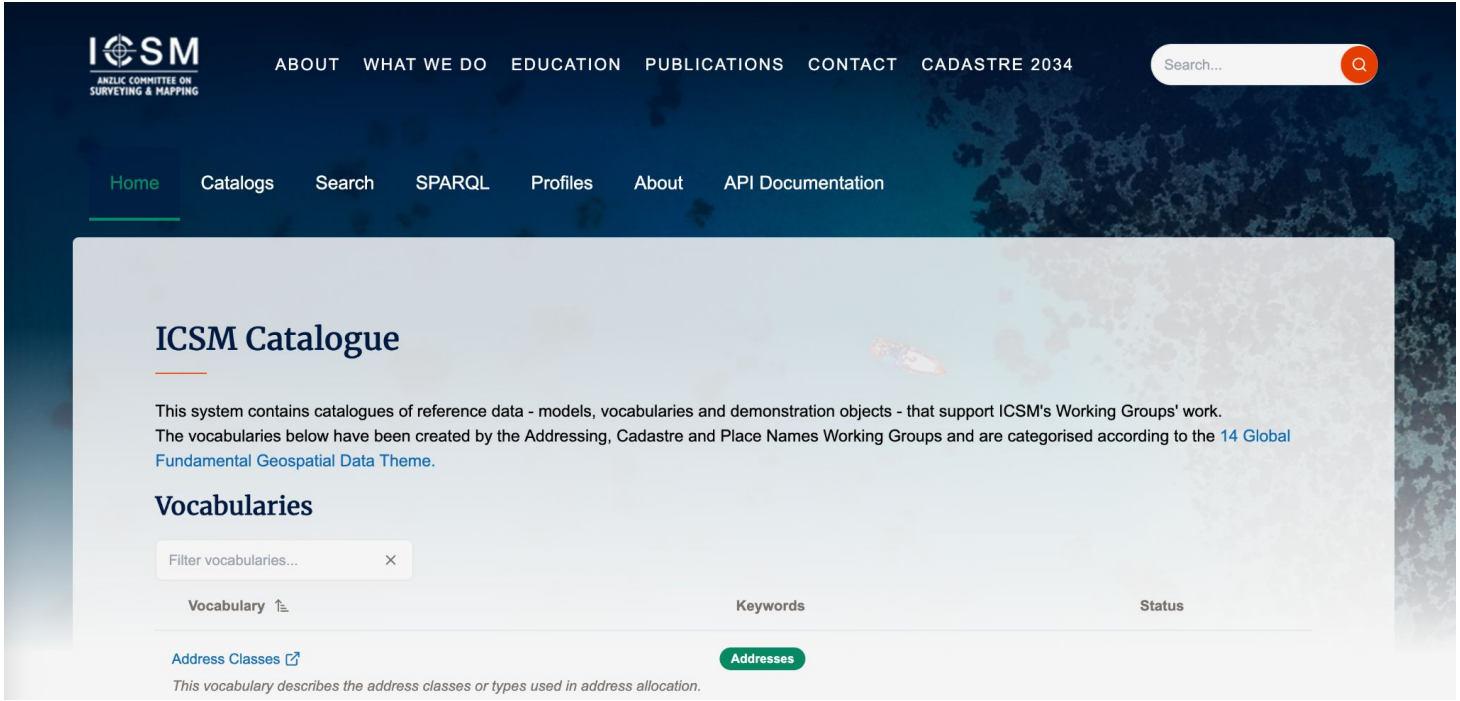

Intergovernmental Committee on Surveying & Mapping - distributed

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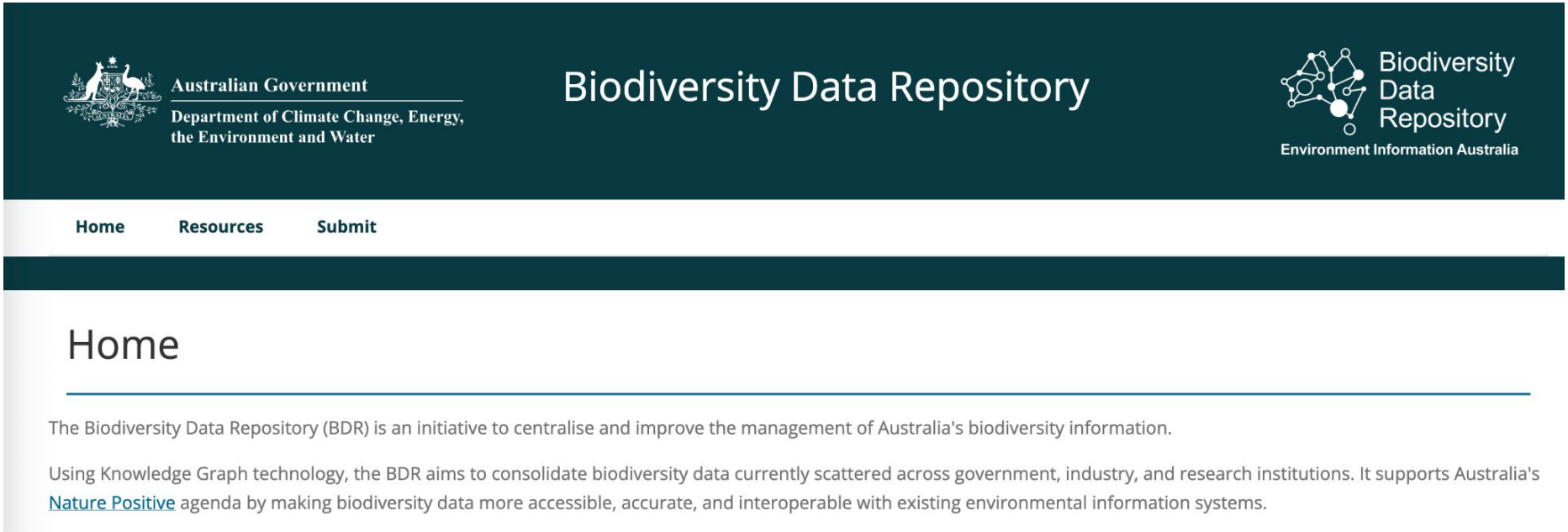

Biodiversity Data Repository

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Large-scale Australian Knowledge Graphs

EIA Test Catalogue

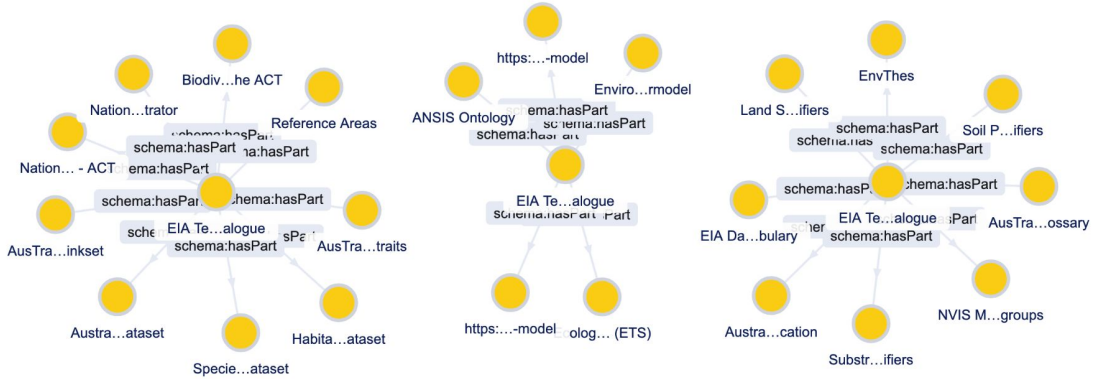
This catalogue was created in mid-2025 to showcase the integration of Environment Information Australia (EIA) datasets.

The catalogue lists test versions of major Australian environmental datasets within EIA's scope. It also lists models and vocabularies needed to support the integration of the datasets.

The catalogue tool also provides the EIA Scenario Demonstrator which describes a series of data discovery scenarios that show off different aspects of the dataset's integration using Semantic Web and Knowledge Graph methods.

The enterprise data model - a "Supermodel" - within which all elements of this catalogue are positioned is online at:

https://linked.data.gov.au/def/eia-supermodel



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Proposed: Environmental Information Australia

Large-scale Australian Knowledge Graphs

GSWA + IDN + ICSM + BDR + EIA ?

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Large-scale Australian Knowledge Graphs

GSWA + IDN + ICSM + BDR + EIA ?

Which of these would you need to underpin *your* Digital Twin?

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What next?

- True distributed publication
  - Indexation & efficient access are un-solved challenges

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- Keeping government focus on “the plan” (any plan)

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Thanks!

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