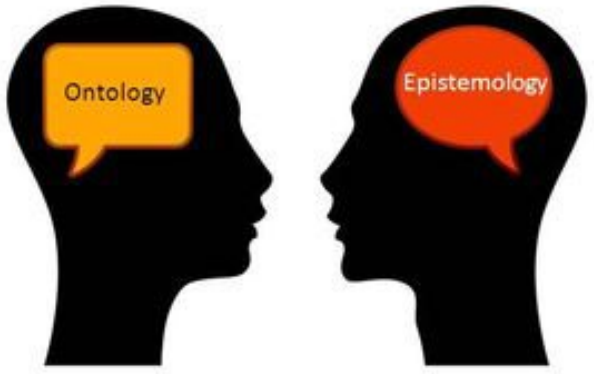
Using Vocabularies to Provide Consistency Across Structured Content

Joseph Busch, Principal Analyst



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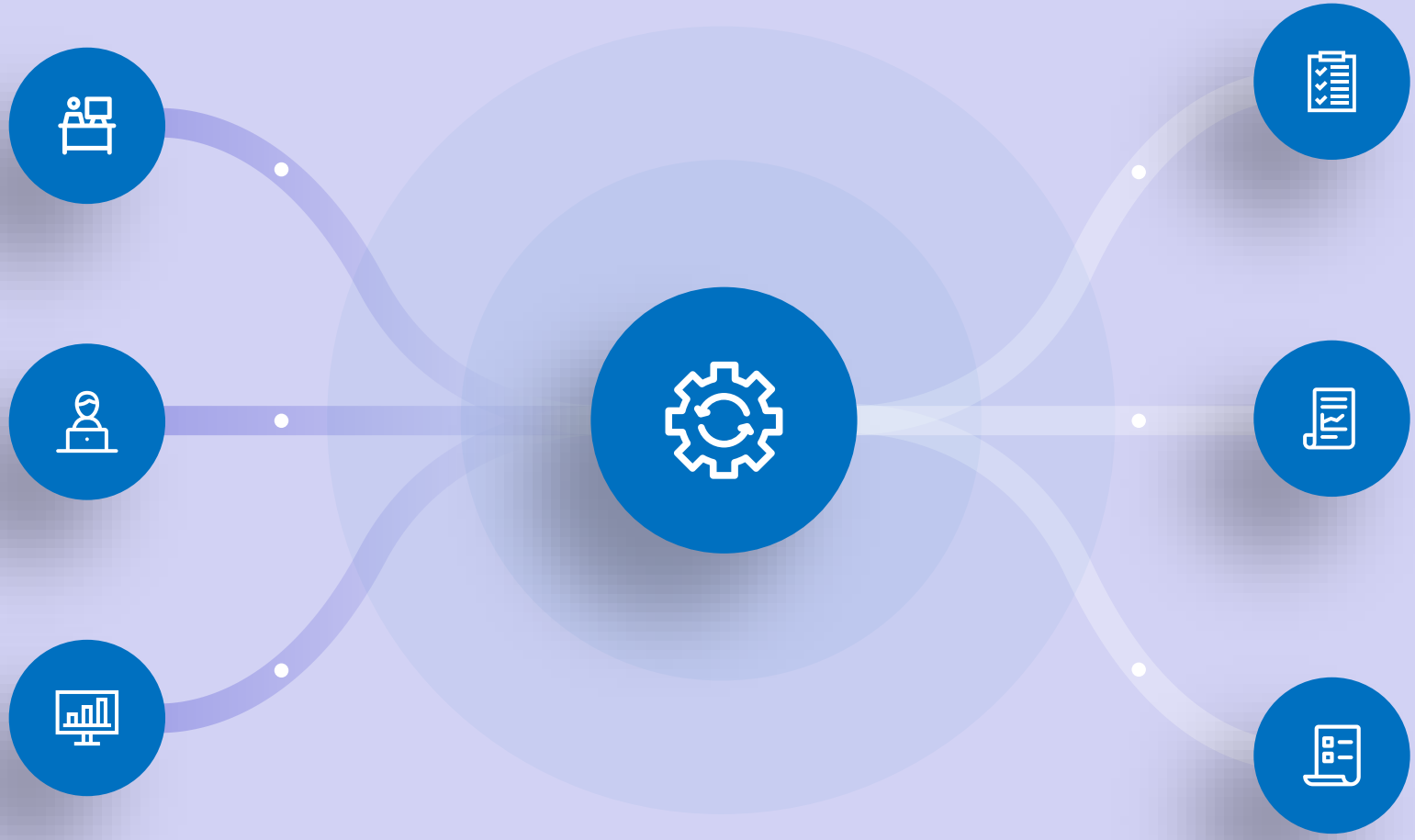
What is an application profile



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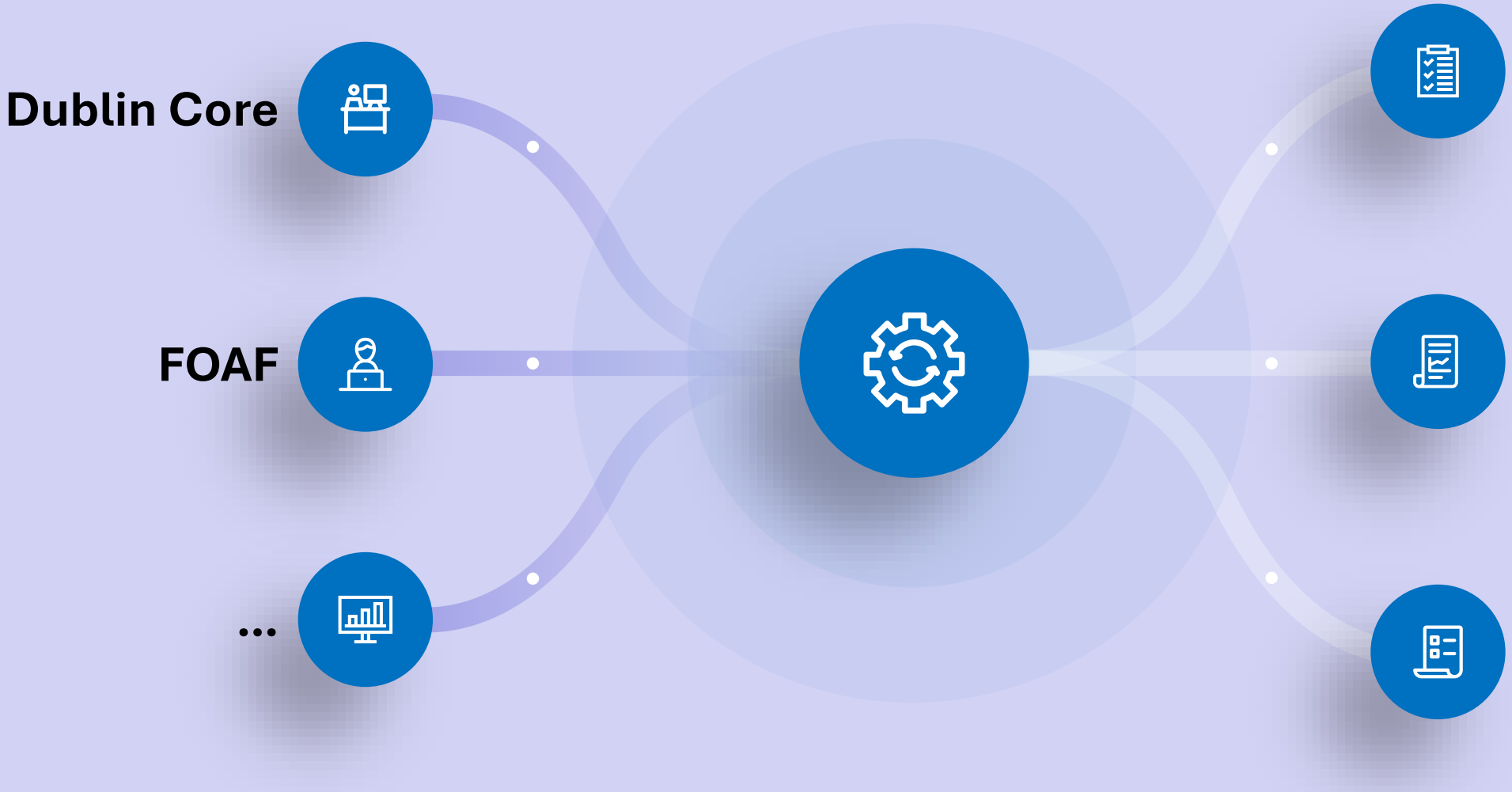


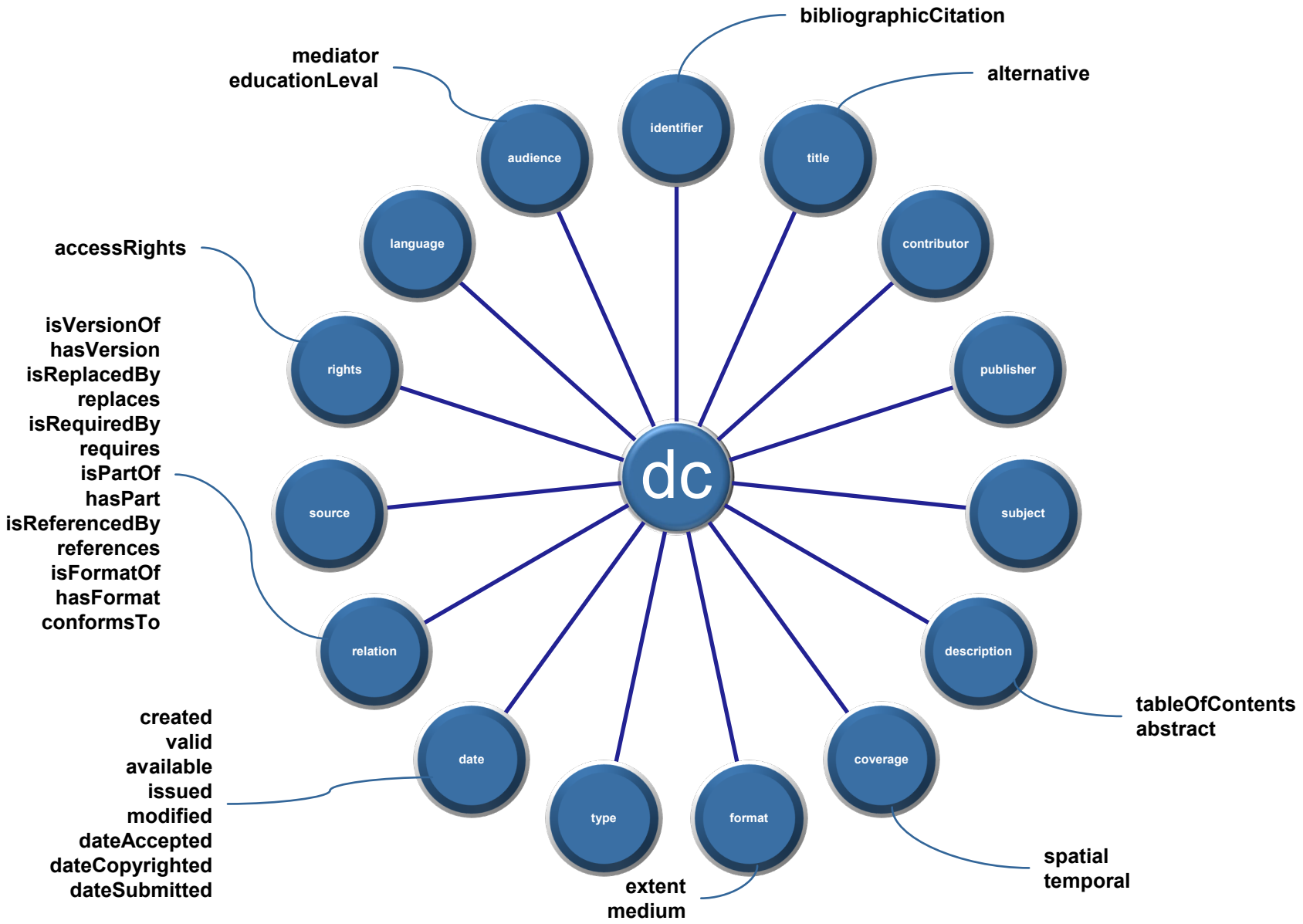
“An Application Profile (AP) is a data specification aimed to facilitate the data exchange in a well-defined application context. It re-uses concepts from one or more semantic data specifications, while adding more specificity, by identifying mandatory, recommended, and optional elements, addressing particular application needs, and providing recommendations for controlled vocabularies to be used.”

Application Profiles: What are they and how to model and reuse them properly? A look through the DCAT-AP example.

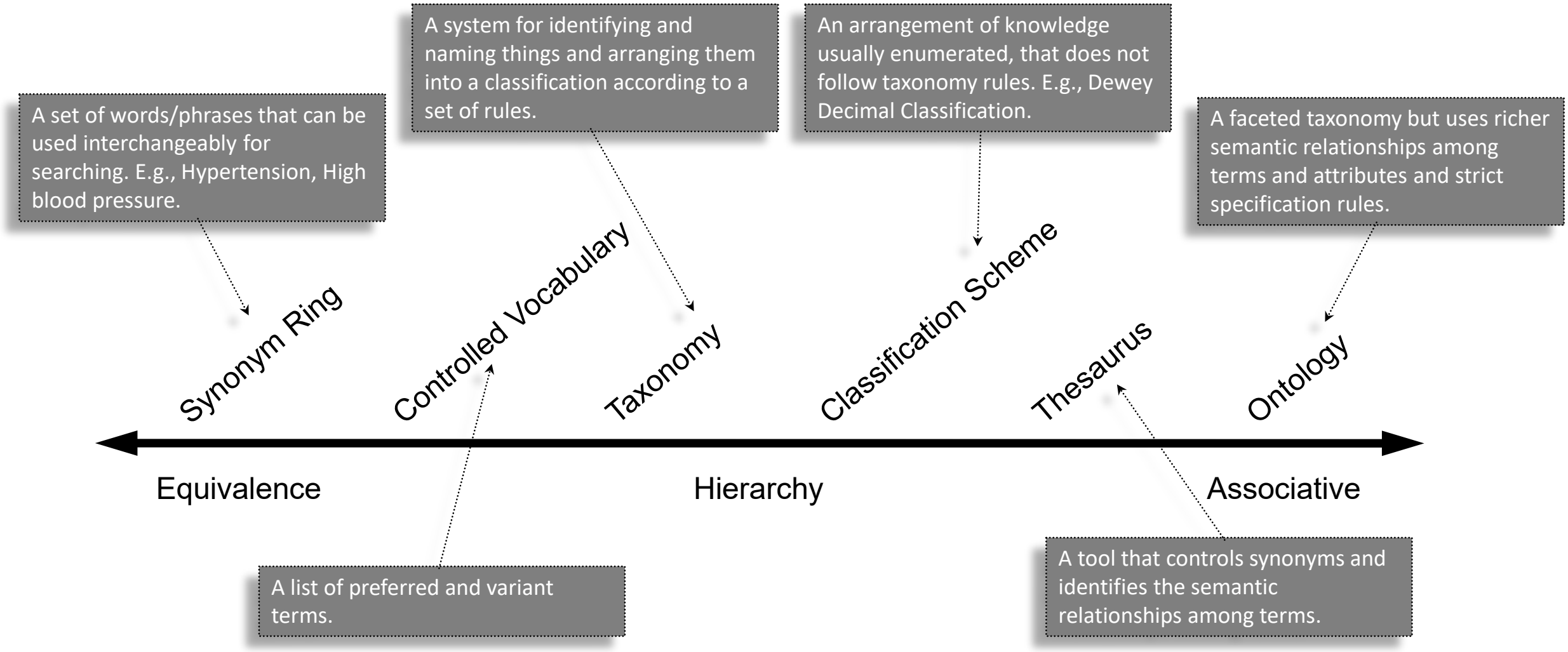
Two kinds of vocabularies – concept schemes and semantic schemes

- Concept schemes, such as metadata schemes, structure the how of information, defining the elements and rules for metadata.
- Semantic schemes, such as taxonomies and thesauri, provide a consistent set of terms to describe the what of information in a structured way.

Concept scheme: Dublin Core



Semantic Schemes: Simple to Complex



After: Amy Warner. *Metadata and Taxonomies for a More Flexible Information Architecture*

W3C application profile

- Provides a named set of constraints, extensions, or guidance on how to implement and interact with web technologies for a particular purpose.
- For example, DCAT Application Profiles specify how the Data Catalog Vocabulary (DCAT) should be used to describe datasets and data services within particular contexts, such as for government open data portals.

Constraints on base specifications

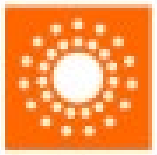
- An application profile doesn't create entirely new web standards but specifies how existing W3C Recommendations (like RDF, SKOS, or DCAT specifications) should be used in a particular context. (See, e.g., *The Profiles Vocabulary*)
- This might involve limiting the use of certain features, requiring specific data types or vocabularies, or defining how different specifications interact.

Interoperability

- The primary goal of an application profile is to facilitate out-of-the-box interoperability between different systems or applications within a defined domain.
- By adhering to a common profile, developers can ensure that their implementations can seamlessly exchange information and interact with each other.

Communities of practice

- Application profiles are often developed to address the specific needs of a particular community or industry sector.
- For example, a profile might be created for sharing learning resource metadata (LRMI), for creating Dublin Core applications (DCAP), for tabular Dublin Core application profiles (DC TAP), or for sharing knowledge organization systems (NKOS AP).



DCAP DCTAP NKOS AP

The vision of the application profile is to enable interoperability …

… but the practice of documenting the requirements may be just as important.

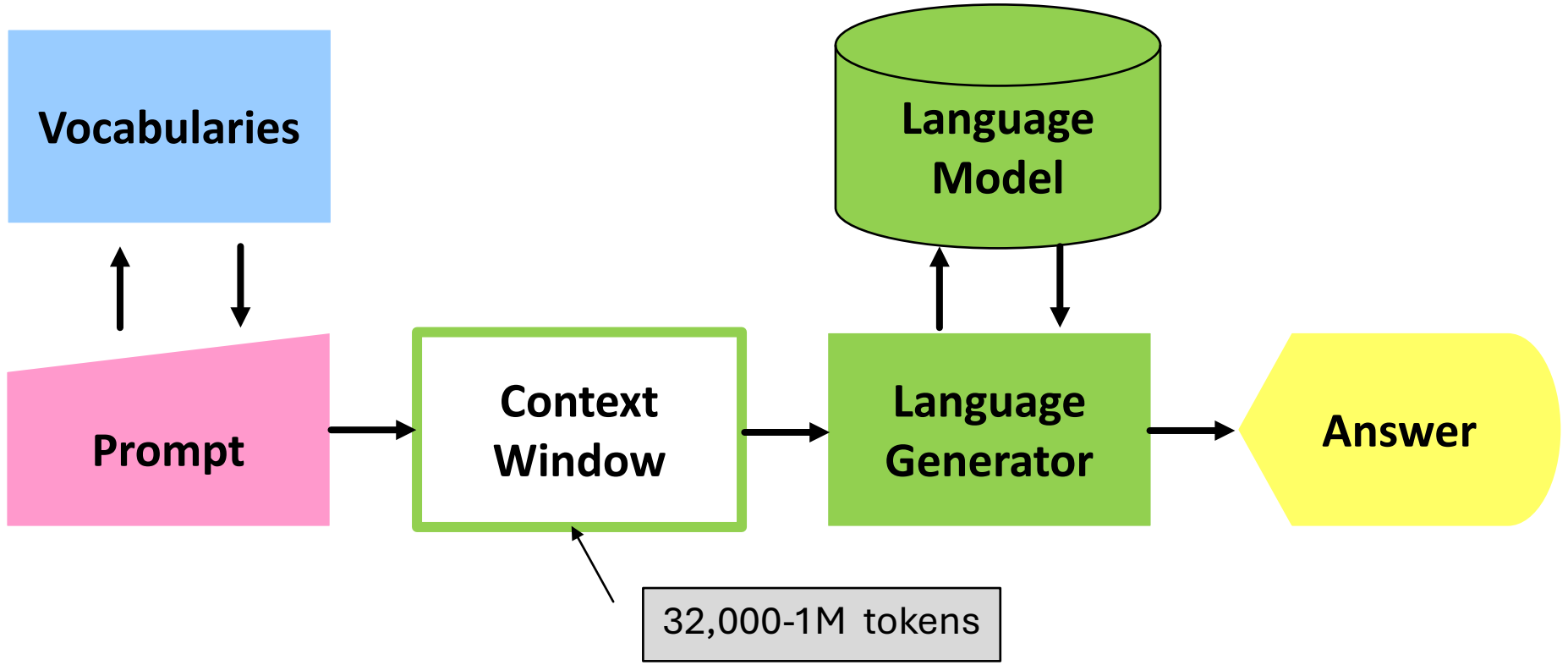
This is important in the context of AI and data management because…

1) Everything is data.
2) Generative AI does not really understand language (or see images or hear music)
3) The AI user interface is natural language.

Gen AI is like web search...
... the results seem relevant
but are unreliable.

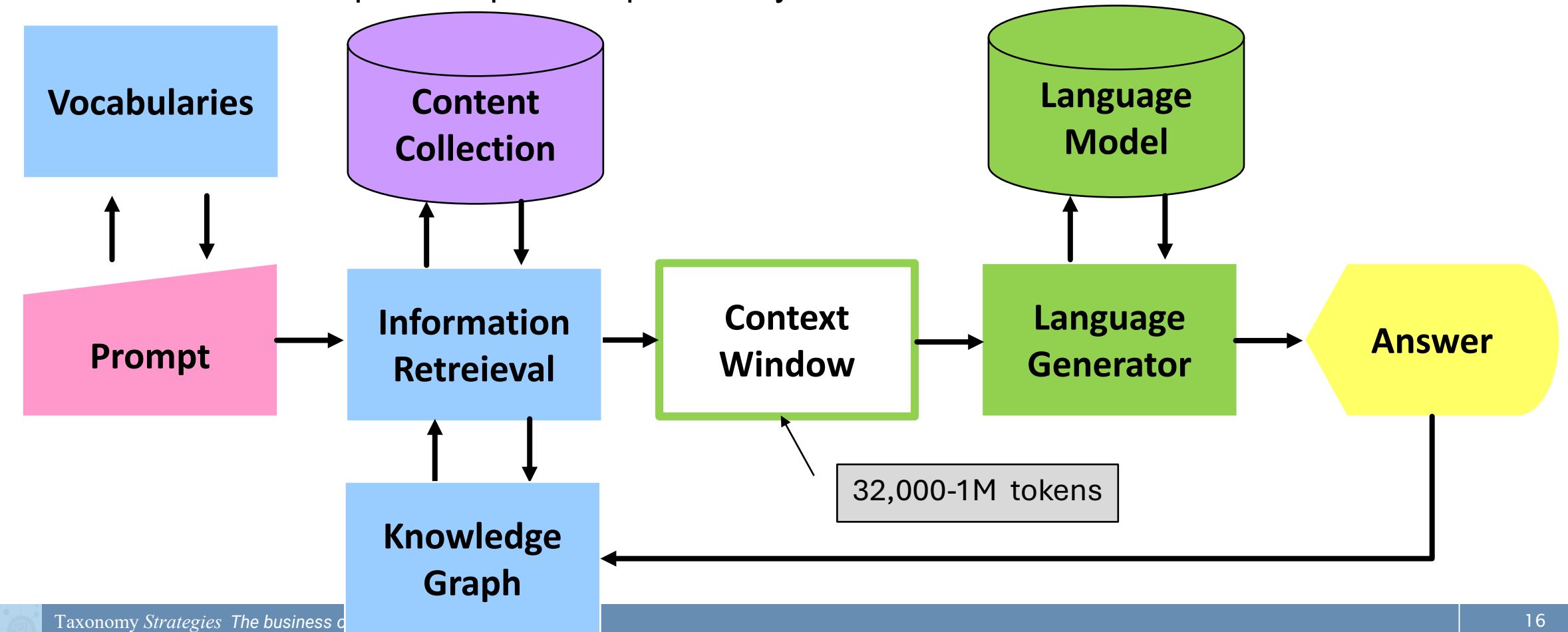
Integrating vocabularies in prompts using the context window

- Incorporate synonyms using a domain thesaurus
- Broaden or narrow the concepts using a hierarchical taxonomy
- Provide specific contexts using concept schemes



Retrieval Augmented Generation (RAG)

- Identify entities in the output, linking entities to knowledge graphs, and connecting models to knowledge bases
- Index source content to improve document recall and precision
- Annotate output to improve explainability and trustworthiness



Summary

- Application profiles provide a framework for structuring information related to particular applications.
- There are important specifications for profile vocabularies developed by the Dublin Core and W3C communities.
- There are two kinds of vocabularies—metadata schemas and controlled vocabularies.
- The practice of documenting requirements may be more important than interoperability.
- Profiles may be a useful framework for integrating both types of vocabularies into AI applications to improve their reliability and transparency.

Resources

- *Data Catalog Vocabulary (DCAT) - Version 3. W3C Recommendation (22 August 2024)*
- *DCAT-AP 3.0*. SEMIC Support Centre (14 June 2024)
- *DCTAP. Dublin Core Application Profiles Working Group (n.d.)*
- *Dublin Core Application Profile Guidelines. (2005-09-03)*
- *Guidance on Publishing Application Profiles of Vocabularies W3C Dataset Exchange Working Group (last edited on 10 October 2025)*
- *Networked Knowledge Organization Systems Dublin Core Application Profile (NKOS AP) DCMI NKOS Task group (2019-11-03)*
- *The Profiles Vocabulary*. W3C Working Group Note (18 December 2019)

Who I am

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