The Role of Taxonomy and Ontology in Semantic Layers

Webinar
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ENTERPRISE KNOWLEDGE

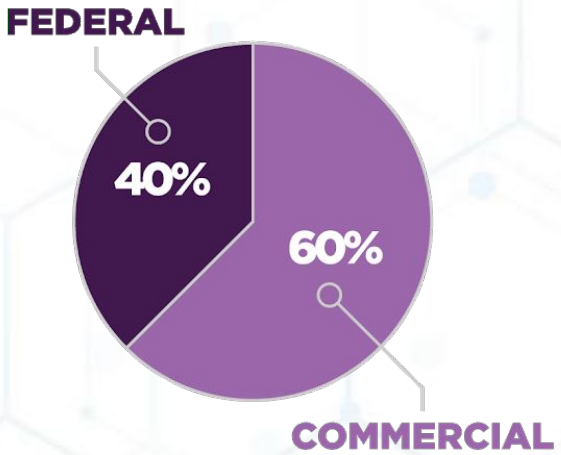
Enterprise Knowledge at a Glance

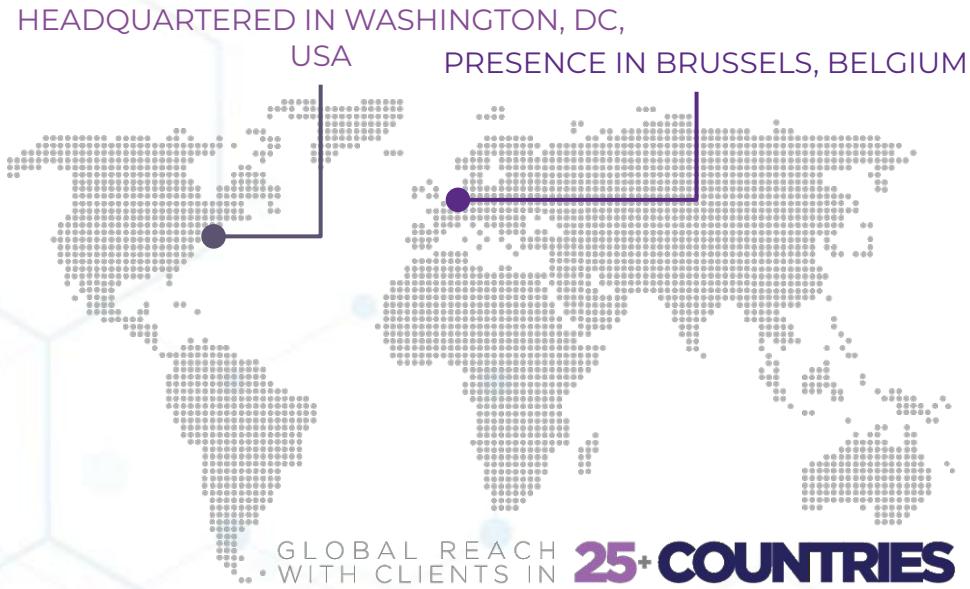
ESTABLISHED 2013 – OUR FOUNDERS AND PRINCIPALS HAVE BEEN PROVIDING KNOWLEDGE MANAGEMENT CONSULTING TO GLOBAL CLIENTS FOR OVER 20 YEARS.

10 AREAS OF EXPERTISE

- KM STRATEGY & DESIGN
- TECHNOLOGY SOLUTIONS
- CONTENT & BRAND STRATEGY
- ENTERPRISE SEARCH
- ENTERPRISE LEARNING
- TAXONOMY & ONTOLOGY DESIGN
- AGILE, DESIGN THINKING, & FACILITATION
- KNOWLEDGE GRAPHS, DATA MODELING, & AI
- INTEGRATED CHANGE MANAGEMENT
- CONTENT MANAGEMENT

STABLE CLIENT BASE





80+ EXPERT CONSULTANTS

AWARD-WINNING CONSULTANCY

KMWORLD'S
100 COMPANIES THAT MATTER IN KM (2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024)
TOP 50 TRAILBLAZERS IN AI (2020, 2021, 2022)

CIO REVIEW'S
20 MOST PROMISING KM SOLUTION PROVIDERS (2016)

INC MAGAZINE
#2,343 OF THE 5000 FASTEST GROWING COMPANIES (2021)
#2,574 OF THE 5000 FASTEST GROWING COMPANIES (2020)
#2,411 OF THE 5000 FASTEST GROWING COMPANIES (2019)
#1,289 OF THE 5000 FASTEST GROWING COMPANIES (2018)

INC MAGAZINE
BEST WORKPLACES (2018, 2019, 2021, 2022)

WASHINGTONIAN MAGAZINE'S
TOP 50 GREAT PLACES TO WORK (2017)

WASHINGTON BUSINESS JOURNAL'S
BEST PLACES TO WORK (2017, 2018, 2019, 2020)

ARLINGTON ECONOMIC DEVELOPMENT'S
FAST FOUR AWARD – FASTEST GROWING COMPANY (2016)

VIRGINIA CHAMBER OF COMMERCE'S
FANTASTIC 50 AWARD – FASTEST GROWING COMPANY (2019, 2020)

Outline

Introduction to Taxonomies

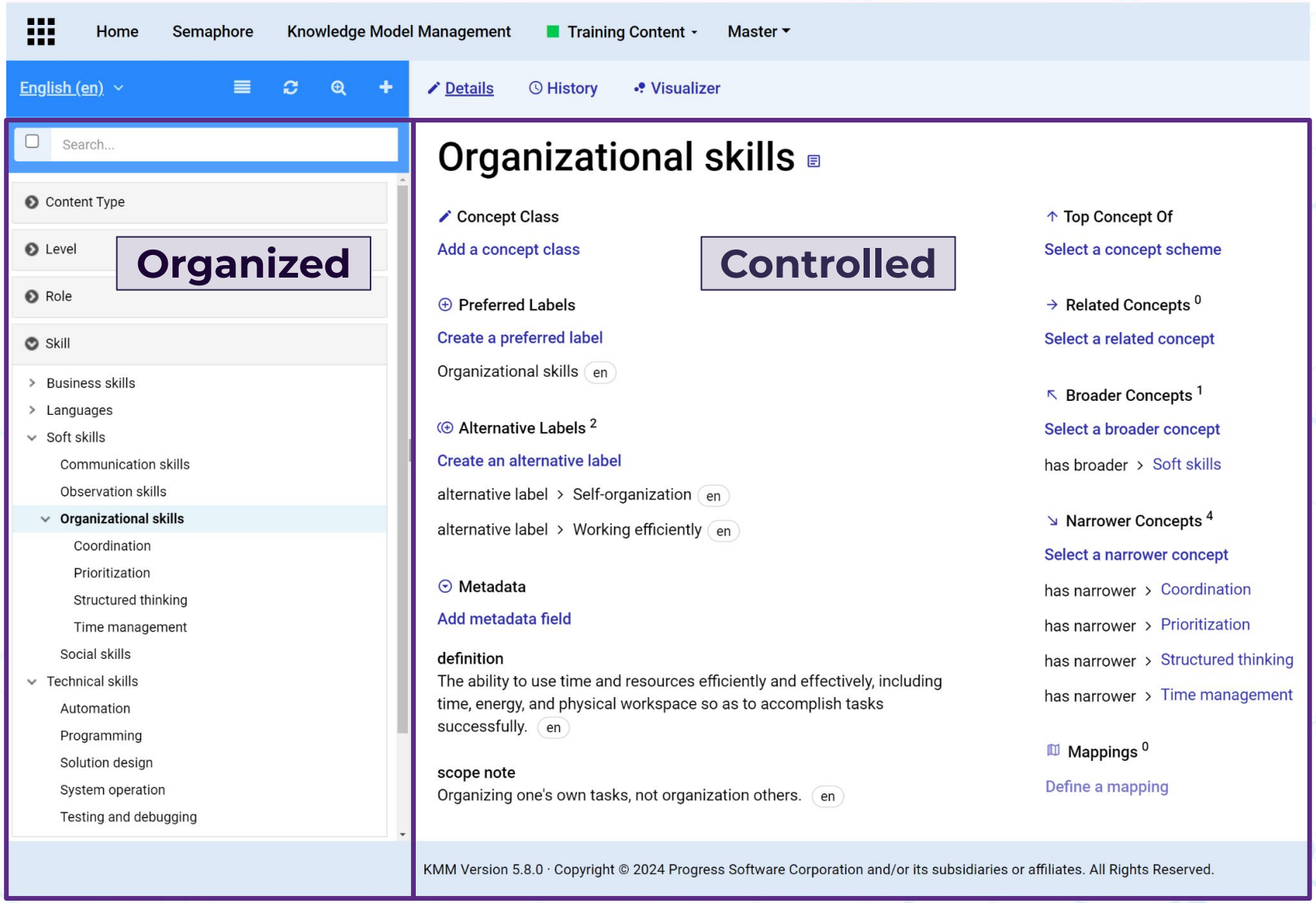
Introduction to Ontologies

Introduction to the Semantic Layer

What is a Taxonomy?

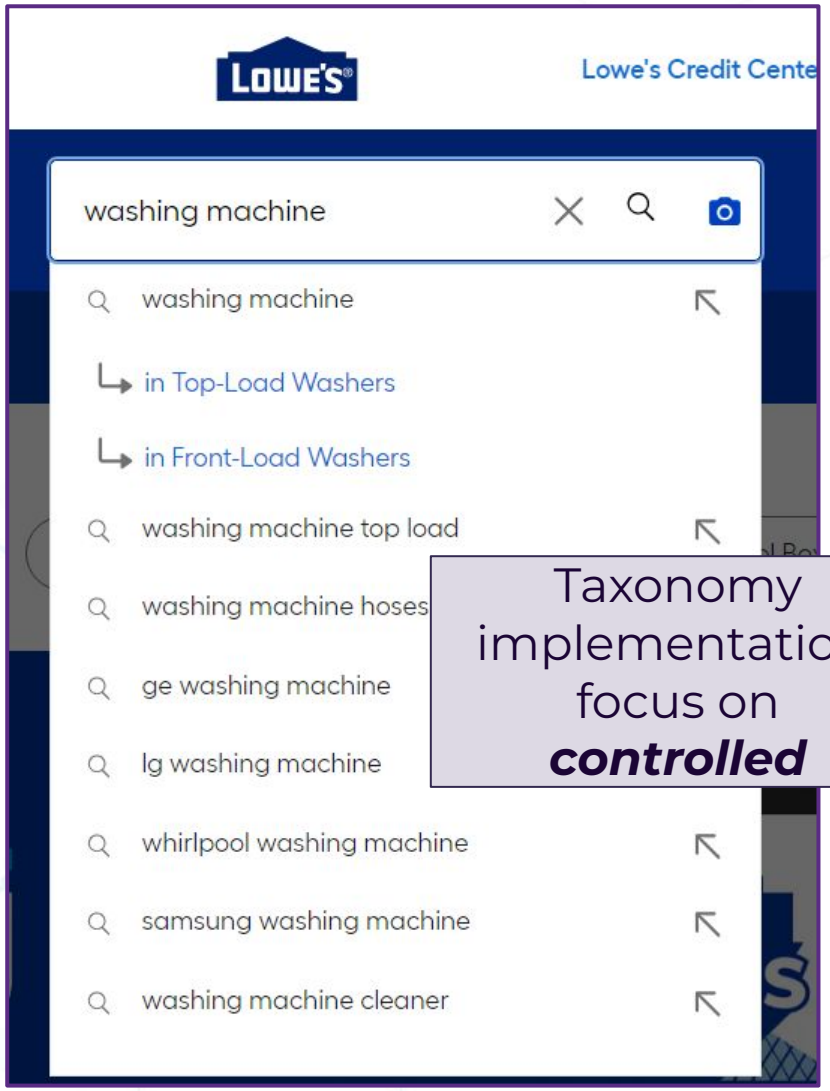
A knowledge organization system that is…

1. **Controlled:**
   A kind of controlled vocabulary, based on unambiguous concepts, not just words (*things*, not *strings*).
2. **Organized:**
   Concepts are organized in a structure of hierarchies, categories, or facets to make them easier to find and understand.

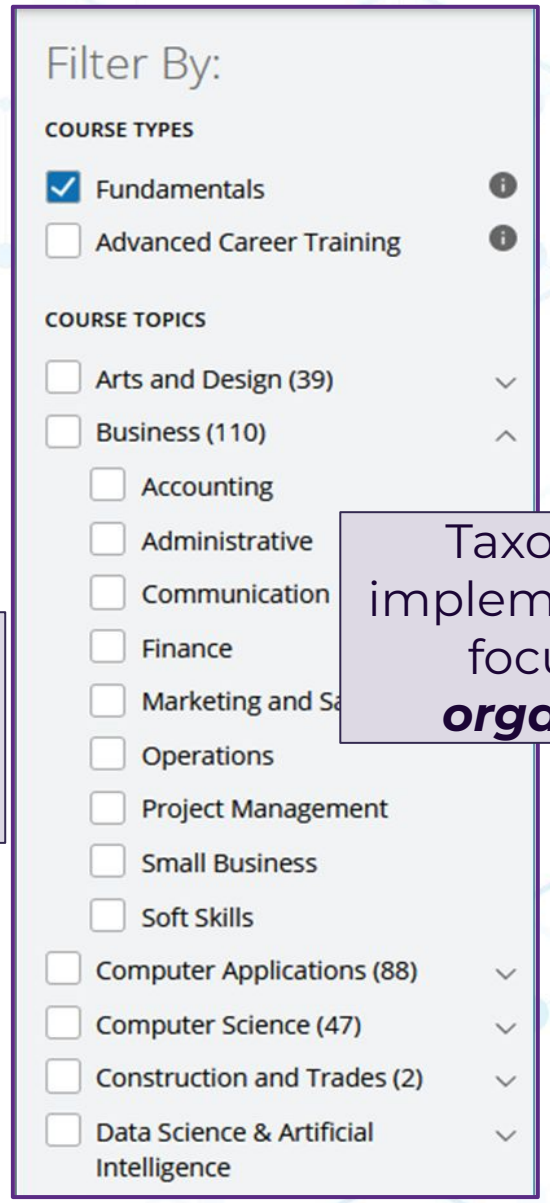


What is a Taxonomy For?

- Concepts are used to tag/categorize content to make finding and retrieving specific content easier.
- Supporting better findability than search alone.
- The taxonomy is an intermediary that links users to the desired content.



Taxonomy implementation: focus on ***controlled***



Taxonomy implementation: focus on ***organized***

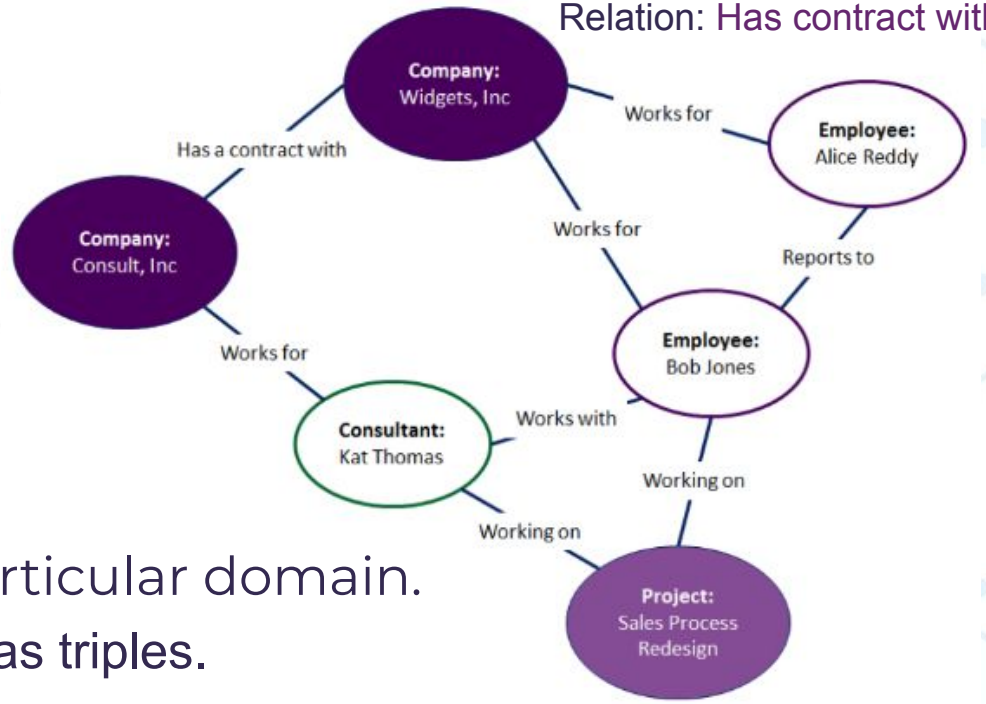
What are Taxonomy Uses?

What you can do with a taxonomy

- **Consistent tagging:** Enable comprehensive and accurate content retrieval
- **Normalization:** Bring together different names, localizations, languages for concepts
- **Standard search:** Find content about…. (search string matches taxonomy concepts)
- **Topic browse:** Explore subjects arranged in a hierarchy and then content on the subject
- **Faceted (filtering/refining) search:** Find content meeting a combination of basic criteria
- **Discovery:** Find other content tagged with same concepts as tagged to found content; explore broader, narrower, and (sometimes) related taxonomy topics
- **Content curation:** Create feeds or alerts based on pre-set search terms
- **Metadata management:** Support identification, comparison, mapping, analysis, etc.

What is an Ontology?

Class: Company
Individual: Widgets, Inc.
Relation: Has contract with

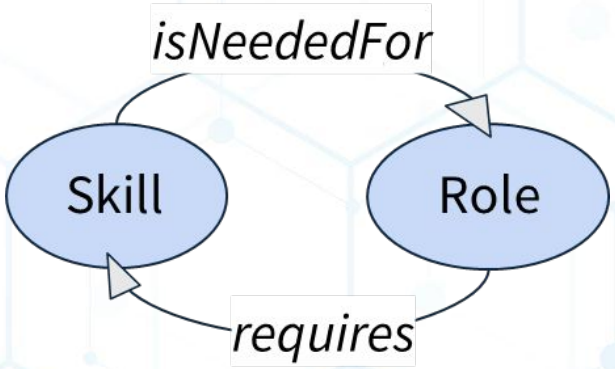


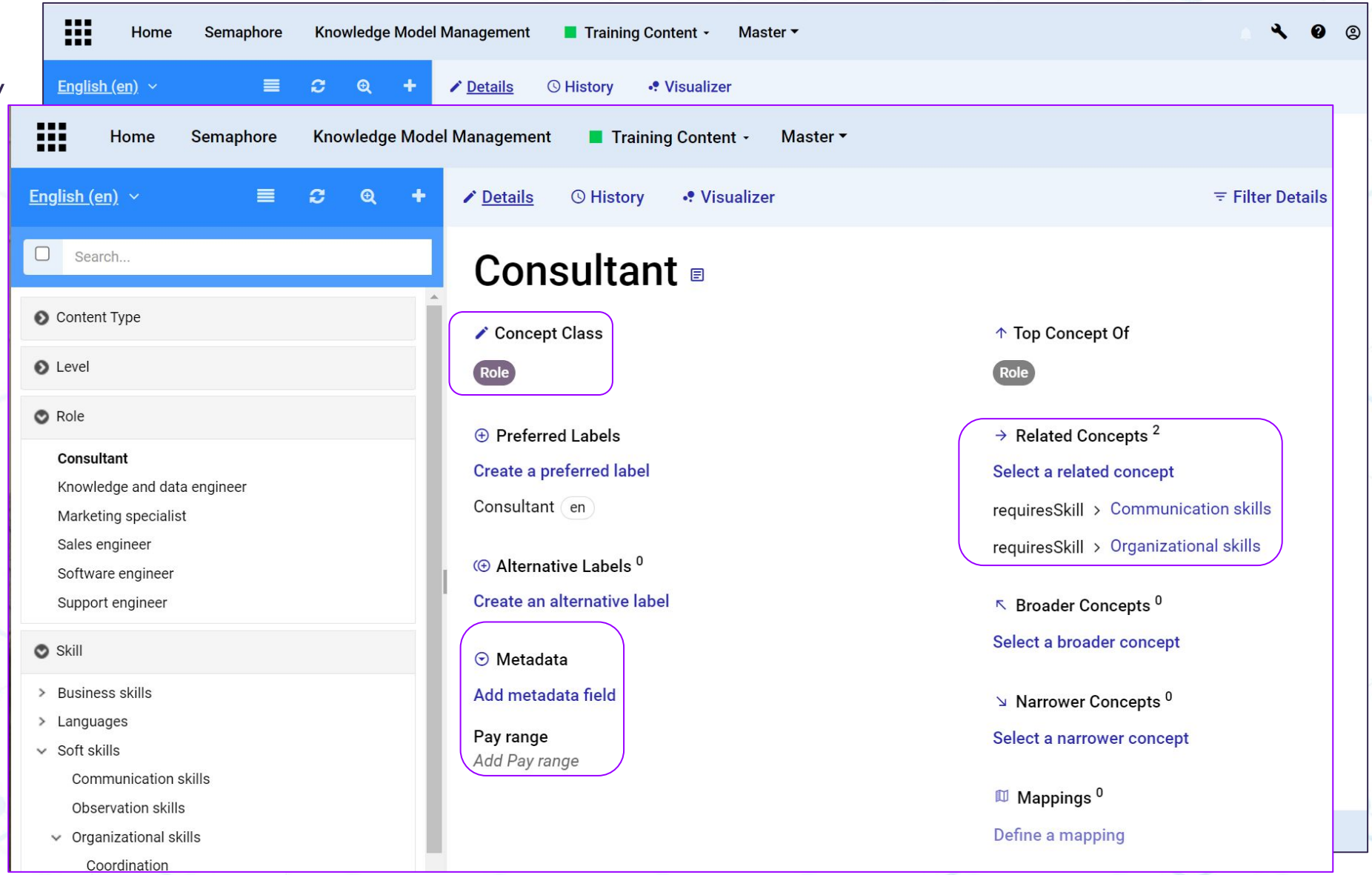
An ontology is a model of knowledge domain.
A structured set of entities, relationships and attributes in a subject domain, with semantic expressiveness

- A form of knowledge representation.
  - In addition to knowledge organization.
- A set of precise descriptive statements about a particular domain.
  - Statements as subject-predicate-object are expressed as triples.
- A formal naming and definition of the types, properties and interrelationships of entities in a particular domain.
  - **Classes**, custom **semantic relationships**, custom **attributes**
- A more abstract layer in describing a knowledge organization system.
  - Overlays and connects to a taxonomy/controlled vocabularies with added semantics.
- Based on W3C Semantic Web standards: RDF, RDF-Schema, and OWL

What is an Ontology?

An ontology can be applied to a taxonomy as a semantic layer, defining **classes,** and adding **semantic relations** and **attributes.**





What are Taxonomy + Ontology Uses?

What you cannot do with a taxonomy alone, but can with an added ontology

- Model **complex interrelationships** (e.g. in product approval or supply chain processes) and also connect to content
- Perform complex **multi-part searches**: e.g. find contacts in a specific location, who are employed by companies which belong to certain industries
- Search on more specific **criteria** that vary based on category (class)
- Explore **explicit relationships** between concepts (not just broader, narrower, related)
- **Visualize** of concepts and semantic relationships
- Perform **reasoning** and **inferencing** across data
- Search across **datasets**, not just search for content
- **Connect across siloed** content and data repositories across the enterprise

What is an Ontology For?

Applications that use ontologies

- Advanced semantic search

- Business analytics tools

- Insight engines

- Recommendation systems

- Intelligent chatbots

- Natural language question-answering

An ontology can also link across multiple taxonomies and other controlled vocabularies, providing a means of connecting them.

Why a Semantic Layer?

- A taxonomy or ontology is more useful if not siloed within a single application.
- A taxonomy + ontology can help **connect across siloed content** and **data** repositories across the enterprise.
- This is done through a **Semantic Layer** approach and architecture.

Problems:

- Data silos
- Heterogeneous data sources
- Mix of unstructured and structured data
- Same things with different names
- Localized meanings for the same thing

Causing:

- Inefficiencies
- Missed opportunities
- Poor decisions

Solutions:

- Sharing data and content
- Semantic links
- Unified vocabulary
- Unified application view

Provided by:

- Semantic Layer

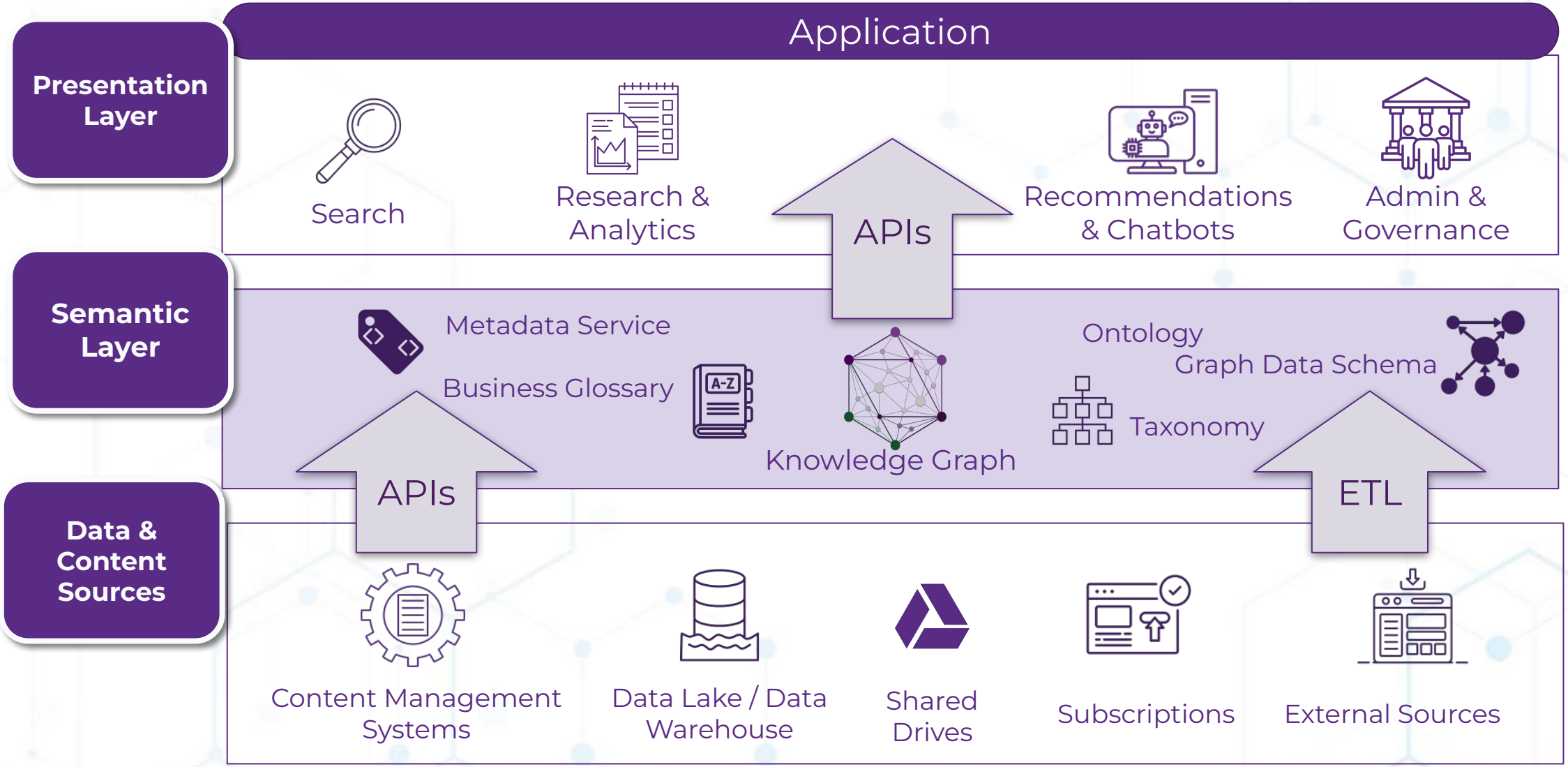
Achieving:

- Enterprise intelligence

Siloed Content/Data and Applications

	Applications				
Presentation Layers	Enterprise CMS Search UI	Website Search UI	Intranet Search UI	Ecommerce Search UI	CRM Search UI
Semantic Layers	Enterprise CMS Taxonomy & Metadata	Web CMS Taxonomy & Metadata	Intranet Taxonomy & Metadata	PIM Taxonomy & Metadata	CRM Taxonomy & Metadata
Data & Content Sources	Enterprise CMS Content	Web CMS Content	Intranet Content	PIM Product Data	CRM Contacts Data

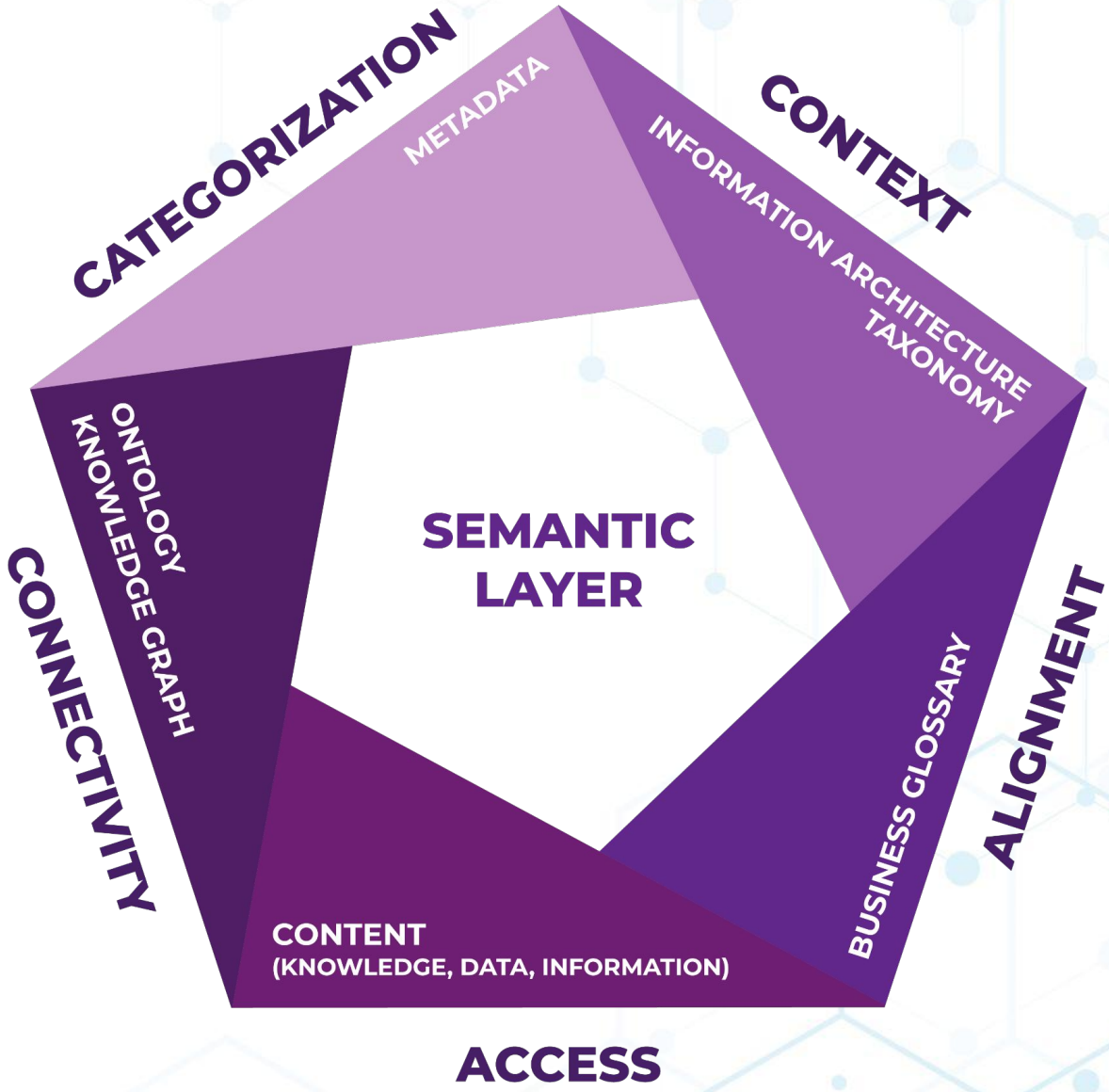
Semantic Layer: Connecting Across Silos



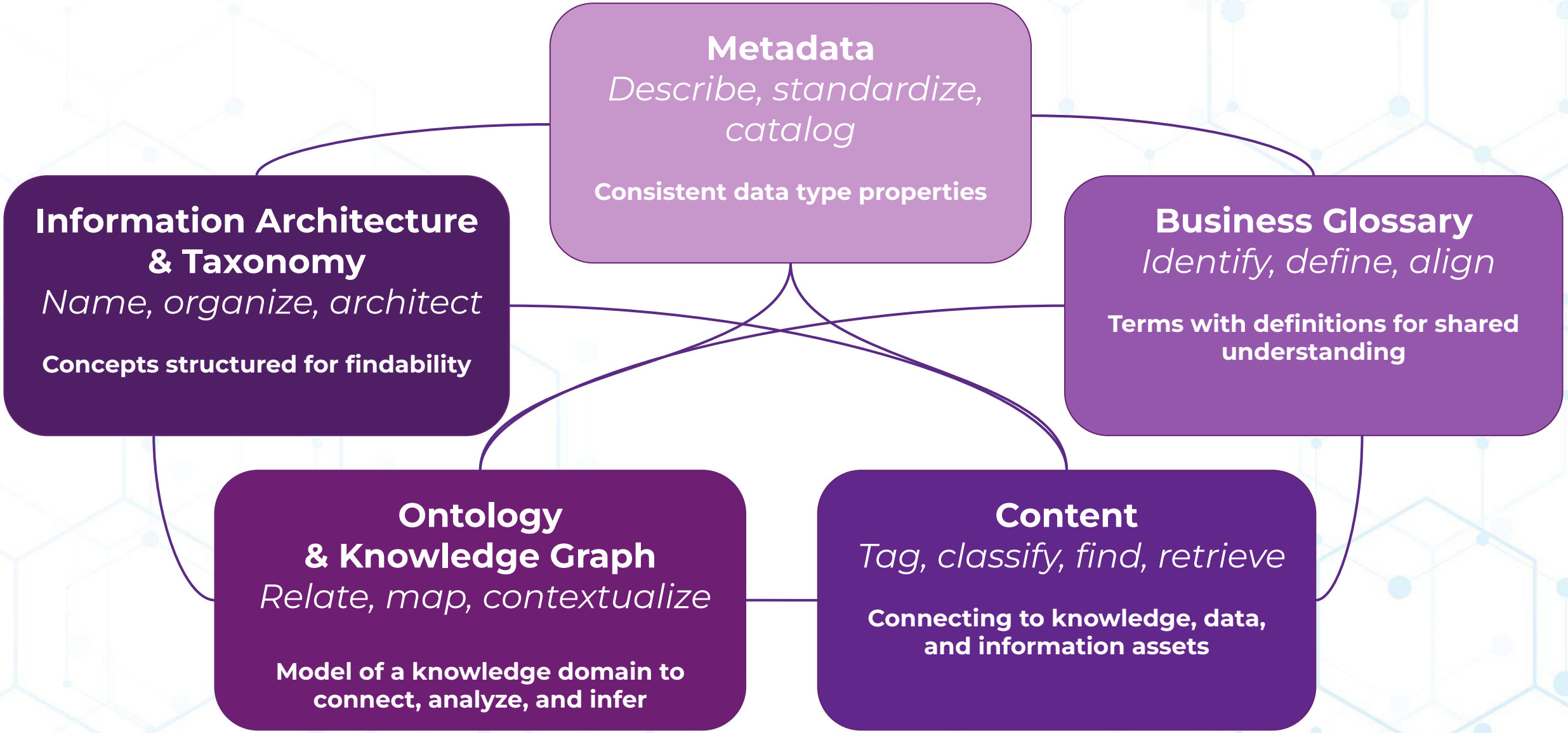
What is the Semantic Layer?

A **Semantic Layer** is a **standardized framework** that **organizes** and **abstracts organizational knowledge** and **data** (structured, unstructured, semi-structured) and **serves as a connector** for all organizational knowledge assets.

A **Semantic Layer** enables data federation and virtualization of semantic labels or rules (e.g. taxonomies/ business glossaries or ontologies) to capture and connect data based on business or domain meaning and value.



Semantic Layer Components



Taxonomy & Ontology in the Semantic Layer

Connected taxonomy approaches:

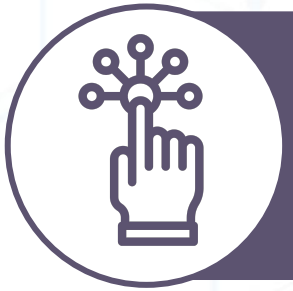
- A single enterprise taxonomy
  - Different concepts exposed in different applications as needed (via SKOS collections)
  - Different labels for the same concepts managed with label properties (via SKOS-XL)
- Frontend application taxonomy(s) linked to repository taxonomies (via SKOS mapping relations)
- A master hub taxonomy including all concepts from all taxonomies, linked to all other taxonomies (via SKOS mapping relations)

Connected ontology approaches:

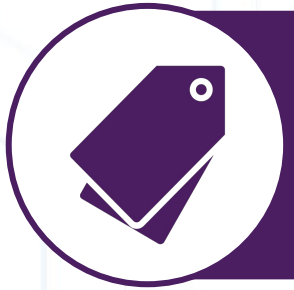
- A single enterprise ontology
- An enterprise ontology that links across taxonomies and other controlled vocabularies
- Multiple varied custom schemes derived from a single enterprise ontology

Problems a Semantic Layer Addresses

INEFFICIENT DATA ANALYSIS PROCESSES
Manual analysis and reporting can take weeks for one person to collect from multiple disconnected sources to capture insights at an enterprise level and make better business decisions



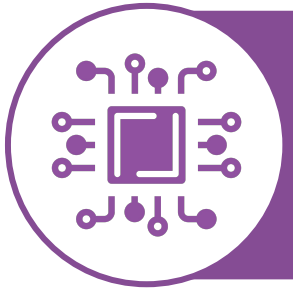
NON-INTUITIVE USER INTERACTIONS
Technical expertise required to interact with systems prevents broader access to data; systems are not user-friendly and require extensive training



INCONSISTENT METADATA
Inconsistently applied metadata or uncontrolled metadata values make it difficult or impossible to connect data across systems, compounding inefficiencies

POOR DATA QUALITY & GOVERNANCE
No way to produce repeatable data reports with lineage tracking to comply with regulatory requirements

VENDOR LOCK
Data encoded in proprietary, vendor specific formats prevents organizations from being able to evolve their technology ecosystem as needs change



AI HALLUCINATIONS
Unreliable AI responses due to lack of context / alignment with business meaning of data, producing hallucinations and introducing challenges in following how AI decisions were reached

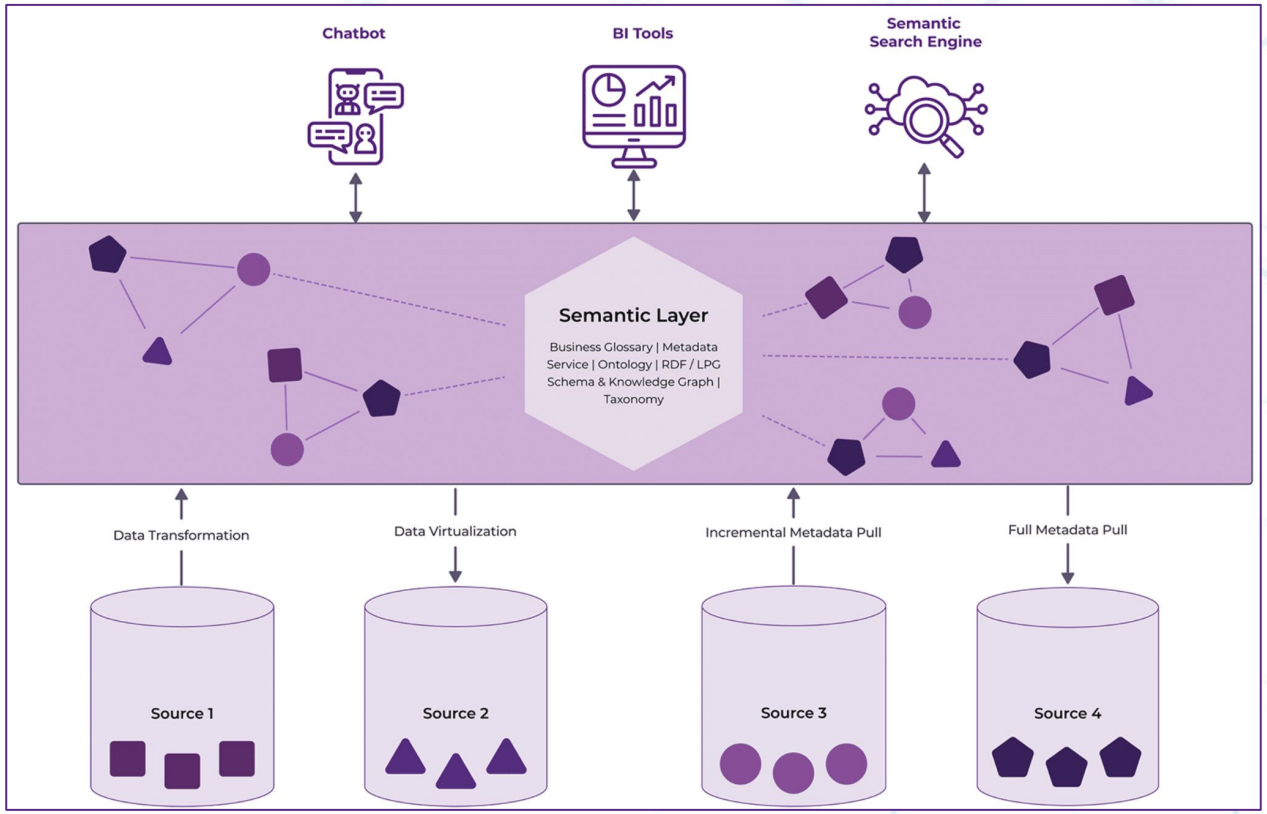
Implementing the Semantic Layer

Possible approaches

1. **A Metadata-First Logical Architecture**:
   Using Enterprise Semantic Layer Solutions
2. **Built-for-Purpose Architecture**:
   Individual Tools with Semantic Capabilities
3. **A Centralized Architecture**:
   Within an Enterprise Data Warehouse or Data Lake

A Metadata-First Logical Architecture

- Using an enterprise semantic layer solution.
- Creating a logical layer that abstracts the underlying data sources by focusing on metadata.
- The most common approach.
- Progress Semaphore is a tool for this enterprise semantic layer solution.



Metadata-First Logical Architecture

Resources

- "What is a Semantic Layer (Components and Enterprise Applications," (February 1, 2024) Lulit Tesfaye, *Enterprise Knowledge Blog*.
- "The Top 5 Reasons for a Semantic Layer" (February 14, 2024) Joe Hilger, *Enterprise Knowledge Blog*.
- "The Top 3 Ways to Implement a Semantic Layer" (March 12, 2024) Lulit Tesfaye, *Enterprise Knowledge Blog*.
- "What Every CEO Needs to Know About Semantic Layers" (February 29, 2024) by Zach Wahl, *Enterprise Knowledge Blog*.
- "What isn't a Semantic Layer" (February 23, 2024) by Sara Nash, *Enterprise Knowledge Blog*.
- "What is a Semantic Architecture and How do I Build One?" White Paper (April 2, 2020) by Lulit Tesfaye, Enterprise Knowledge
- "The Importance of a Semantic Layer in a Knowledge Management Technology Suite" (May 27, 2021), *Enterprise Knowledge Blog*.
- "Defining the Semantic Layer Webinar" (March 1, 2024) webinar recording
- "KM Trends – Semantic Layer" (February 8, 2024) Zach Wahl, podcast recording

Q&A

Thank you for listening.

Questions?

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