



Convergence and Realignment: Semantic Technologies for Media

SMPTE+
August 31, 2021

The background of the slide is a light blue-grey color. It features a top-down view of a person's hands interacting with a tablet. The tablet displays a colorful circular chart with five segments in green, yellow, red, blue, and purple. To the right of the tablet, there is a complex network diagram with white nodes and connecting lines, including a globe icon. In the bottom right corner, there is a white speech bubble containing the text:

Heather Hedden
Data & Knowledge Engineer
Semantic Web Company

About the Speaker



Heather Hedden

Data and Knowledge Engineer
Semantic Web Company

Over 25 years of experience in developing and managing taxonomies, metadata, and other knowledge organization systems for various organizations and applications.

Instructor of self-paced online taxonomy courses.

Prior taxonomy consultant and staff taxonomist.

Author of *The Accidental Taxonomist*.

Semantic Web Company (SWC) and PoolParty



SWC is developer / vendor of
PoolParty Semantic Suite

Most complete and secure
**Semantic Middleware /
Semantic AI platform** on
the Global Market

W3C standards compliant



ISO 27001:2013
certified

First release in 2009

Current version **8.0**

On-premises or
cloud-based



Over **200** installations
world-wide



Semantic AI:

Fusion of Graphs,
NLP, and Machine
Learning



Named as Visionary
in **Gartner's Magic
Quadrant** for Metadata
Management Systems
2019, 2020



KMWorld listed PoolParty
as one of the
Trend-Setting Products
2015 - 2020 and listed
SWC in the **AI 50** list of
companies in 2020

Outline

- ▶ Metadata
- ▶ Taxonomies
- ▶ Semantic technologies
- ▶ Knowledge graphs

Metadata and the cloud

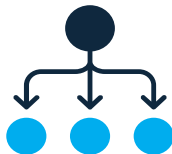


- ▶ The cloud is not just a place for media storage, it is also for metadata management.
 - ▷ Administrative (its size, duration, type, format, producer, rights)
 - ▷ Descriptive (*about* what, where, when, who, why, how)
- ▶ Managing metadata externally from MAM or other systems:
 - ▷ supports common metadata that can be shared across applications and content repositories/sources
 - ▷ enables search and retrieval across resources, both internal and external.



Taxonomies are:

- ▶ Controlled vocabularies - restricted values for descriptive metadata properties
- ▶ Organized into structures of hierarchies, categories, and/or attribute types
- ▶ Based on unambiguous concepts, not just words:
things, not strings
 - ▷ Bringing together synonyms (alternative labels)
- ▶ For tagging and retrieving content for what it is about



Leisure and culture

- . Arts and entertainment venues
 - . Museums and galleries
- . Children's activities
- . Culture and creativity
 - . Architecture
 - . Crafts
 - . Heritage
 - . Literature
 - . Music
 - . Performing arts
 - . Visual arts
- . Entertainment and events
- . Gambling and lotteries
- . Hobbies and interests
- . Parks and gardens
- . Sports and recreation
 - . Team sports
 - . Cricket
 - . Football
 - . Rugby
 - . Water sports
 - . Winter sports
- . Sports and recreation facilities
- . Tourism
 - . Passports and visas
- . Young people's activities

Taxonomy Management

Tools for taxonomy management, for adding and editing **Concepts** and:

Relationships

Labels

Notes

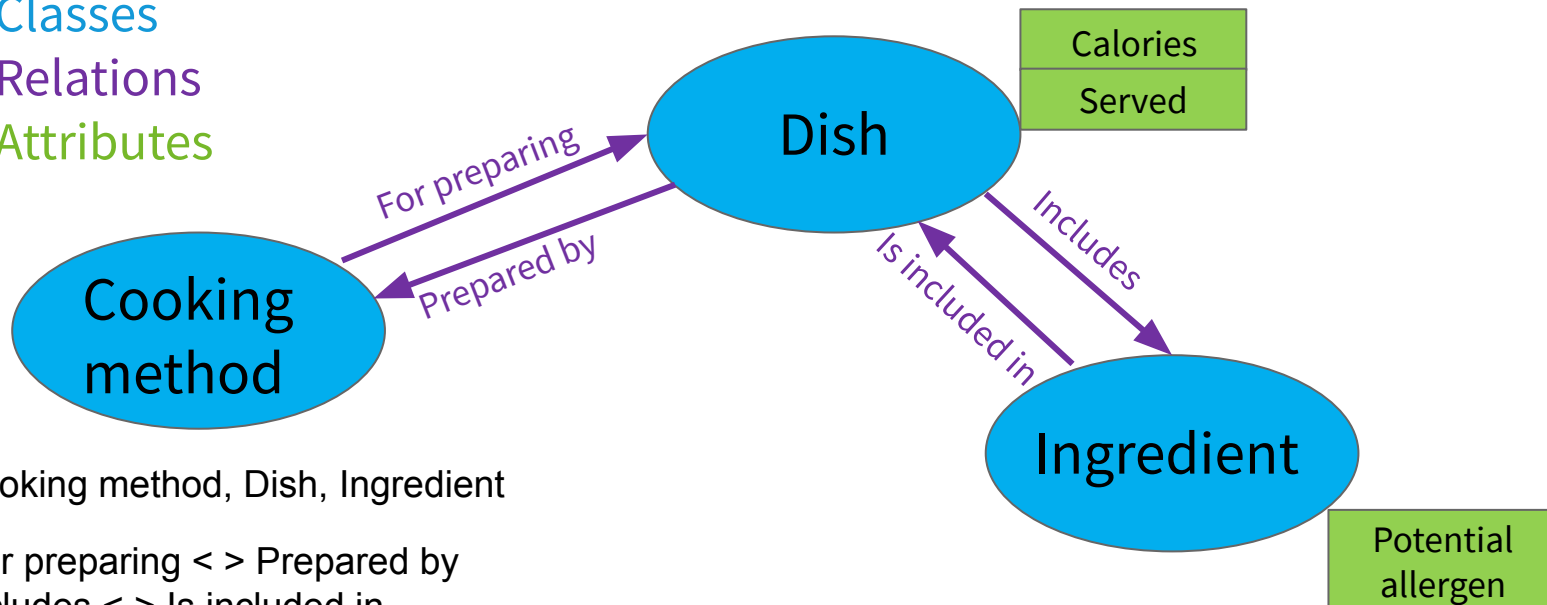
In accordance with quality standards

The screenshot displays the poolparty taxonomy management interface. On the left, a tree view shows the hierarchy: **Cooking** (5) > **Dishes** (10) > **Desserts** (4) > **Cakes** (4). The 'Cakes' category is expanded, showing sub-concepts: Cheese cakes (0), Chocolate cakes (0), Fruit cakes (0), and Layer cakes (0). The main panel shows the details for the 'Cakes' concept, which is identified as a 'Dish' with the URL <https://elysium.poolparty.biz/Recipes/81>. The interface includes tabs for 'Details', 'Notes', 'Documents', 'Linked Data', 'Triples', 'Visualization', and 'Quality Management'. The 'SKOS' tab is active, showing 'Recipe-Scheme' and a '+' icon. The 'Broader Concepts' section lists 'Desserts' as a parent concept. The 'Narrower Concepts' section lists 'Cheese cakes', 'Chocolate cakes', 'Fruit cakes', and 'Layer cakes' as child concepts. The 'Preferred Label' section shows 'Cakes' as the preferred label. The 'Alternative Labels' section shows 'Tortes' as an alternative label. The 'Hidden Labels' section is currently empty. The 'Related Concepts' section lists 'Quick breads' as a related concept. The 'Scope Notes' section contains the text: 'A form of sweet food made from flour, sugar, and other ingredients, that is usually baked.'

- ▶ **Semantics** = meaning
- ▶ **Semantic model** - knowledge organization system that describes a domain of knowledge by various types of entities, their types of properties, and their types of interrelationships
- ▶ **Ontology** - a formal kind of semantic model
- ▶ **Semantic technologies** - the application of semantics in a machine-readable language, to be managed in machines, and so that machines can *understand* data.
- ▶ **Semantic web technology** - guidelines and standards from the World Wide Web Consortium (W3C) to describe and relate data on the Web and inside enterprises that use web technologies.
 - ▶ Includes: RDF, SKOS, OWL, RDFS, SPARQL
 - ▶ Based on unique URIs and subject-predicate-object triples



Classes
Relations
Attributes



Classes: Cooking method, Dish, Ingredient

Relations: For preparing < > Prepared by
Includes < > Is included in

Attributes: Calories, Served, Potential allergen

Ontology Applied to a Taxonomy

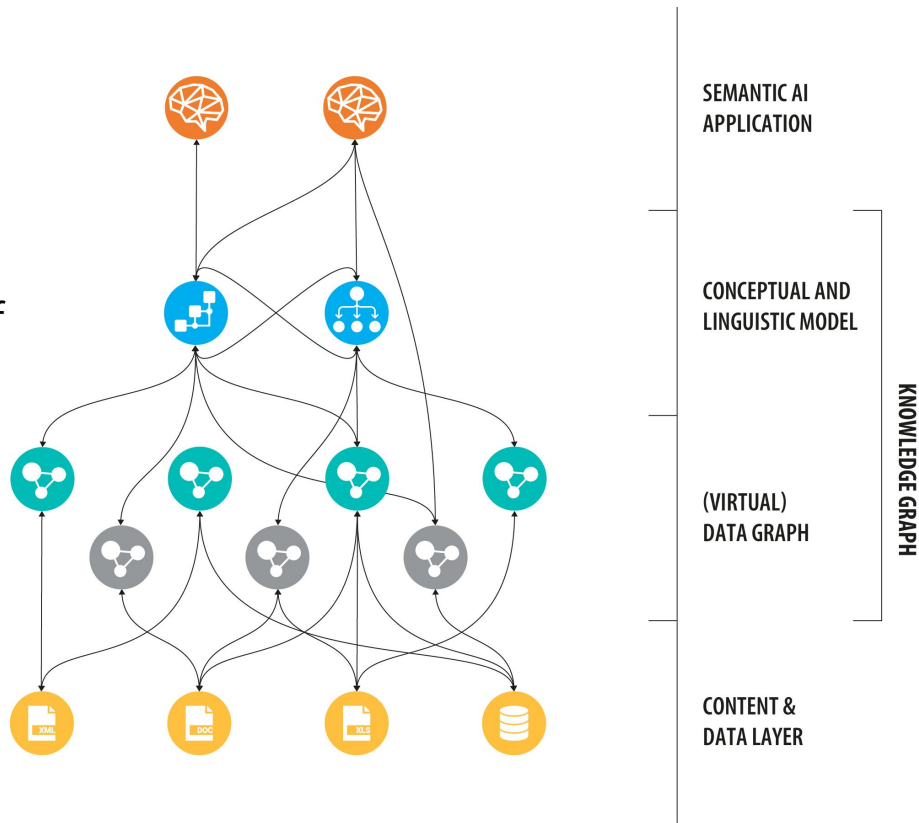
An ontology adds a semantic layer to a taxonomy, enriching it with semantic relationships and custom attributes.

The screenshot shows a taxonomy browser interface. On the left is a hierarchical tree of categories. The 'Cooking' category is expanded, showing 'Cooking methods (5)' and 'Dishes (10)'. Under 'Dishes', 'Cakes (4)' is expanded to show 'Cheese cakes (0)', 'Chocolate cakes (0)', 'Fruit cakes (0)', and 'Layer cakes (0)'. The 'Layer cakes (0)' category is highlighted in orange. On the right, the 'Layer cakes' entity is displayed. It has a URL <https://elysium.poolparty.biz/Recipes/84> and is classified as a 'Dish'. Below this, there are tabs for 'Details', 'Notes', 'Documents', 'Linked Data', 'Triples', 'Visualization', and 'Quality Management'. The 'Details' tab is active, showing a 'SKOS' section with a 'Recipe-Scheme' label. The details are organized into two columns. The left column contains: 'For Occasion' (with a link to 'Parties'), 'Goes With' (with a link to 'Ice cream'), 'Has Ingredient' (with links to 'Butter', 'Eggs', and 'Wheat flour'), and 'Prepared by' (with a link to 'Baking'). The right column contains: 'Calories' (430), and 'Served' (Room temperature). Each detail has an information icon and a plus sign for expansion.

Knowledge Graphs

Knowledge Graphs are:

- ▶ The combination of: specific instance data/metadata + taxonomy + ontology
- ▶ With data stored in a graph database: a network of nodes and links, *not* a table of rows and columns
- ▶ Both human-readable and machine-readable



Graph database types

- ▶ **Labeled property graphs** - developed for efficient data storage and querying in content management systems.
- ▶ **Triple store RDF graphs** - built on Semantic Web RDF standards, developed for interoperability and exchange of data

Knowledge graph benefits

- ▶ Better content analytics
- ▶ Better content and knowledge discovery
- ▶ Better customer satisfaction
 - ▷ through personalized access to relevant content
 - ▷ through customized recommendations



Recommender Technologies

- ▶ **Content-based filtering** - Similar content recommended based on a single user's interactions
 - ▷ Can only make recommendations on previous interactions or feedback of the user
- ▶ **Collaborative filtering** - Recommendations based on interactions from multiple similar users
 - ▷ Requires a large number of users

Disadvantages to both content-based and collaborative filtering:

- ▷ New users or items which had not been trained upon, don't get recommendations initially: "cold start" problem due to insufficient data
- ▶ **Support Vector Machines (SVM)** - Machine learning classification method, using algorithms, training examples, statistical learning, which calculates distances between categories
 - ▷ Requires time to train data, and performance varies based on the data.
- ▶ **Knowledge-based systems** - Based on explicit knowledge of the content, stored in a graph database, part of a knowledge graph, with semantic relationships such as what "goes with" what.





Heather Hedden

Data and Knowledge Engineer
Semantic Web Company Inc.
One Boston Place, Suite 2600
Boston, MA 02108

857-400-0183

heather.hedden@semantic-web.com

www.linkedin.com/in/hedden

Semantic Web Company www.semantic-web.com

PoolParty software www.poolparty.biz