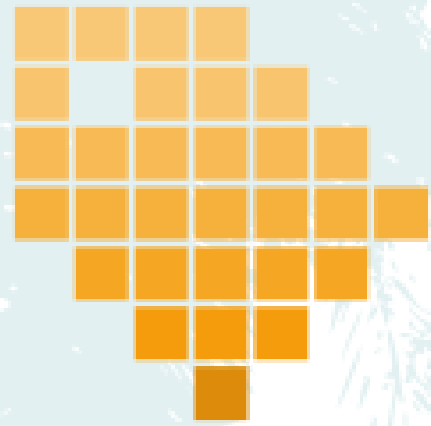


Haystack 4.0

What It Is and Why It's Important



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Haystack 4

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TL;DR

"Too Long; Didn't Read" Version



- Vocabulary
- Taxonomy
- Ontology
- Inference

Vocabulary

Vocabulary

- Precisely defining our terms
- Human language is filled with ambiguity
- Machines don't like ambiguity
- Human terms: air handler, air handling unit, AHU, rooftop unit, package unit, etc
- Haystack term: **ahu**

Haystack Today

- Haystack today is a controlled vocabulary
- Tag library defines our terms
- Tags are defined in machine readable format
- But everything else is ad hoc (human formats)
- Taking it to the next level....

Conjuncts

- **Conjuncts**: new terms which are composed of two or more marker tags
- Coining new "compound words"
- Expands our vocabulary
- **elec**: Relating to electricity or electric charge
- **meter**: Equip to meter a substance or phenomenon
- **elec-meter**: Electricity meter

Taxonomy

Taxonomy

- Organizing our terms into an classification tree
- Tree organizes terms from general to specific
- Expresses types or "is-a" relationships
- Remember high school biology? Kingdom, Phylum, Class, Order, Family, Genus, Species

KINGDOM: Animalia



PHYLUM: Chordata



CLASS: Mammalia



ORDER: Carnivora



FAMILY: Canidae



GENUS: *Canis*



SPECIES: *Canis lupus*



Taxonomies in Haystack 4.0

- Every term (tag or conjunct) has a supertype
- The inverse is subtype
- We've organized every term into a taxonomy tree using this pattern
- In many cases we have added new terms to the Haystack vocabulary

Phenomenon

phenomenon

substance

fluid

gas

air

liquid

water

chilled-water

New Space Taxonomy

space

building

floor

room

zone-space

hvac-zone-space

lighting-zone-space

Ontology

Ontology

- Define additional relationships between terms
- Taxonomy captures one important relationships – supertypes/subtypes
- Haystack 4.0 provides a framework to define new relationships between terms

Ontological Relationships

- unit tagOn point
- ahu contains discharge-duct
- duct conveys air, pipe conveys fluid
- boiler heats fluid, ahu heats air
- tank stores substance, battery stores elec
- valve regulates fluid, damper regulates air
- pump moves fluid, fan moves air

Inference

Inference

- What do taxonomies and ontologies give us?
- **Inference!**
- One tag/term carries with it a lot more knowledge
- Inference engine
- Smarter tools
- More powerful query language
- Export to RDF

- Vocabulary (improved with conjuncts!)
- Taxonomy (new with subtyping!)
- Ontology (all new!)
- Inference (better tools and queries!)