Haystack 4.0
What It Is and Why It’s Important

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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
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!)