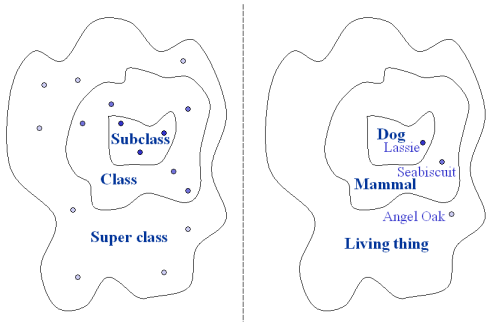
Semantic Modeling (Using SADL/OWL)

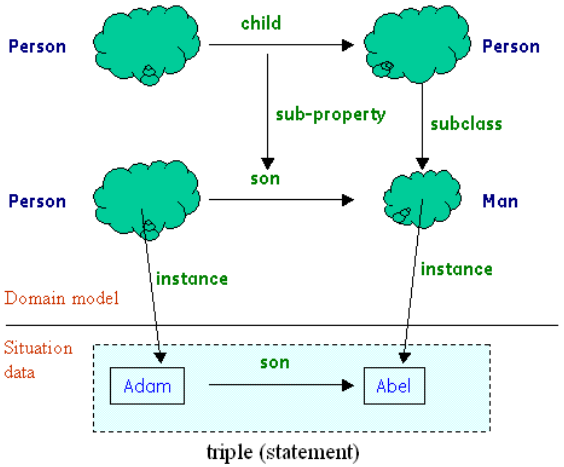
Models based on set theory:

- Formal, subset of first-order logic
- Computable (OWL DL)



Models consist of:

- Instances (occurrences of things, ideas)
- Classes (categories of instances)
- Properties (attributes, relationships)
- Hierarchies of classes, properties
- Statements about specific instances



Restrictions capture first-order logic:

gender of **Person** must be one of {Male , Female}.
a **Person** is a **Man** only if **gender** has value Male.
a **Person** is a **Mother** only if **child** has at least 1 value,
gender has value Female.

Rules capture domain logic, calculations:

Rule UncleDefined
given **x** is a **Man**
y is a **Person**
z is a **Person**
p is a **Person**
if **x** is **child** of **p**
y is **child** of **p**
z is **child** of **y**
then **x** is an **Uncle**
x is **uncle** of **z** .

Rule AreaOfRectangle
given **x** is any **Rectangle**
then **area** of **x** = **height** of **x** * **width** of **x** .

References:
OWL: http://www.w3.org/2004/owl
SADL: http://sadl.sourceforge.net

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What's a Semantic Model Good For?

Reusable Domain Model

- Equipment structure, configuration
- Business strategy

Reasoning

- Compute logical implications, numerical values, etc.

Consistency Checking

- Is input (situation data) valid?

Model-Driven User-Interface

- Configure user-interface based on equipment type, user, etc.

Example Domains Modeled To-Date

- Equipment maintenance
- Equipment configuration
- Data provenance in multi-level security environment
- Security policy
- Smart Grid network model tracing and validation