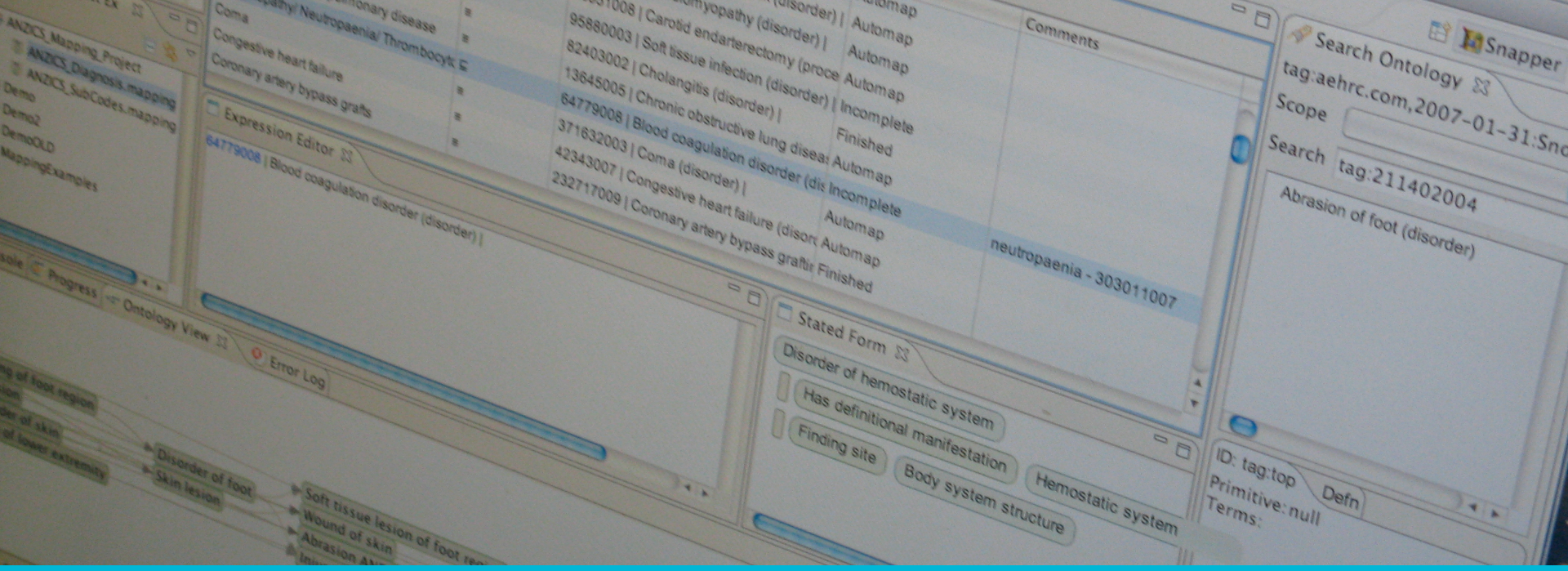

Avoiding Excessive Description Logics Through Concrete Domains

Michael Lawley | Principal Research Scientist, AEHRC

October 2014

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Description Logic: the semantic foundation for SNOMED CT

OWL2-EL

- no negation
- no universal quantification
- polynomial algorithm
  - SNOMED CT: n ~ 300,000 (flat)
  - AMT: n ~ 60,000 (nested)
- => tractable reasoning
- => tractable modelling

Modelling Medicines

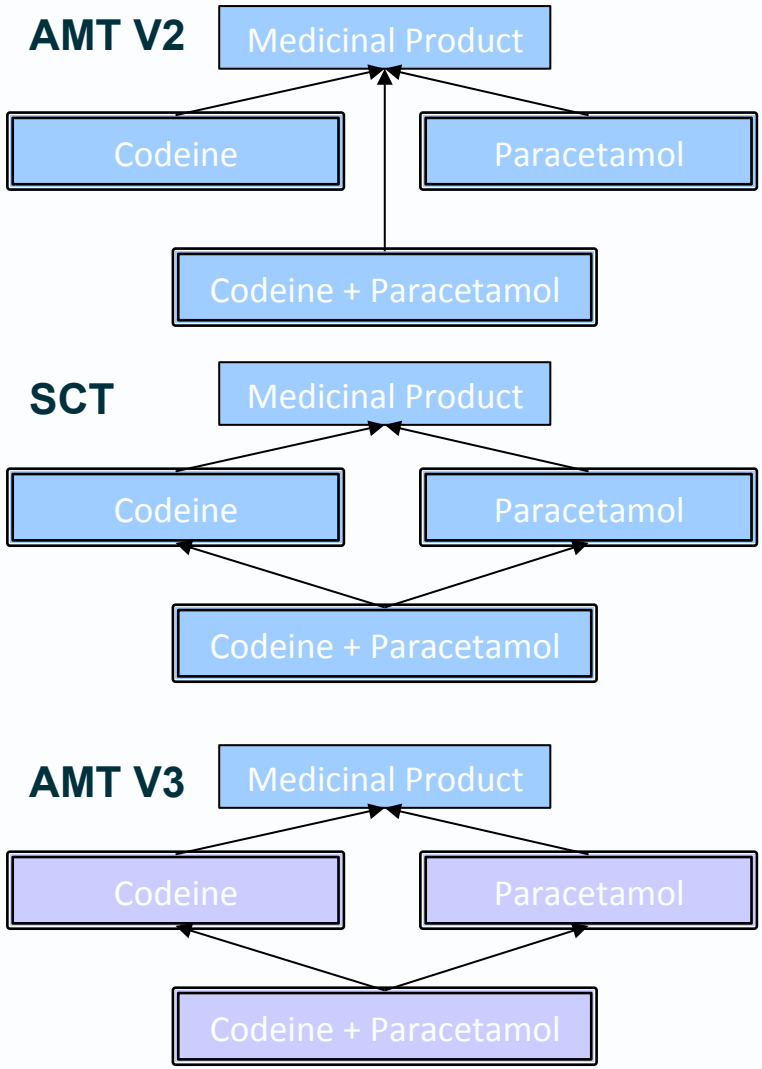
Primitive concepts hide modelling errors

Fully defined concepts

- expose modelling errors
- lead to higher quality
- better for querying and post coordination

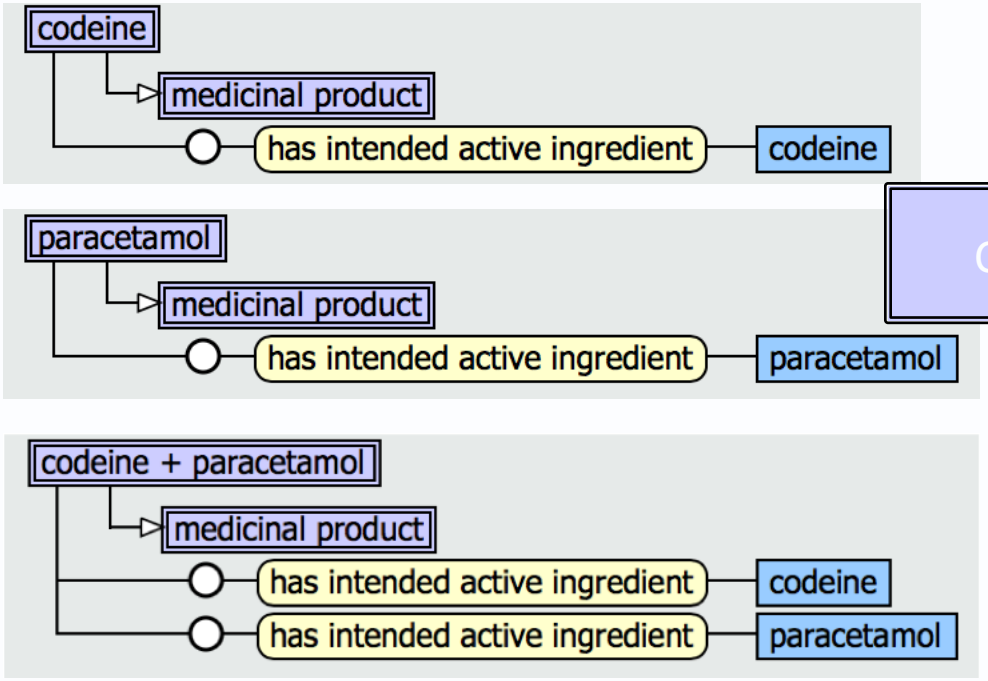
Multi-ingredient medications

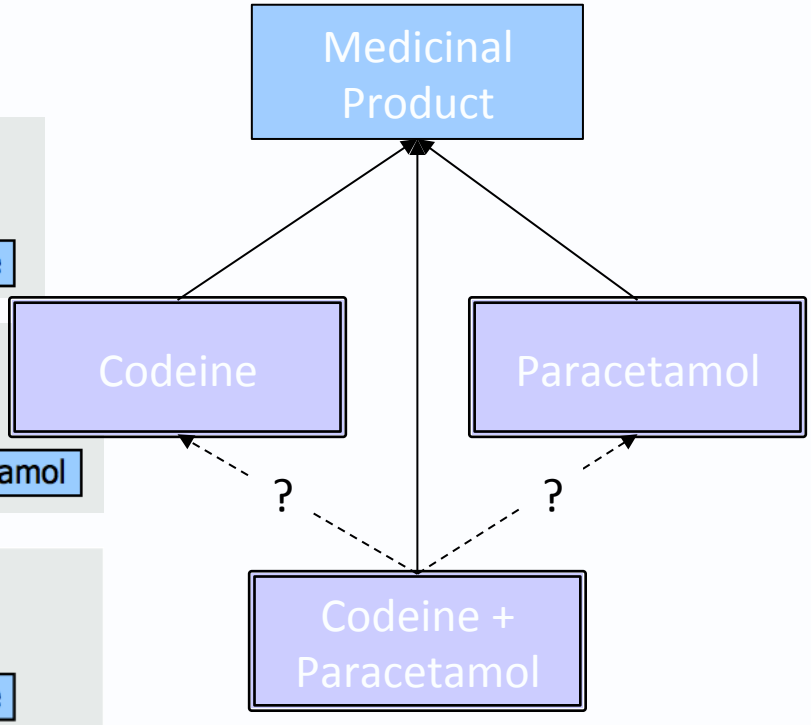
codeine + paracetamol



Modelling Medicines

Has *some* ingredient





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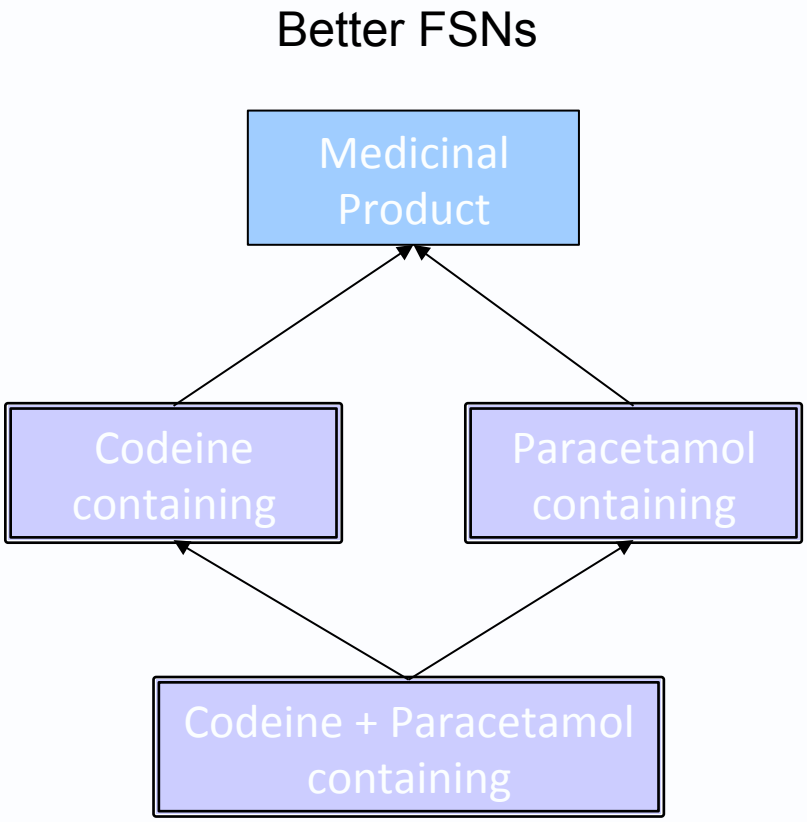
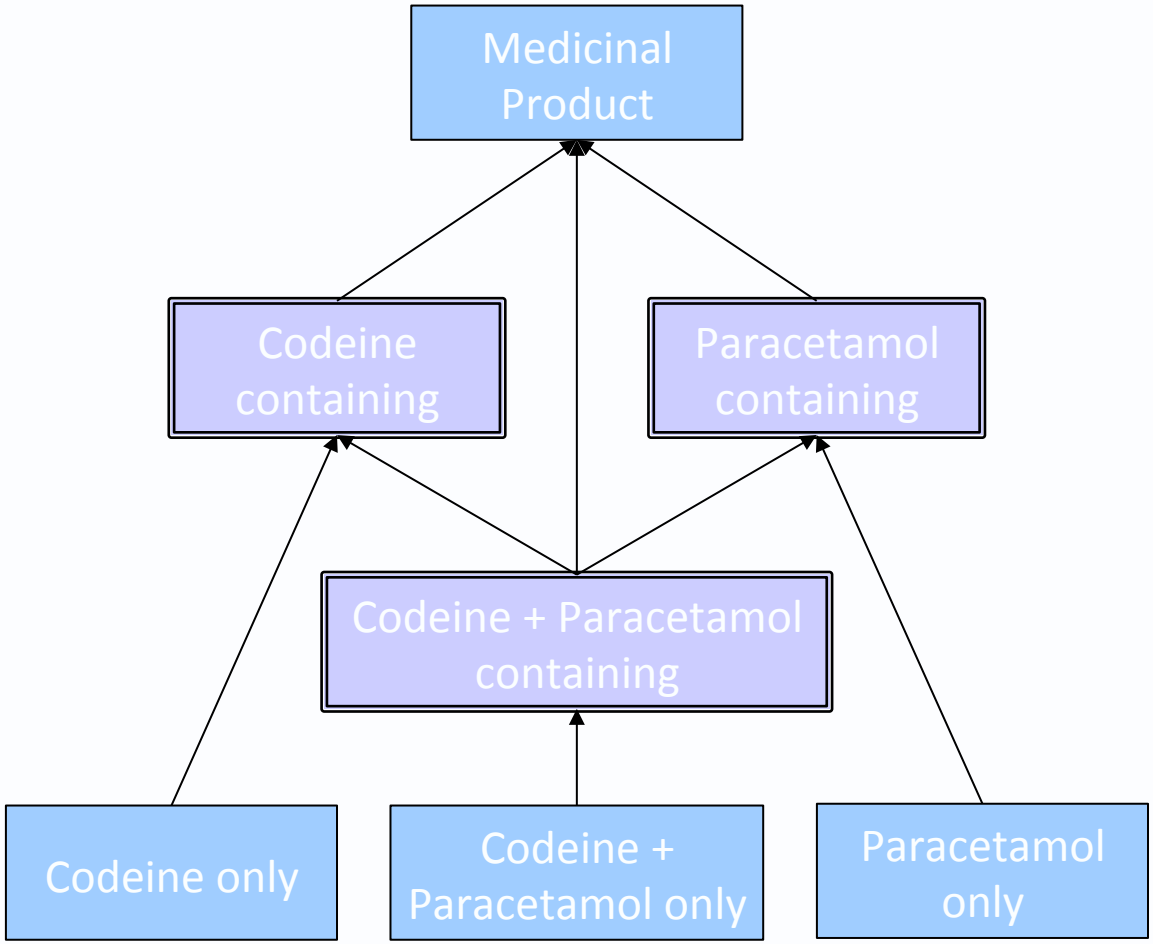


-only medications



Modelling –only medications

|Medicinal Product| : |has Active Ingredient| = |Codeine|

this says that it has **some** ingredient which is |Codeine|

we need to restrict it to **only** ingredients which are |Codeine| but without going outside of OWL2-EL

Modelling –only medications

Solution: use concrete domains to model the number of ingredients

|Medicinal Product| :
    |has Active Ingredient| = |Codeine|
    |has Active Ingredient Count| = #1

|Medicinal Product| :
    |has Active Ingredient| = |Codeine|
    |has Active Ingredient| = |Paracetamol|
    |has Active Ingredient Count| = #2

Compare to extended DL approach

|Medicinal Product| :
    |has Active Ingredient| =only |Codeine|

|Medicinal Product| :
    |has Active Ingredient| =only |Codeine|
    |has Active Ingredient| =only |Paracetamol|

Compare to extended DL approach

|Medicinal Product| :
    |has Active Ingredient| =only |Codeine|

|Medicinal Product| :
    |has Active Ingredient| =only (|Codeine| or |Paracetamol|)

Compare to extended DL approach

|Medicinal Product| :
    |has Active Ingredient| =only |Codeine|
    |has Active Ingredient| = |Codeine|

|Medicinal Product| :
    |has Active Ingredient| =only (|Codeine| or |Paracetamol|)
    |has Active Ingredient| = |Codeine|
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Modelling –only medications

Solution: use concrete domains to model the number of ingredients

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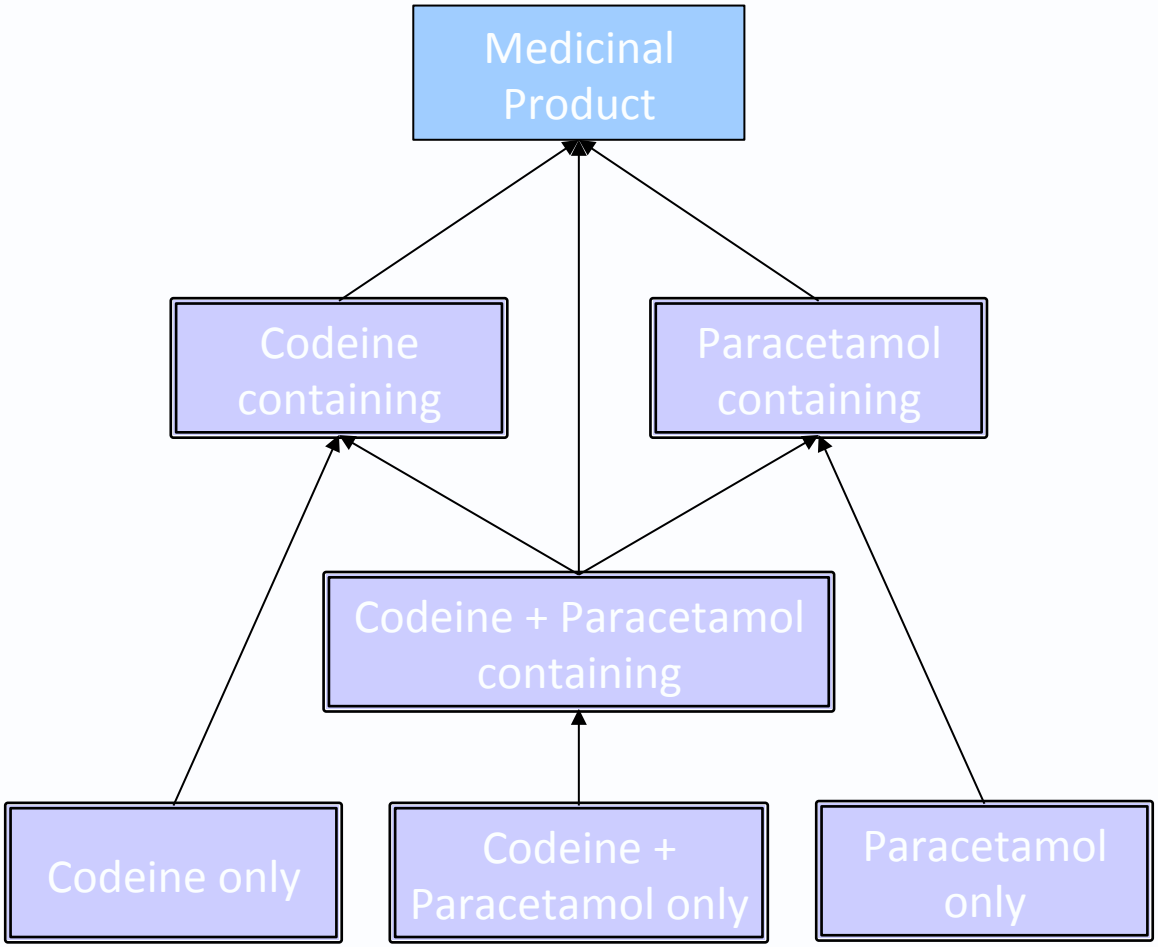
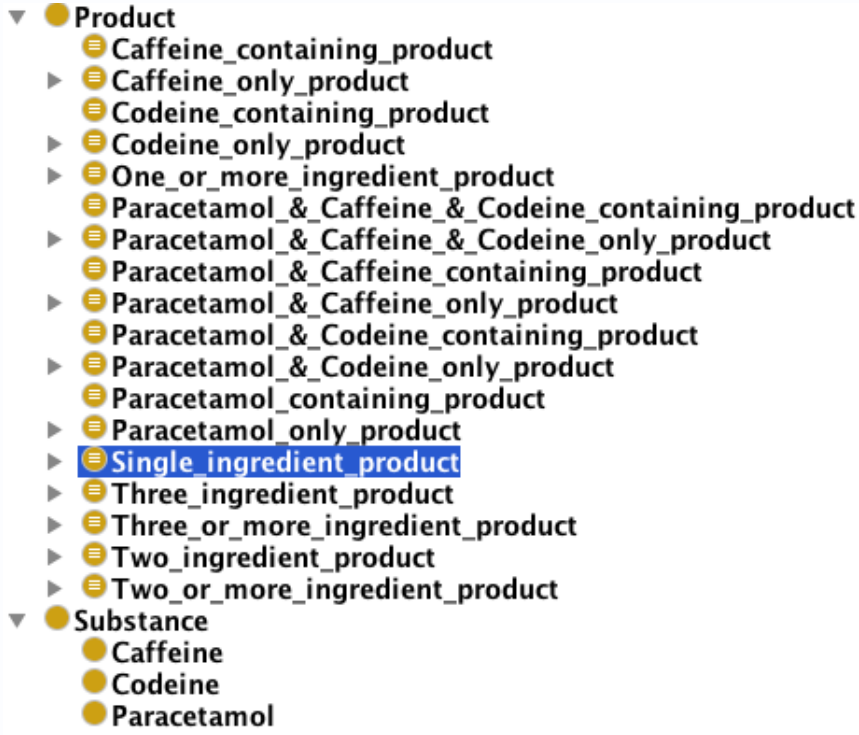
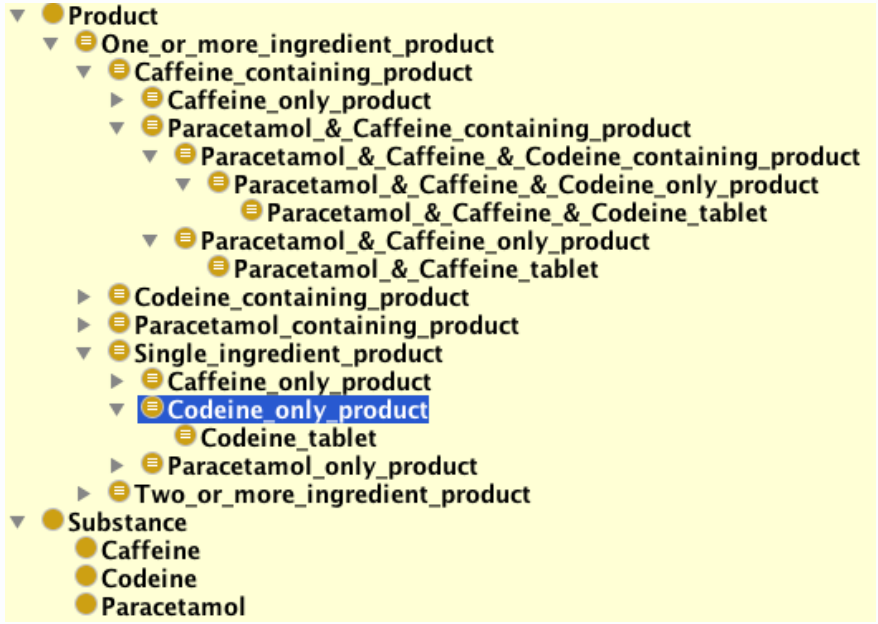
|Medicinal Product| :
    |has Active Ingredient| = |Codeine|
    |has Active Ingredient| = |Paracetamol|
    |has Active Ingredient Count| = #2

-only medications, fully defined



Protege example





Benefits

Removes need for primitive –only concepts;
primitive concepts hide modelling errors

QA rules can be implemented to check the stated ingredient count and the inferred # of active ingredient attributes

Abstract –only concepts such as |single ingredient product| can be defined as used to simplify modelling

Ingredient count is available directly from model which aids in implementation and querying

Additional benefits

|Placebo|
=== |Medicinal Product|:
        |has Active Ingredient Count| = #0

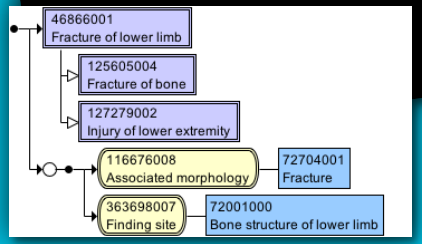
Non-acting ingredients (colours, flavours, other) need not be included in the count:

|Inert substance (only) tablet|
=== |MPUU|:
        |has Active Ingredient| = |inert substance|
        |has Active Ingredient Count| = #0
        |hasForm| = |tablet|

Uni-lateral & Bi-lateral

Unspecified	site count > #0
Unilateral	site count = #1
Bilateral	site count = #2

Allows such concepts to reside in Findings hierarchy rather than being relegated to Situations hierarchy



Thank you

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