

SNOMED CT

Compositional Grammar

SNOMED CT Languages

Compositional Grammar (CG)

- SNOMED CT concept definitions
- “The set of things that ...”

Expression Constraint Language (ECL)

- Define sets of SNOMED CT concepts
- “The set of all concept definitions having ...”
- Dependent on a given “substrate” (Release / Edition / Version)

Query Language

- Lexical / model based selection of SNOMED CT concepts
- “The set of concept definitions with the string ‘...’ in a description of definition”

Template Language(s)

- Transformation between data models / spreadsheets / ... and CG or ECL

SNOMED CT Languages

Compositional Grammar (CG)

- Latest Version Nov, 2016 - <https://confluence.ihtsdotools.org/display/DOCSCG>
- (Some) tooling available on IHTSDO site and third party tools

Expression Constraint Language (ECL)

- Latest Version, Feb, 2017 - <https://confluence.ihtsdotools.org/display/DOCECL/>
- Version 1.3 underway with changes to support MCRM
- Some tooling is beginning to emerge

Query Language

- Development on hold pending release of STS

Template Syntax(s) (STS)

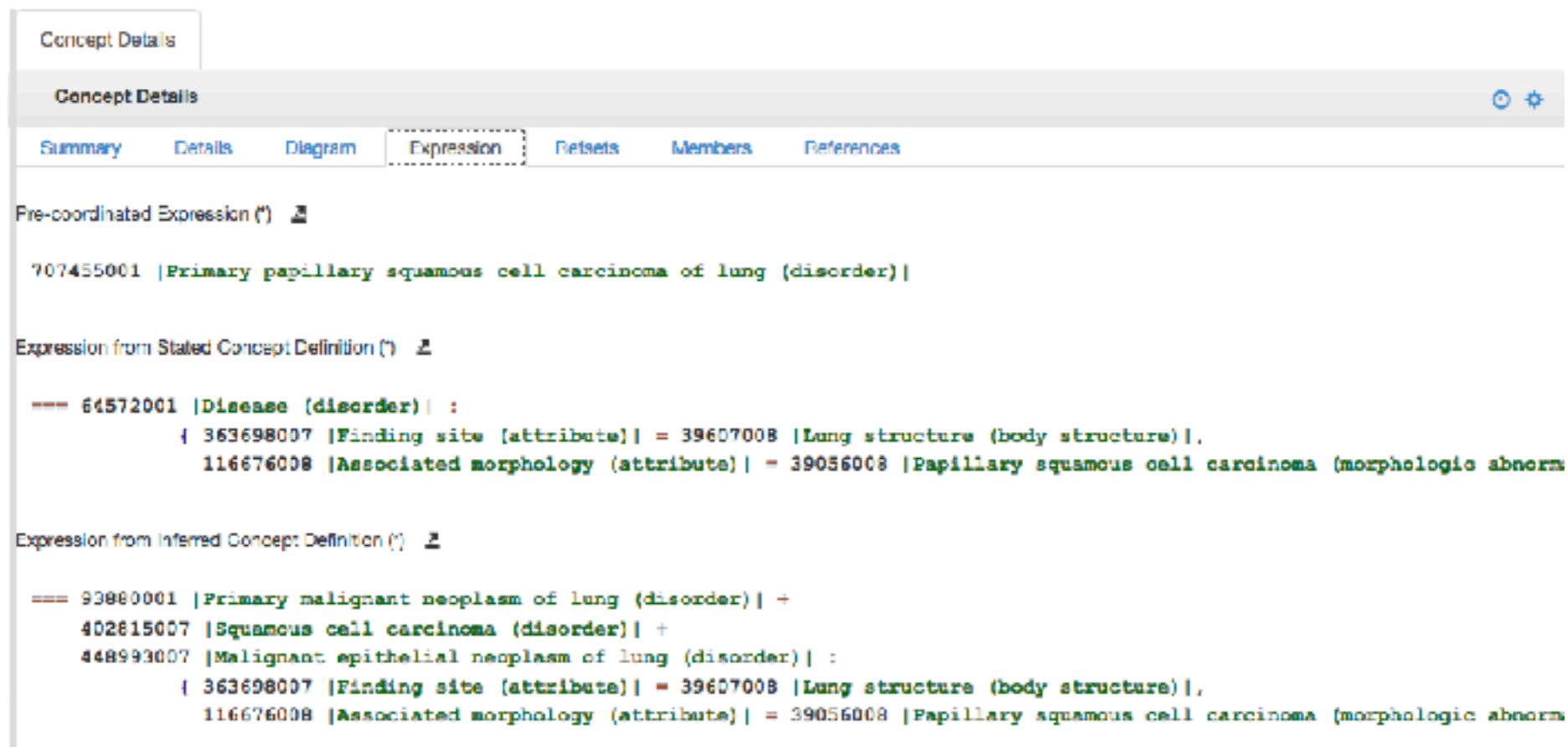
- Actively under development - no public documents as of yet

Compositional Grammar

- Formal language for defining SNOMED CT concepts (classes)
- Expresses (most of) the Description Logic (DL) available in SNOMED CT
- Can be transformed to/from OWL
- SNOMED CT *only* — does not support URI's/Namespaces and DL beyond SNOMED itself
 - In particular, universal quantifier (all/only), disjointness, disjunction (or) and nested definitions are not supported

Compositional Grammar

- Many examples in: <https://confluence.ihtsdotools.org/display/DOCSCG/6+Examples>
- CG representation available in IHTSDO Browser



The screenshot displays the 'Concept Details' page in the IHTSDO Browser. The page has a navigation bar with tabs for 'Summary', 'Details', 'Diagram', 'Expression', 'Retsets', 'Members', and 'References'. The 'Expression' tab is currently selected. Below the navigation bar, there are three sections of code representing different types of expressions:

- Pre-coordinated Expression (*)**:
`707455001 |Primary papillary squamous cell carcinoma of lung (disorder)|`
- Expression from Stated Concept Definition (*)**:
`=== 64572001 |Disease (disorder)| :
 { 363698007 |Finding site (attribute)| = 39607008 |Lung structure (body structure)|,
 116676008 |Associated morphology (attribute)| = 39056008 |Papillary squamous cell carcinoma (morphologic abnormality)| }`
- Expression from Inferred Concept Definition (*)**:
`=== 93880001 |Primary malignant neoplasm of lung (disorder)| +
 402815007 |Squamous cell carcinoma (disorder)| +
 448993007 |Malignant epithelial neoplasm of lung (disorder)| :
 { 363698007 |Finding site (attribute)| = 39607008 |Lung structure (body structure)|,
 116676008 |Associated morphology (attribute)| = 39056008 |Papillary squamous cell carcinoma (morphologic abnormality)| }`

Compositional Grammar

Construct:

64572001 |Disease (disorder)| :

{ 363698007 |Finding site (attribute)| = 39607008 |Lung structure (body structure)|,

116676008 |Associated morphology (attribute)| = 39056008 |Papillary squamous cell carcinoma (morphologic abnormality)| }

Shortened:

64572001:{363698007=39607008,116676008=39056008}

Interpretation:

any instance of a disease, as defined by SNOMED CT concept code 64572001 *having an element/component that consists of* ({ ... }):

- a) a finding site that is an instance of some structure of the lung and
- b) an associated morphology that is an instance of some Papillary squamous cell carcinoma

Compositional Grammar

Construct:

71388002 |procedure| :

- { 260686004 |method| = 129304002 |excision - action| ,
405813007 |procedure site - direct| = 20837000 |structure of right ovary| ,
424226004 |using device| = 122456005 |laser device| }
- { 260686004 |method| = 261519002 |diathermy excision - action| ,
405813007 |procedure site - direct| = 113293009 |structure of left fallopian tube| }

Interpretation:

any instance of a procedure that:

- a) has an element/component that consists of both
a method that is a kind of excision - action with a direct procedure site of
the structural of the right ovary
- b) has an element/component that consists of both
a method that is a loop excision action with a direct procedural site of a structure of the
left fallopian tube

Why Compositional Grammar?

1) Classification

All instances of:

64572001 |Disease (disorder)| :

{ 363698007 |Finding site (attribute)| = 39607008 |Lung structure (body structure)|,

116676008 |Associated morphology (attribute)| = 39056008 |Papillary squamous cell carcinoma (morphologic abnormality)| }

Are also instances of:

363358000 | Malignant tumor of lung (disorder) |

402815007 | Squamous cell carcinoma (disorder)

...

Why Compositional Grammar?

2) Post-coordination

707455001 |Primary papillary squamous cell carcinoma of lung (disorder)| :

{363698007 |Finding site (attribute)| =77194008 | Structure of root of right lung (body structure) }

This is something that *could* be recorded in data:

“code”: “70745501:{363698007:77194008}”,

Compositional Grammar

SNOMED Specific

- *Can* be transformed into OWL...

Not designed for non-SNOMED identifiers

- OWL uses URI's

Does not eliminate complexity:

{“finding site” : [Finding site value set],

“morphology” : [Morphology value set],

... “code”: “[disease value set]:{363698007:[morphology value set]}”,

Expression Constraint Grammar

- Similar to SNOMED CT Compositional Grammar in structure
- Set builder - grammar construct defines a *set* of SNOMED CT concept concepts that satisfy a particular pattern or rule
- Includes set operators (and/or/minus)
- Can reference other sets, including SCT Reference Sets
- Includes notion of 'substrate' (Release / Version / Edition)

Expression Constraint Grammar

- Many examples in <https://confluence.ihtsdotools.org/display/DOCECL/6.+Examples>

Conjunction and disjunction can also be applied to attribute values. The example below is satisfied only by members of the adverse drug reactions reference set for GP/FP health issue, which have a causative agent that is *either* a subtype of pharmaceutical / biologic product *or* a subtype of substance.

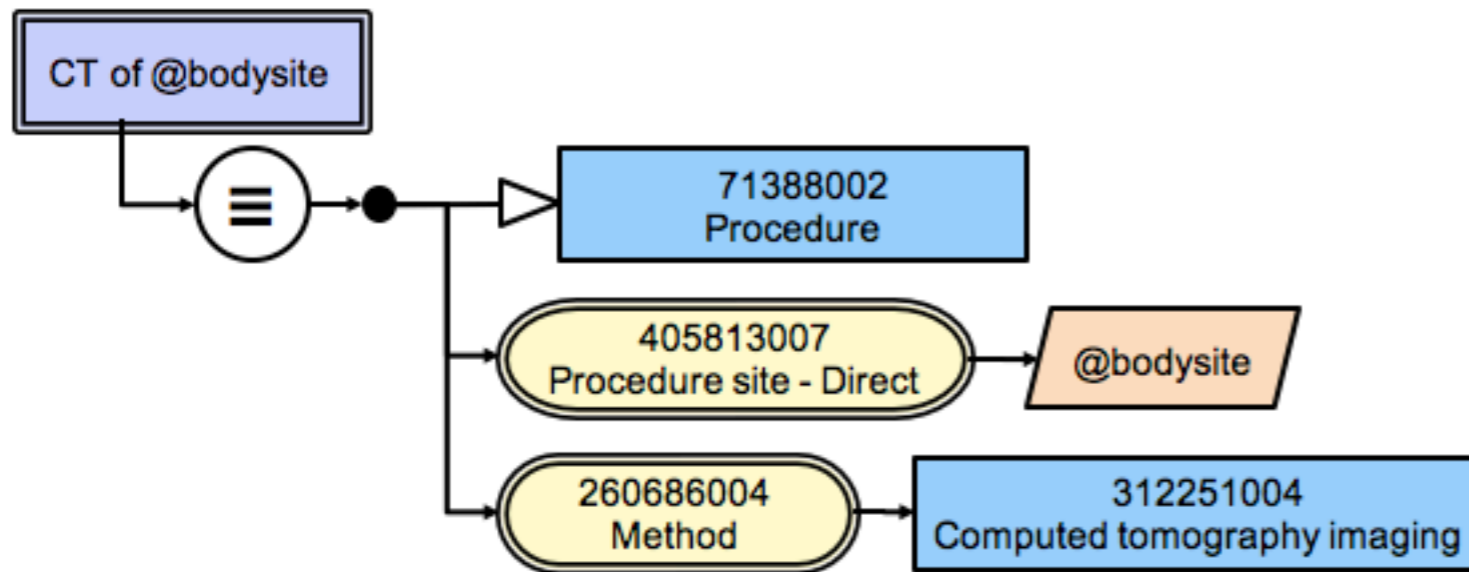
```
^ 450990004 |Adverse drug reactions reference set for GP/FP health issue| :  
  246075003 |Causative agent| = (< 373873005 |Pharmaceutical / biologic product| OR <  
105590001 |Substance| )
```

Template Syntax

- Mapping to/from other data structures
 - Spreadsheets
 - Messages
 - ...
- <https://confluence.ihtsdotools.org/display/DOCSTS>
- Use cases include *Authoring of Pre-coordinated Concepts*
 - General notion is that you can create in a spreadsheet and define the mapping to a SCG expression w/ constraints (!)

Template Syntax

Template (diagram)



Template (syntax)

```
71388002 |Procedure| :
  { 363704007 |Procedure site| = [[+id @bodysite]],
    260686004 |Method| = 312251004 |Computed tomography
    imaging action| }
```

Summary

Compositional Grammar is very SNOMED CT focused

- Limited value in mixed code system / model situations
- Does not eliminate need for models / tooling

Template Syntax *maps* external structures / spreadsheets to SCG (and other) constructs

- Allows simpler models
- Keeps options open for mapping
- *Preliminary* - but group could influence final options