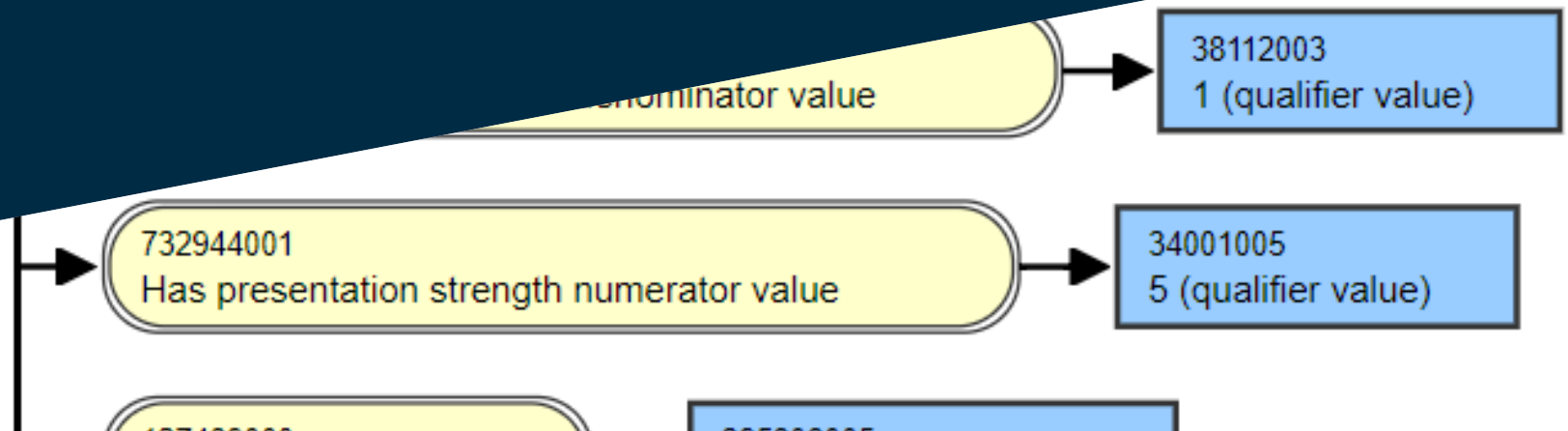


Basic concepts and structure of SNOMED CT system

Daniel Karlsson, National Board of Health and Welfare, Sweden



Content

- SNOMED CT structure and formats
- Use of SNOMED CT in terminology servers
- SNOMED CT and analytics
- Any other SNOMED CT topic
- Discussion and questions

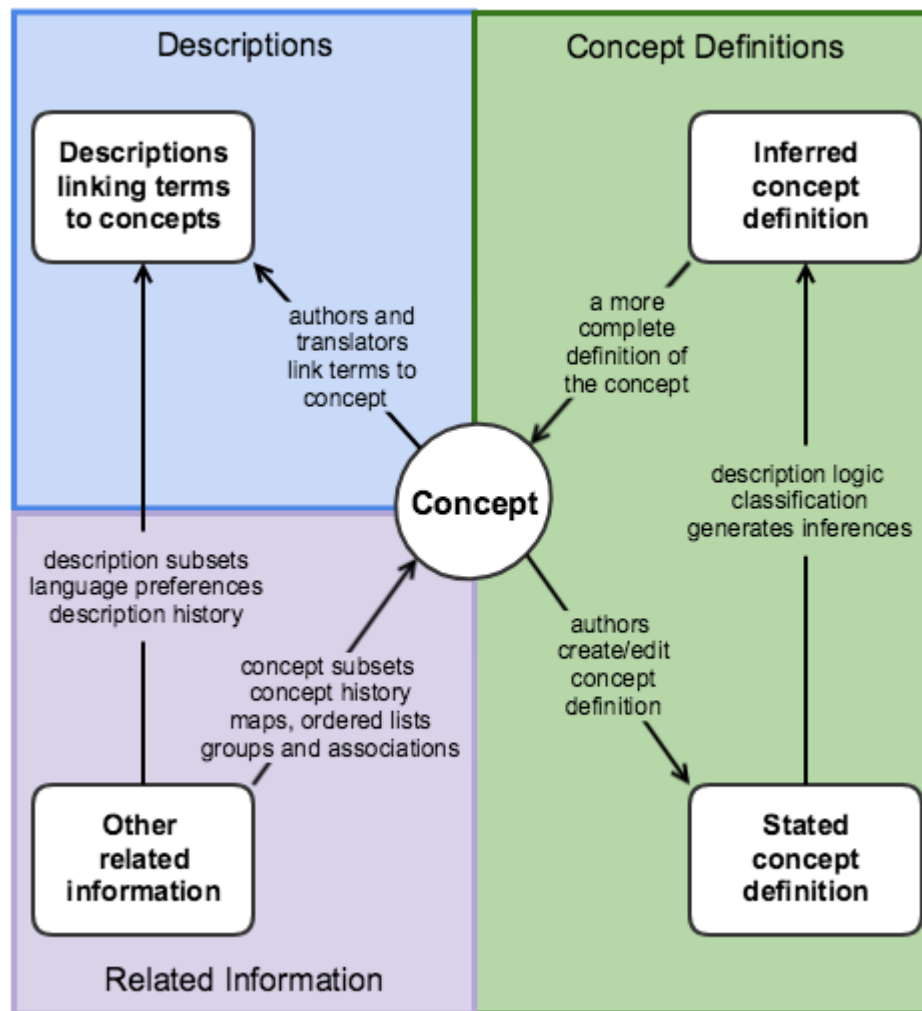
My self

- Daniel Karlsson

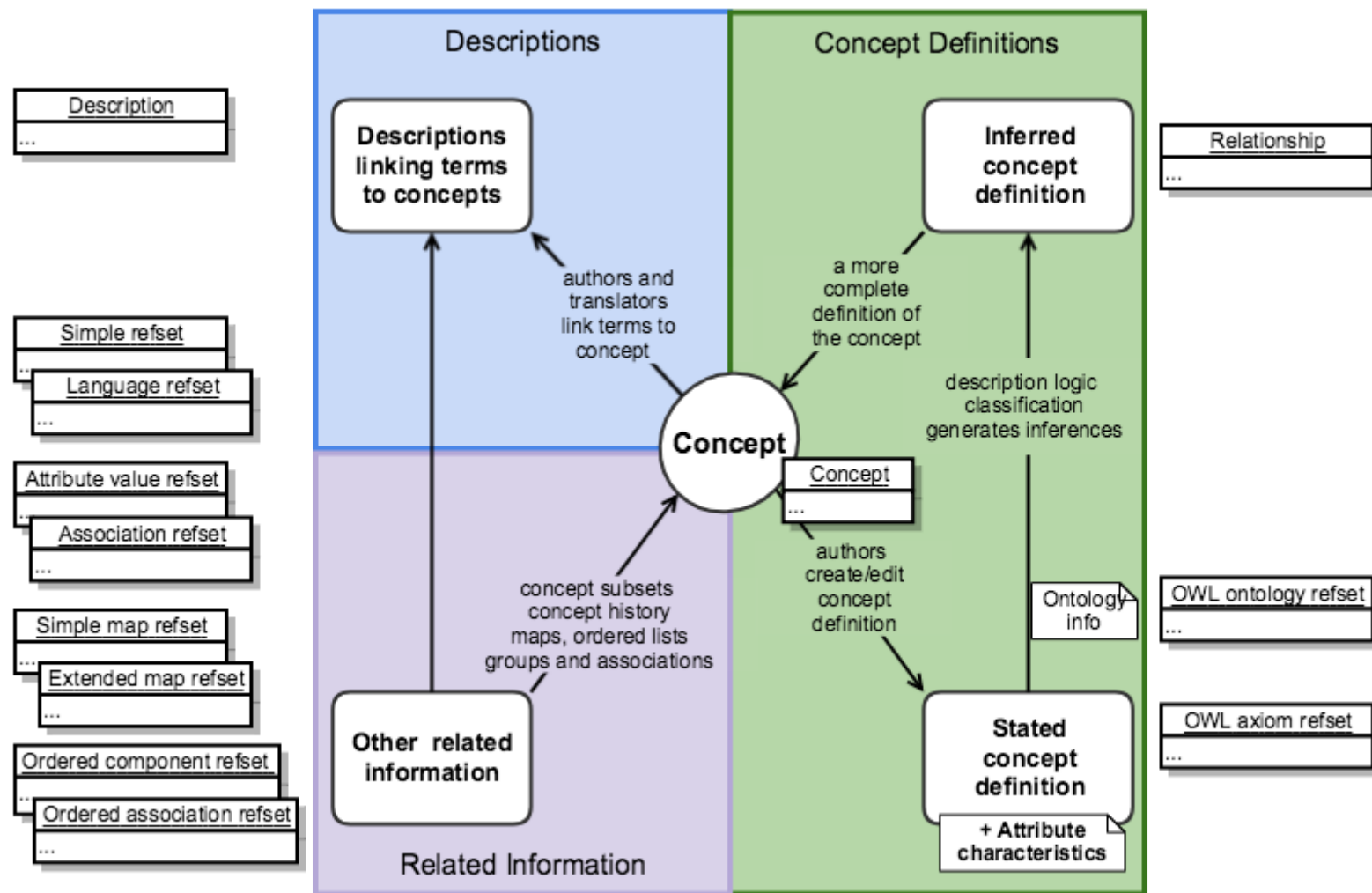
SNOMED CT structure and formats

- Logical
 - Concepts, Descriptions, Definitions (Relationships), Reference set (members)
- Release Format 2 – RF2
 - The representation and source of truth
- Terminology services
 - The way to access SNOMED CT

SNOMED CT structure and formats



SNOMED CT structure and formats



SNOMED CT modules

- A module is “a group of SNOMED CT components and/or reference set members managed, maintained, and distributed as a unit.”
- Some examples
 - The international *edition* has the modules 900000000000207008 | SNOMED CT core module (core metadata concept) | and 900000000000012004 | SNOMED CT model component module (core metadata concept) |
 - The Swedish *edition* has all the international modules plus 45991000052106 | SNOMED CT Sweden NRC maintained module (core metadata concept) |
 - The Swedish module *depends on* the international modules

SNOMED CT editions and versions

- An edition is a set of modules including all dependencies
 - Example: International edition, US edition
- An extension is a set of modules adding to the international modules
 - Can *not* be used separately!
 - Example: Danish extension
- A SNOMED CT version is an edition (or extension?) published at a specific date
 - Example: Swedish extension May 2020

RF2 release types

- FULL
 - Contains the full history of every component and reference set
- SNAPSHOT
 - Contains only the component the latest time stamp (effectiveTime)
- DELTA
 - All changes since last released version

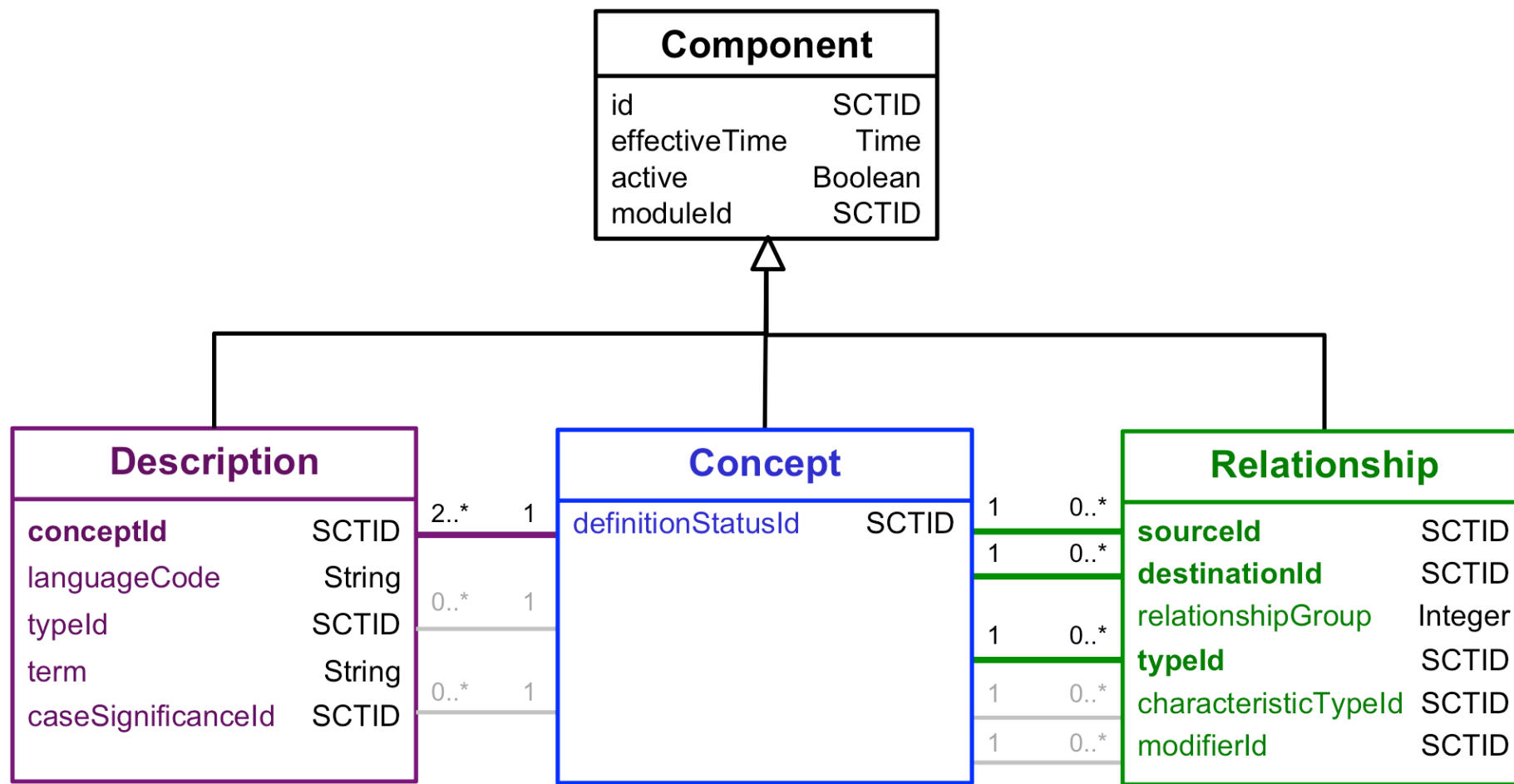
RF2 release files

- Tab-separated UTF-8 encoded text files
- Not for humans reading!
- Every file and every row of those files has at least
 - id
 - effectiveTime
 - active
 - moduleId

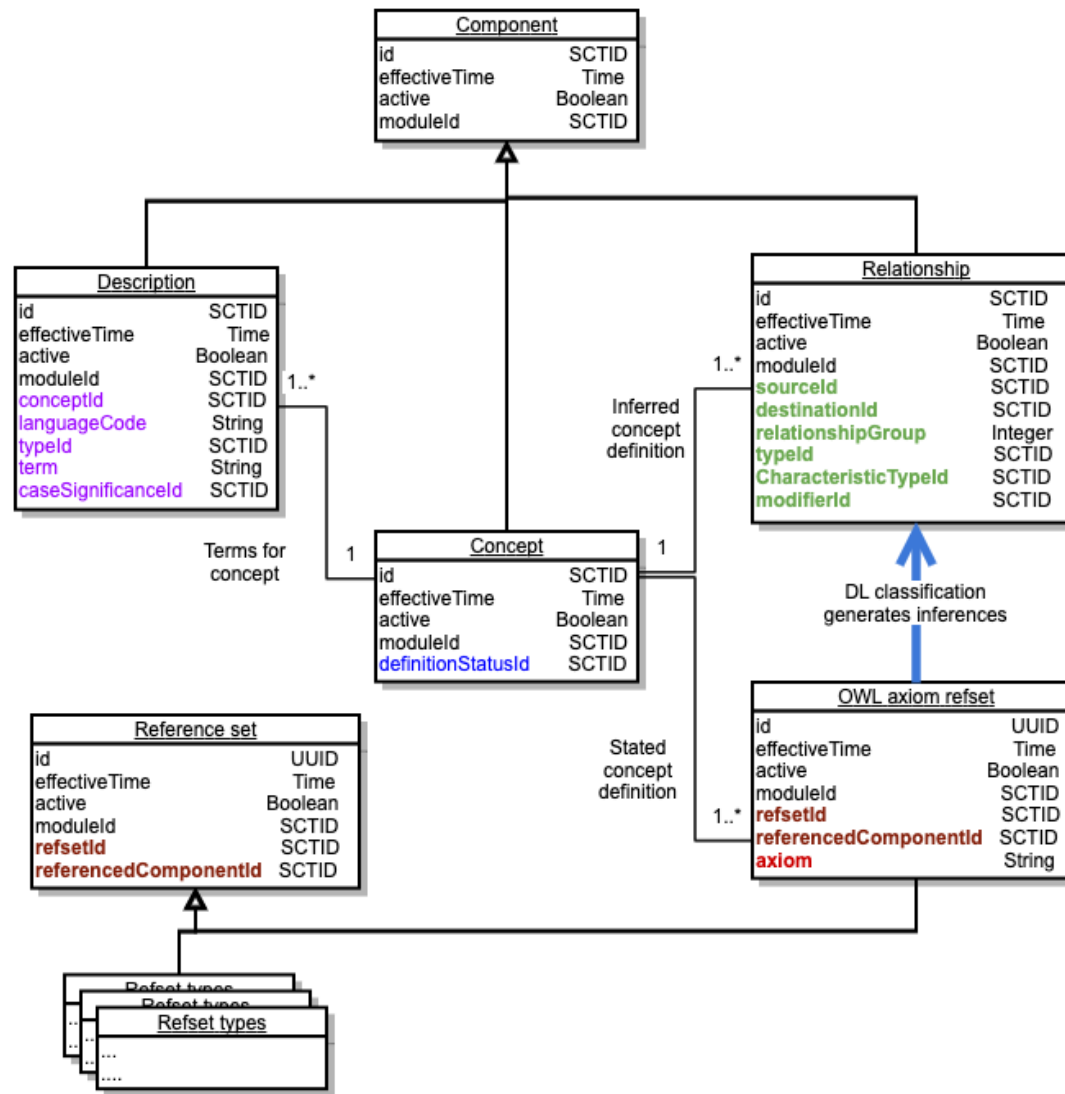
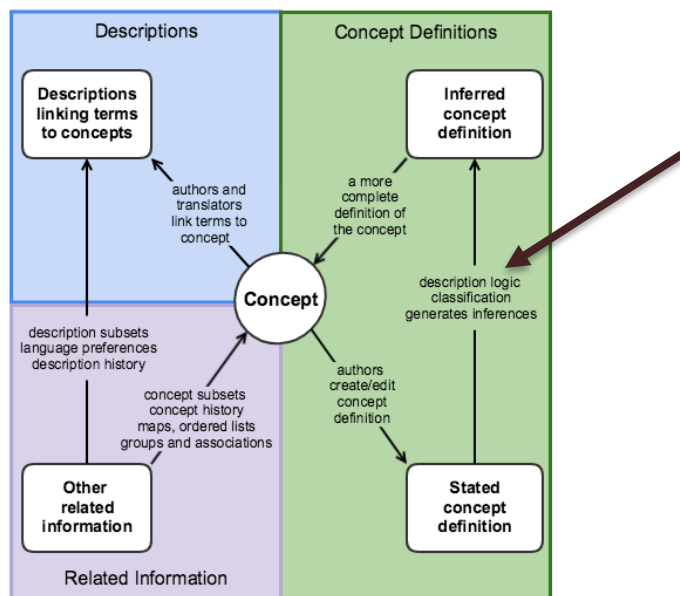
History in RF2

<u>id</u>	<u>effectiveTime</u>	<u>active</u>	<u>moduleId</u>	<u>definitionStatusId</u>
101291009	20070701	1	Module 1	900000000000074008 Primitive
101291009	20080101	1	Module 2	900000000000074008 Primitive
101291009	20080701	1	Module 2	900000000000073002 Defined
101291009	20090101	0	Module 2	900000000000074008 Primitive

Relationships between RF2 files



Relationships between RF2 files



Reference sets

- In addition to the standard RF2 elements, reference sets add
 - refsetId
 - referencedComponentId
 - ...
- 21 different reference set types
 - Example: Simple map reference set adds a map target

...	refsetId	referencedComponentId	mapTarget
...	<u>900000000000498005 SNOMED RT ID simple map </u>	<u>101009 Quilonia ethiopica </u>	L-55535

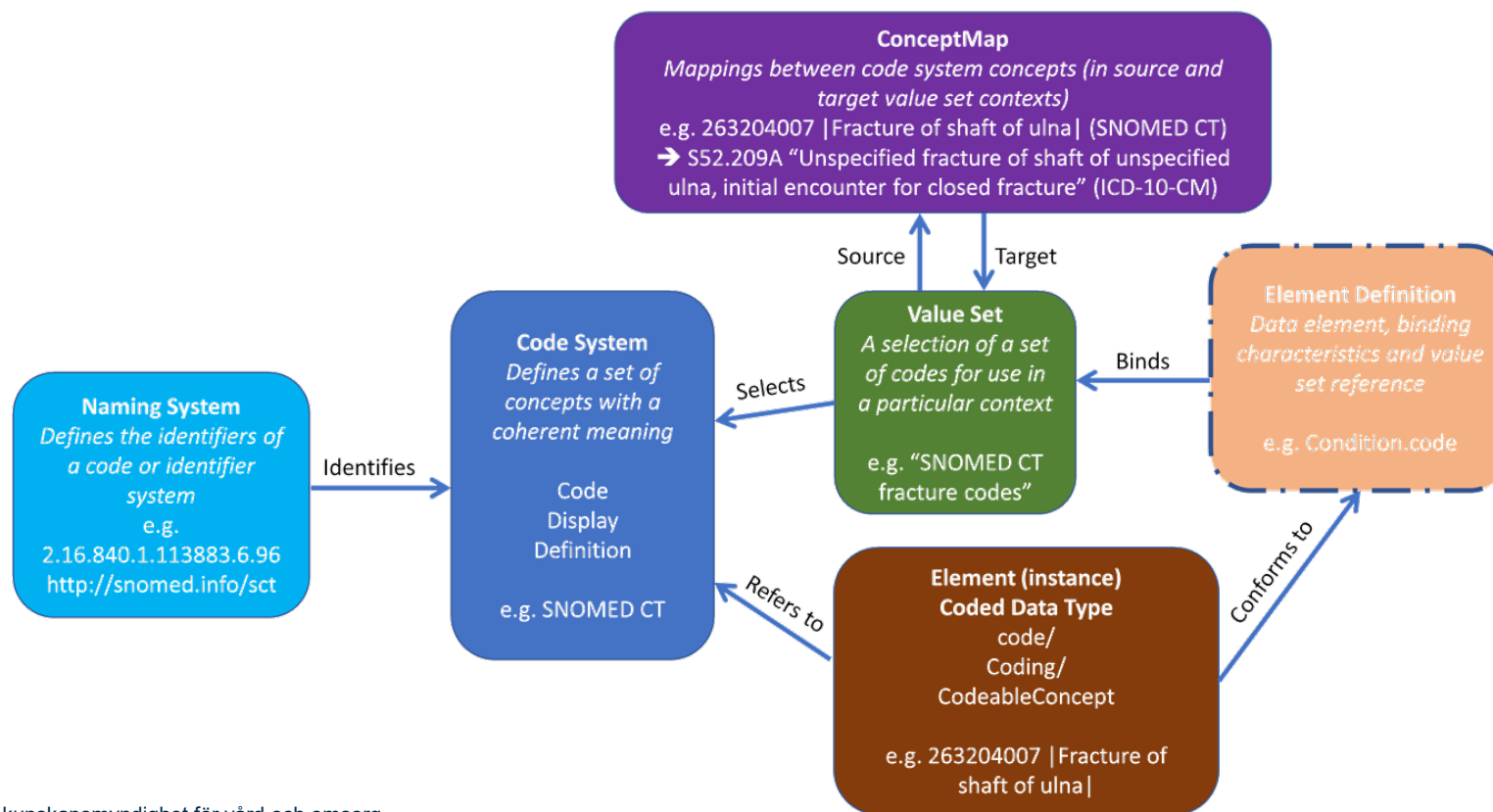
SNOMED CT and terminology services

Terminology services

- Services aimed to allow the use of terminologies
- Hides (some of) the complexity of modern terminologies
 - Lowers the threshold to using all the terminologies' capabilities
- May standardize access when using different terminologies
- Expression Constraint Language
- Two examples:
 - Using SNOMED CT with SQL databases
 - Using SNOMED CT with Snowstorm

FHIR terminology services

- Recent standard for terminology services



Expression Constraint Language

- Query language for SNOMED CT concepts

focus concept

<< 404684003 | Clinical finding (finding) | :
363698007 | Finding site (attribute) | = << 39352004 | Joint structure (body structure) |

operator

attribute

Using SNOMED CT with SQL databases

- Various database loading scripts are available
 - <https://github.com/IHTSDO/snomed-database-loader>

Transitive closure

- Transitive closure of the “Is a” relationships
- A table with all descendants for each concept
- Speeds up querying using the SNOMED CT hierarchy

Practical example

Using SNOMED CT with Snowstorm

- Snowstorm is a free and open source SNOMED CT-only terminology server
 - <https://github.com/IHTSDO/snowstorm>
- The Snowstorm server is behind
 - The SNOMED CT browser
 - The SNOMED International and Managed services authoring tools

Snowstorm

- Installation
- Loading of SNOMED CT
 - International plus an extension
- Using Snowstorm
 - SNOMED International API
 - FHIR API

Practical example

SNOMED CT and analytics

SNOMED CT and analytics

nature

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Information on all covariates was obtained from primary care records by searching TPP SystemOne records for specific coded data. TPP SystemOne allows users to work with the **SNOMED**-CT clinical terminology, using a GP subset of **SNOMED**-CT codes. This subset maps on to the native Read version 3 (CTV3) clinical coding system on which SystemOne is built. Medicines are entered or prescribed in a format compliant with the NHS Dictionary of Medicines and Devices (dm+d)³⁶, a local UK extension library of **SNOMED**. Codelists for particular underlying conditions and medicines were compiled from a variety of sources. These include British National Formulary (BNF) codes from OpenPrescribing.net, published codelists for asthma^{37,38,39}, immunosuppression^{40,41,42}, psoriasis⁴³, systemic lupus erythematosus⁴⁴, rheumatoid arthritis^{45,46} and cancer^{47,48}, and Read Code 2 lists designed specifically to describe groups who are at increased risk of influenza infection¹⁸. Read Code 2 lists were added to with **SNOMED** codes and cross-checked against NHS Quality and Outcomes Framework (QOF) registers, then translated into CTV3 with manual curation. Decisions on every codelist were documented and the final lists were reviewed by at least two authors. Detailed information on compilation and sources for every individual codelist is available at <https://codelists.opensafely.org/> and the lists are available for inspection and reuse by the broader research community.

SNOMED CT and analytics

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Factors associated with using OpenMRS

Elizabeth J. Williams

Nature **584**, 430–434

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Articles

Risk of hydroxychloroquine alone and in combination with azithromycin in the treatment of rheumatoid arthritis: a multinational, retrospective study

Jennifer C E Lane MRCS ^{a, †}, James Weaver MSc ^{b, †}, Kristin Kostka MPH ^c, Talita Duarte-Salles PhD ^d, Maria Tereza F Abrahao PhD ^e, Heba Alghoul MD ^f, Osaid Alser MD ^g, Thamir M Alshammari PhD ^h, Patricia Biedermann MSc ⁱ, Juan M Banda PhD ^j, Edward Burn MSc ^{a, d}, Paula Casajust MSc ^k, Mitchell M Conover PhD ^b, Aedin C Culhane PhD ^l, Alexander Davydov MD ^m, Scott L DuVall PhD ^{n, o}, Dmitry Dymshyts MD ^m, Sergio Fernandez-Bertolin MSc ^d ... Prof Daniel Prieto-Alhambra PhD ^{a, d}

records by searching TPP users to work with the -CT codes. This subset on which SystemOne is with the NHS Dictionary of **SNOMED**. Codelists for from a variety of sources. nPrescribing.net, published s⁴³, systemic lupus Read Code 2 lists designed nza infection¹⁸. Read Code inst NHS Quality and 3 with manual curation. were reviewed by at least or every individual codelist

ly.org/ and the lists are available for inspection and ty.

SNOMED CT and analytics

- Use of knowledge encoded in SNOMED CT to allow aggregation of patient data

Practical example

Questions and discussion

**Mer information finns på:
www.socialstyrelsen.se**