

Developer Training Terminology Services

Belgium - Online
Monday, 20th March 2023

<https://confluence.ihtsdotools.org/display/DEV/Belgium>



Welcome & Introductions

The SNOMED International Team

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Workshop Introduction

To better understand SNOMED CT,
how to deploy it easily in your local environments,
how to keep the terminology updated and
how to integrate it with your applications

Setting up a production-ready SNOMED CT enabled terminology server

- SNOMED CT in Belgium
- Introduction to SNOMED CT
- Introduction to Snowstorm

Exercise: Snowstorm Setup and SNOMED Import

- Releases and Extensions
- Examples of use (browser, UI demo)
- Learn more



Using a SNOMED-enabled terminology server

- Refresh
- Catch-up and questions
- Introduction to components and features of SNOMED CT

Exercise: Accessing SNOMED CT in the TS

- Querying SNOMED CT using the Expression Constraint Language (ECL)

Exercise: Querying SNOMED CT using ECL

- Analytics demo



SNOMED CT in Belgium

SNOMED CT

The global
language of
healthcare



Introduction to SNOMED CT

SNOMED CT

The world's most comprehensive
multilingual clinical terminology

The global
language of
healthcare

A Brief History



2002

First release of SNOMED CT
(merge of SNOMED and Read Codes)

2007



Acquired by IHTSDO
for the public good in 2007



2017

IHTSDO adopted the trading
name **SNOMED International**



Who is involved now?

 Argentina	 Denmark	 Jordan	 Saudi Arabia	 United Arab Emirates
 Armenia	 El Salvador	 Kazakhstan	 Singapore	 United Kingdom
 Australia	 Estonia	 Lithuania	 Slovakia	 United States
 Austria	 Finland	 Luxembourg	 Slovenia	 Uruguay
 Belgium	 Germany	 Malaysia	 Republic of Indonesia	 <p>44 Members</p>
 Brunei	 Hong Kong, China	 Malta	 Republic of Korea	
 Canada	 Iceland	 Netherlands	 Spain	
 Chile	 India	 New Zealand	 Sweden	
 Cyprus	 Ireland	 Norway	 Switzerland	
 Czech Republic	 Israel	 Portugal	 Thailand	

SNOMED CT - Organizational Perspective

SNOMED International



SNOMED International Member

Belgium National Release Center



SNOMED International Affiliate

Vendors - System owners



End-users



Maintains and distributes:

International Edition and all supplementary content and derivatives maintained by SNOMED International

Maintains and distributes:

- Belgium Edition of SNOMED CT
- Value Sets (Care Sets)

Suppliers of clinical information systems

Implements SNOMED CT in their software systems to meet end user requirements

Vision

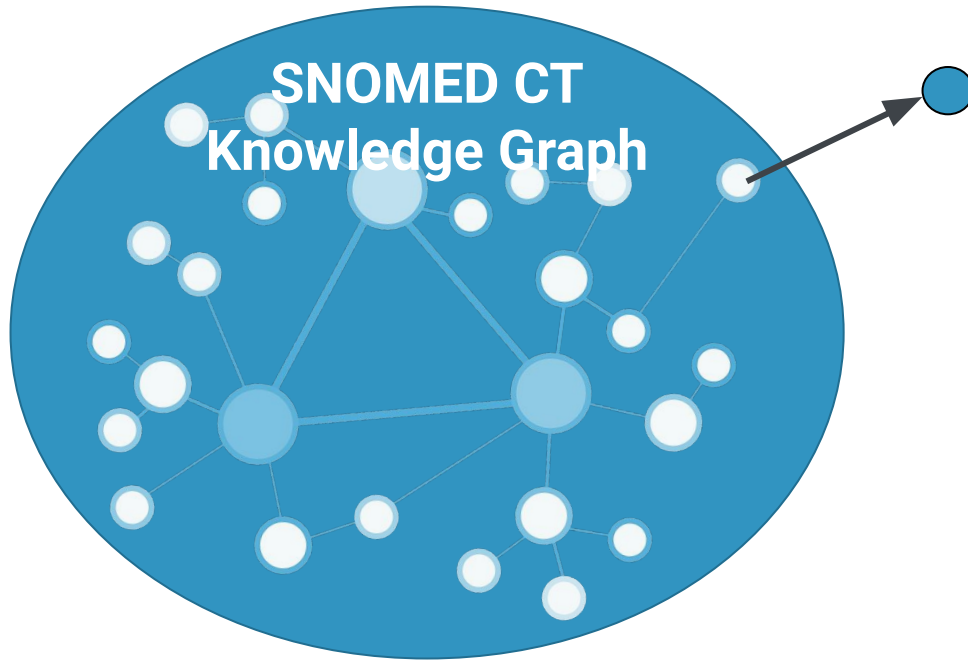
SNOMED
International

By 2025, Clinical Terminologies will be used globally, which will result in better health and improved patient outcomes, supported by one language of health

Delivering

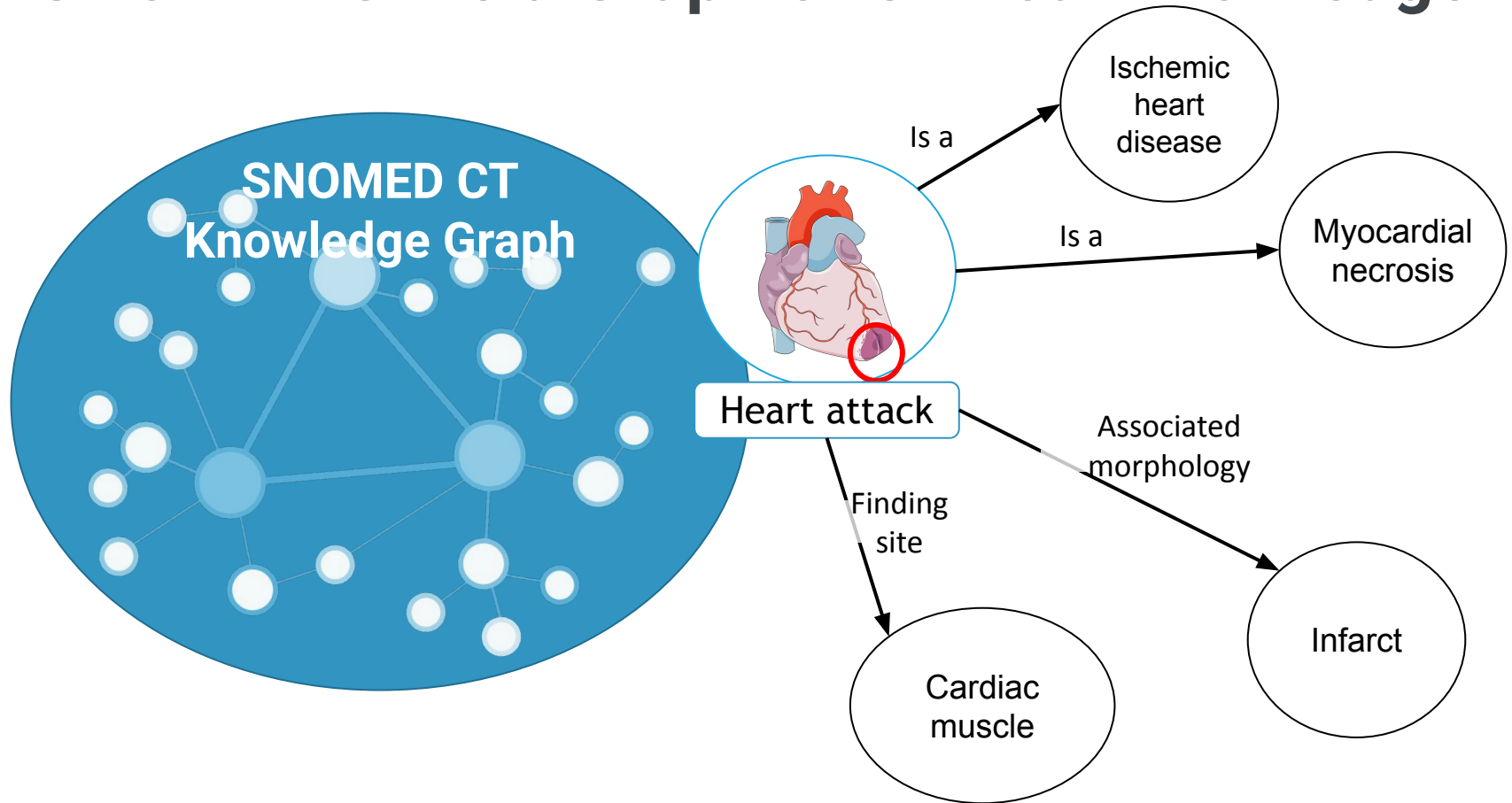
SNOMED CT

SNOMED CT is a Graph of Clinical Knowledge

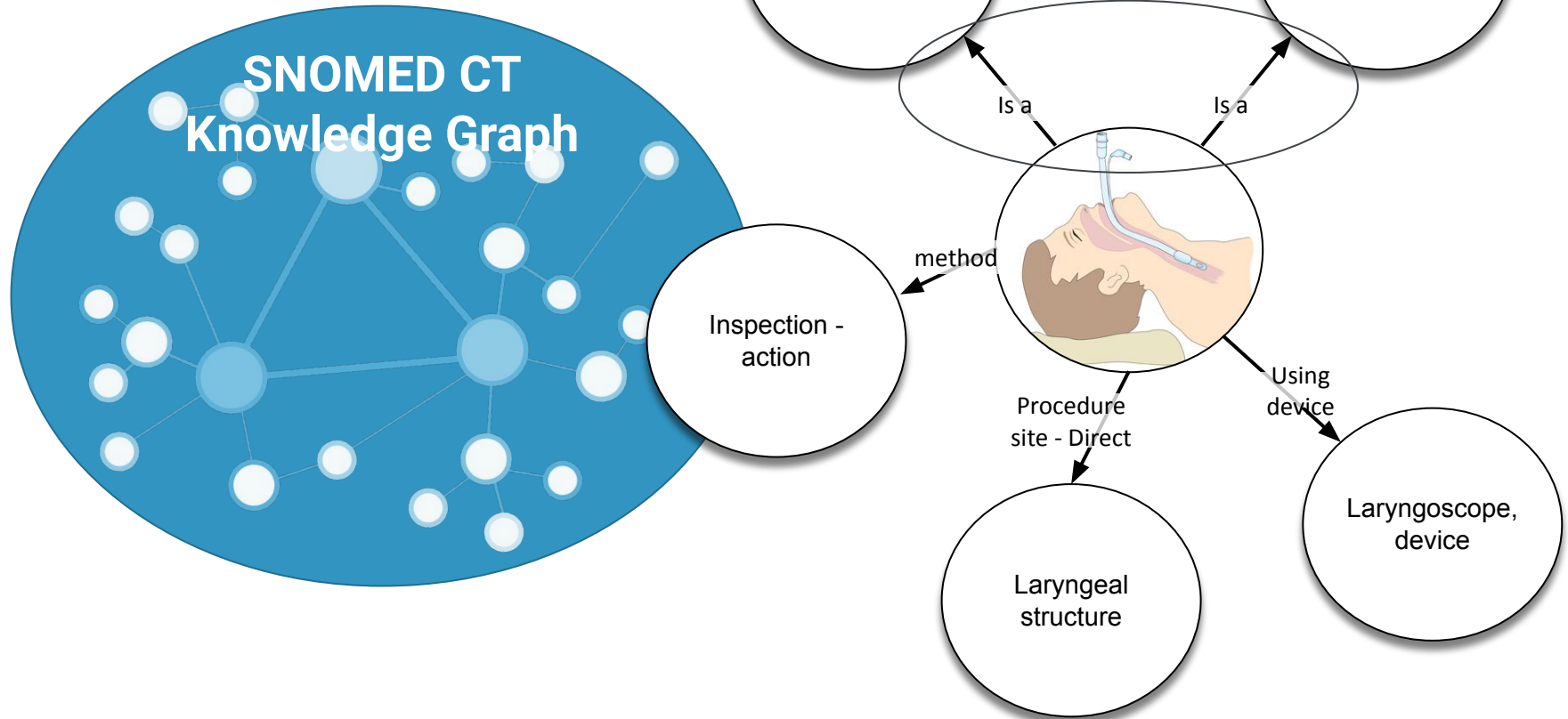


+350 unique clinical concepts linked together via a set of semantic relationships

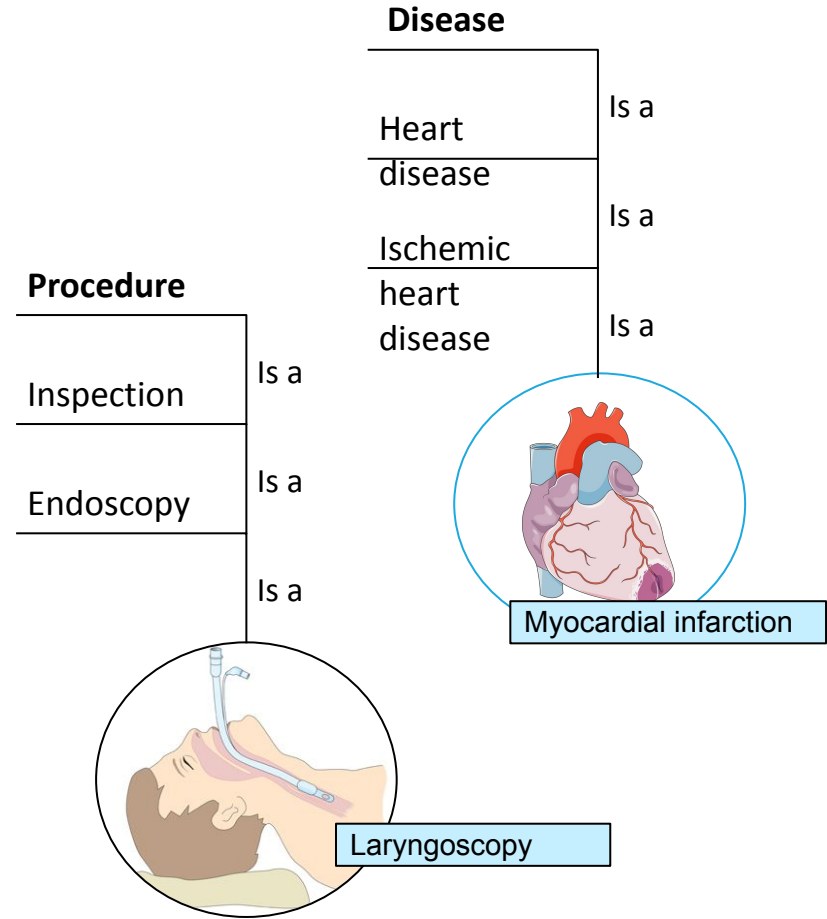
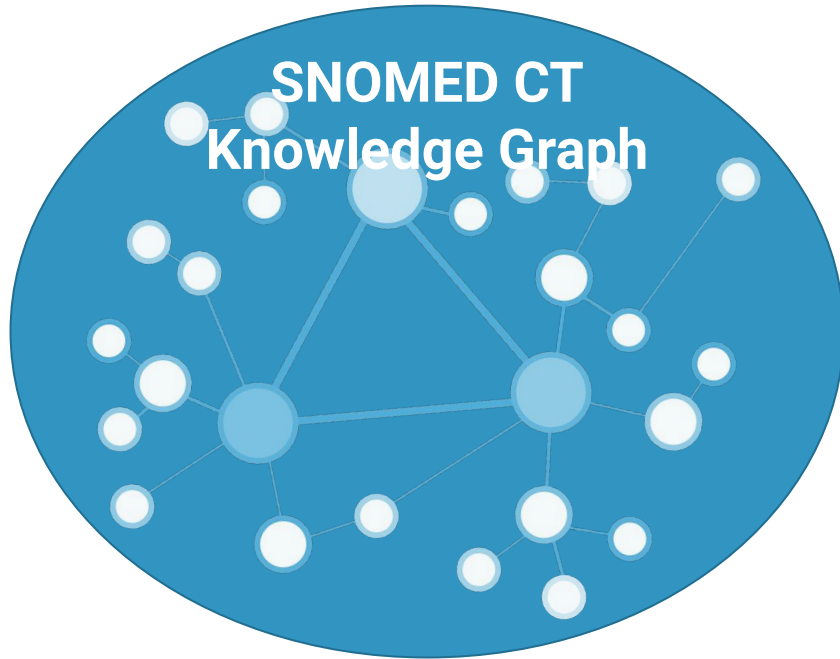
SNOMED CT is a Graph of Clinical Knowledge



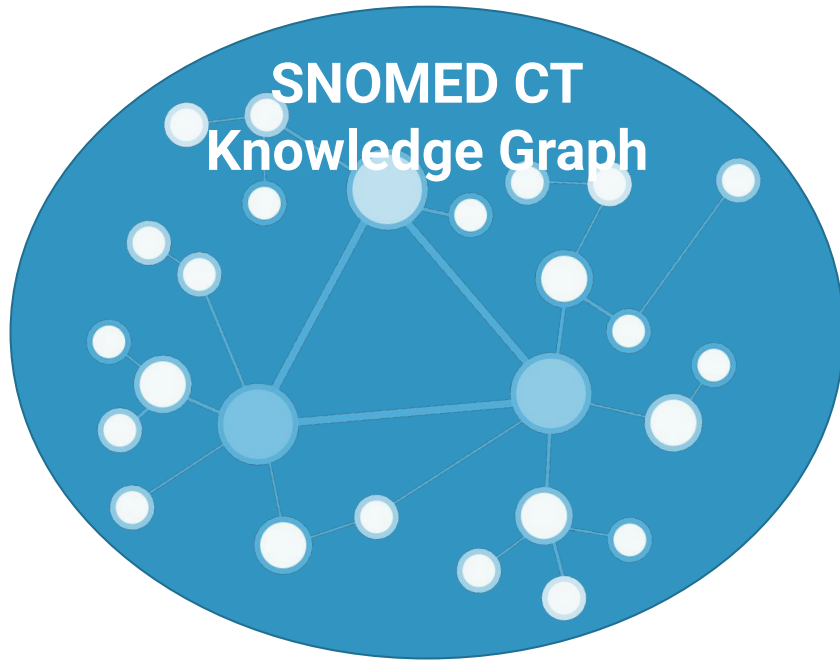
SNOMED CT is a Graph of Clinical Knowledge



Hierarchies



Hierarchies



- ▼ ● SNOMED CT Concept (SNOMED RT+CTV3)
 - ▶ ● Body structure (body structure)
 - ▶ ● Clinical finding (finding)
 - ▶ ● Environment or geographical location (environment / location)
 - ▶ ● Event (event)
 - ▶ ● Observable entity (observable entity)
 - ▶ ● Organism (organism)
 - ▶ ● Pharmaceutical / biologic product (product)
 - ▶ ● Physical force (physical force)
 - ▶ ● Physical object (physical object)
 - ▶ ● Procedure (procedure)
 - ▶ ● Qualifier value (qualifier value)
 - ▶ ● Record artifact (record artifact)
 - ▶ ● Situation with explicit context (situation)
 - ▶ ● SNOMED CT Model Component (metadata)
 - ▶ ● Social context (social concept)
 - ▶ ● Special concept (special concept)
 - ▶ ● Specimen (specimen)
 - ▶ ● Staging and scales (staging scale)
 - ▶ ● Substance (substance)



Hierarchies



Signs and symptoms

Diagnosis

Tests and test results

Procedures

General observations

Functions and abilities

Medical history

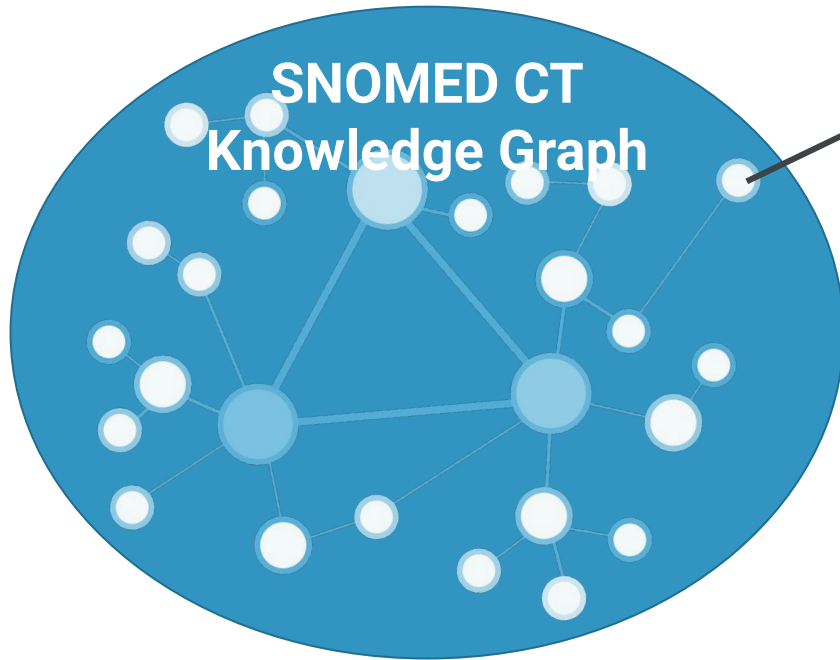
Medication

Social circumstances

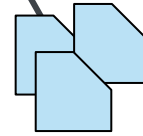
Family history

Care and therapy

SNOMED CT is a Graph of Clinical Knowledge

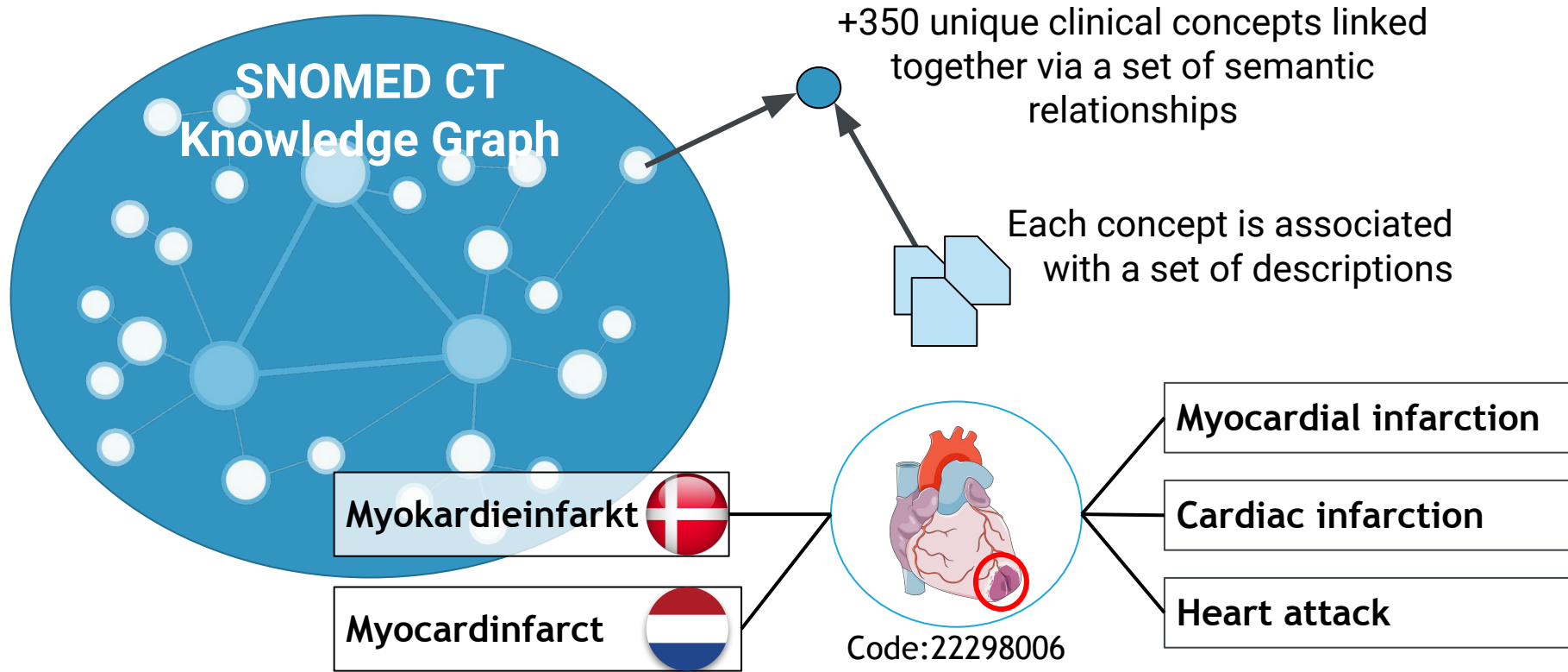


+350 unique clinical concepts linked together via a set of semantic relationships

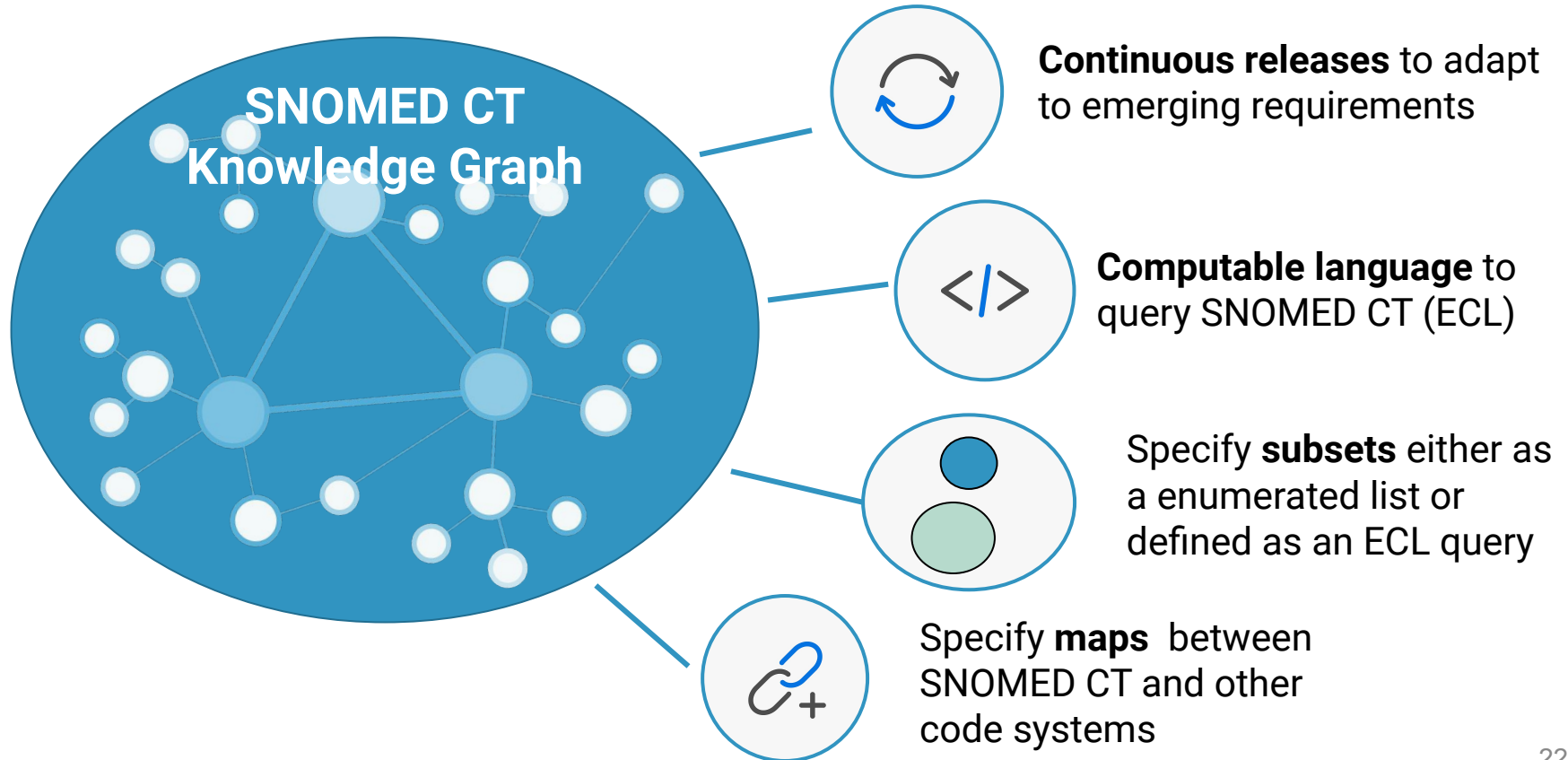


Each concept is associated with a set of descriptions

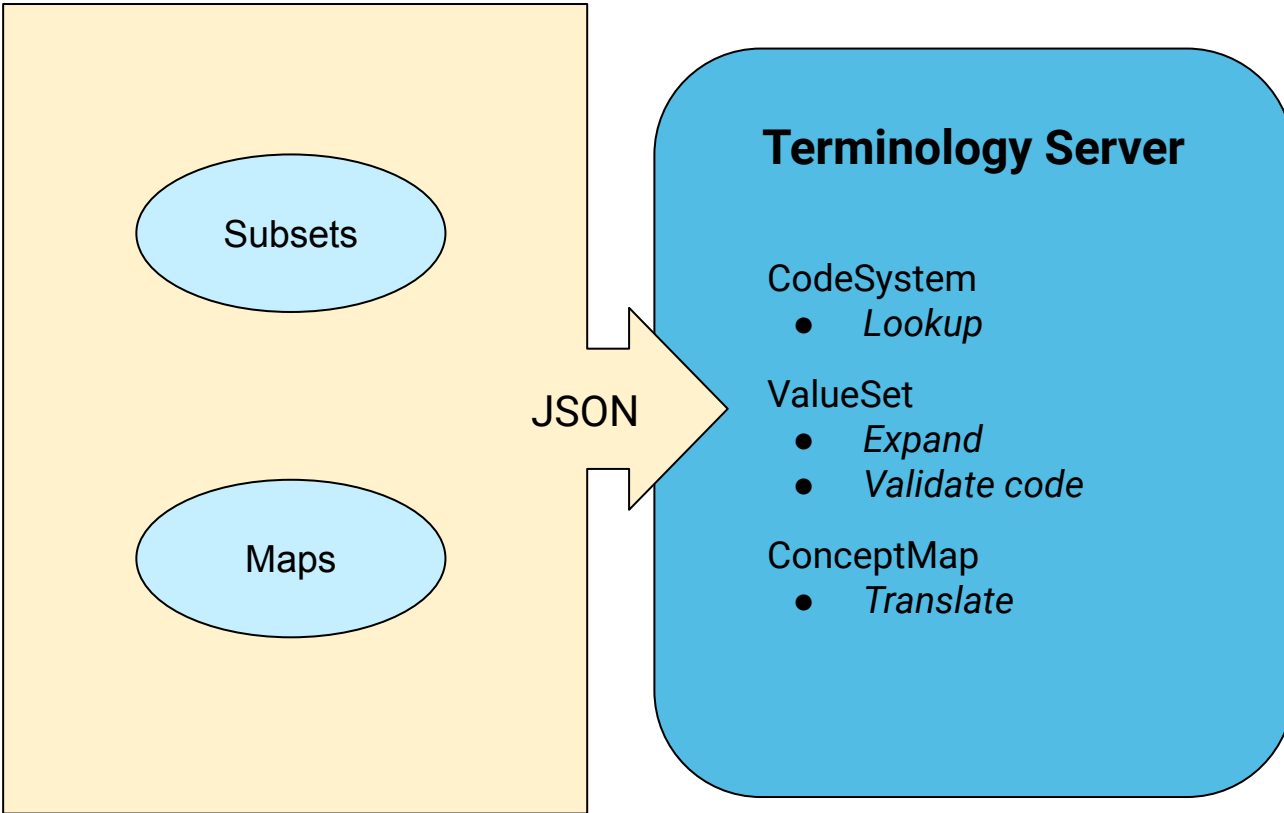
SNOMED CT is a Graph of Clinical Knowledge



SNOMED CT is a Graph of Clinical Knowledge



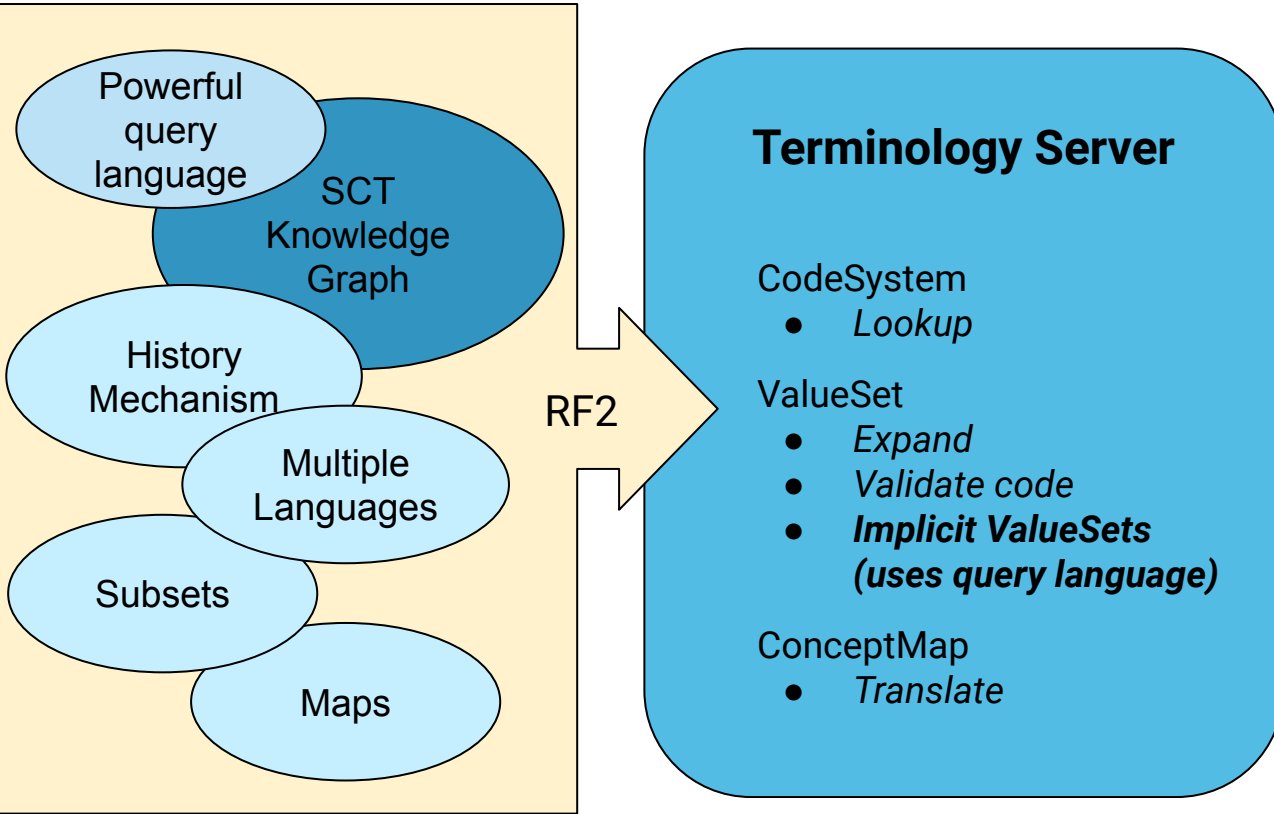
Terminology Services with flat lists



Use Cases

Single Language Data Input	✓
Multiple Language Data Input	✗
Decision Support	✗
Reporting	?
Data Analytics	✗

Terminology Services with SNOMED CT



Use Cases

- Single Language Data Input ✓
- Multiple Language Data Input ✓
- Decision Support ✓
- Reporting ✓
- Data Analytics ✓

A medical professional in blue scrubs is shown from the chest down, holding a tablet. A stethoscope is visible around their neck. The image is overlaid with a complex digital graphic in shades of blue and white. This graphic includes a globe, a padlock with a cross, various hexagons, and the word "MEDICAL" repeated several times. The overall aesthetic is high-tech and medical.

Introduction to Snowstorm

Snowstorm



SNOWSTORM
by SNOMED International

- **Open Source**

- <https://github.com/IHTSDO/snowstorm>
- Apache 2.0 license

- **Features**

- Provides FHIR terminology services
- Cross platform, simple to install and run
- Support for the SNOMED ECL query language
- Version 8.1 will host multiple code systems (LOINC/ICD etc)
- Fast and horizontally scalable using Elasticsearch

- **Tools which leverage Snowstorm**

- SNOMED International Authoring Platform
- SNOMED International Browser
<https://browser.ihtsdotools.org/>



Snowstorm - what it's not.




SNOWSTORM
by SNOMED International

- SNOMED International is not able to provide a commercial support agreement
- SNOMED International is not able to host an international cloud service for use in production systems
 - There is a public Snowstorm instance for reference and manual testing



**Exercise:
Snowstorm Setup and
SNOMED Import**

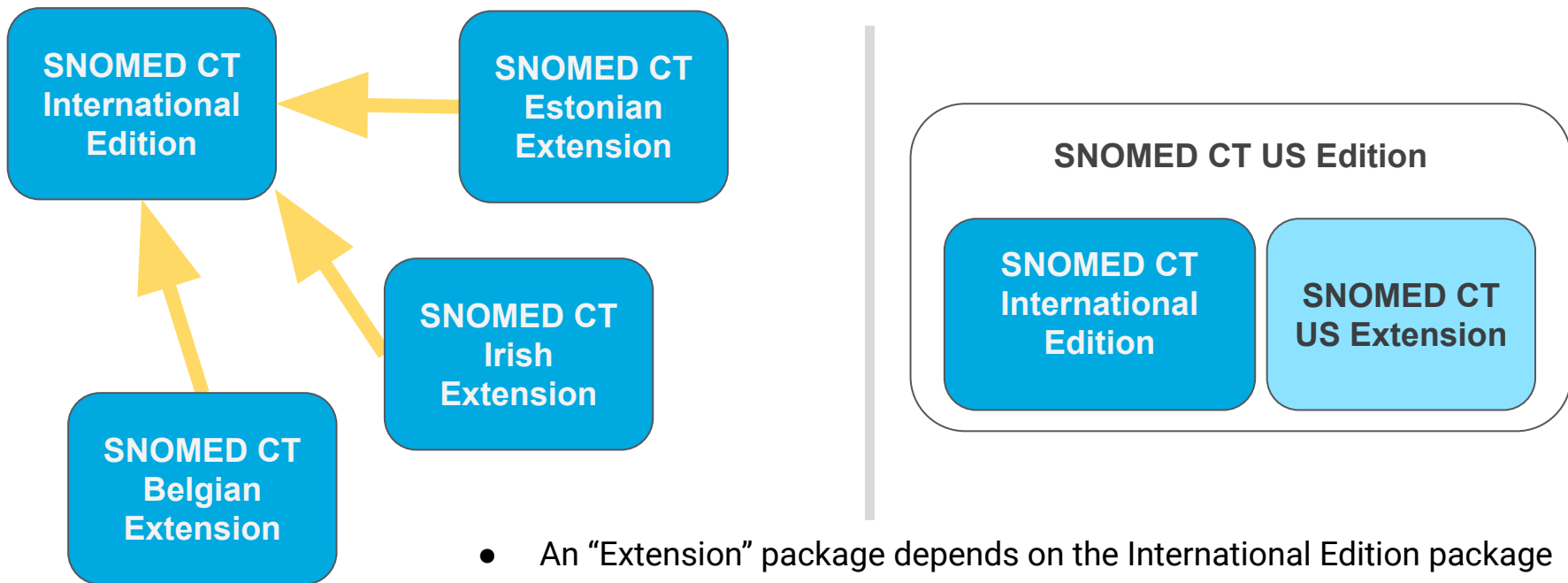
A medical professional in blue scrubs is shown from the chest down, holding a tablet. The image is overlaid with a blue-tinted digital interface featuring hexagonal patterns, a globe, and various medical icons like a cross and a syringe. The word "MEDICAL" is repeated in several places within the digital overlay.

Working with SNOMED CT Releases, Extensions and Snowstorm

Package Format and Layout

- All SNOMED CT releases are distributed in the RF2 format (Release Format 2). This is a set of TSV files compressed as a zip archive.
- Within a release package there are two directories:
 - **Snapshot** - the current state of all components in that edition
 - **Full** - the full history of every component in all releases of the edition

SNOMED CT Edition and Extension Packages



- An “Extension” package depends on the International Edition package
- A “Edition” package contains everything so has no dependencies. These are usually larger than 500MB.

Snowstorm Setup Exercise

- Using your Ubuntu servers we will:
 - Install Elasticsearch and Snowstorm
 - Start loading the International Edition into Snowstorm
.. then continue with the presentation

<http://snomed.org/dev-training>

Releases and Extensions in Snowstorm

SNOMED CT Releases and Extensions

Within a Terminology Server

Snowstorm has a branching mechanism allowing us to:

- Store and access the SNOMED International Edition
- Store and access one or many SNOMED Extensions on top
- Import new releases as they become available
- Retain access to previous SNOMED releases

Snowstorm - Branches

Code Systems and Branches

- Each Code System has a working-branch, containing its SNOMED content, and a version branch, for each release
- The International Edition is stored on a working-branch called **MAIN**, this is the root of the repository
- Extensions working-branches exist under **MAIN** and use a short name matching their Code System
- Examples of Edition/Extension branches:
 - **MAIN** (*The root branch containing the International Edition*)
 - **MAIN/SNOMEDCT-BE** (*The Belgian Extension*)
 - **MAIN/SNOMEDCT-ES** (*The Spanish Translation Extension*)

Snowstorm - Extension Setup

When Snowstorm is started the **SNOMEDCT** Code System and its working-branch **MAIN** is created automatically ready for the terminology content to be imported.

Setting up an extension is a three step process:

1. Import the ***Snapshot*** of the International Edition onto **MAIN**
2. Create the extension Code System “SNOMEDCT-BE”
3. Import the ***Snapshot*** of the additional extension content onto the extension branch **MAIN/SNOMEDCT-BE**

Snowstorm - Extension *Upgrade*



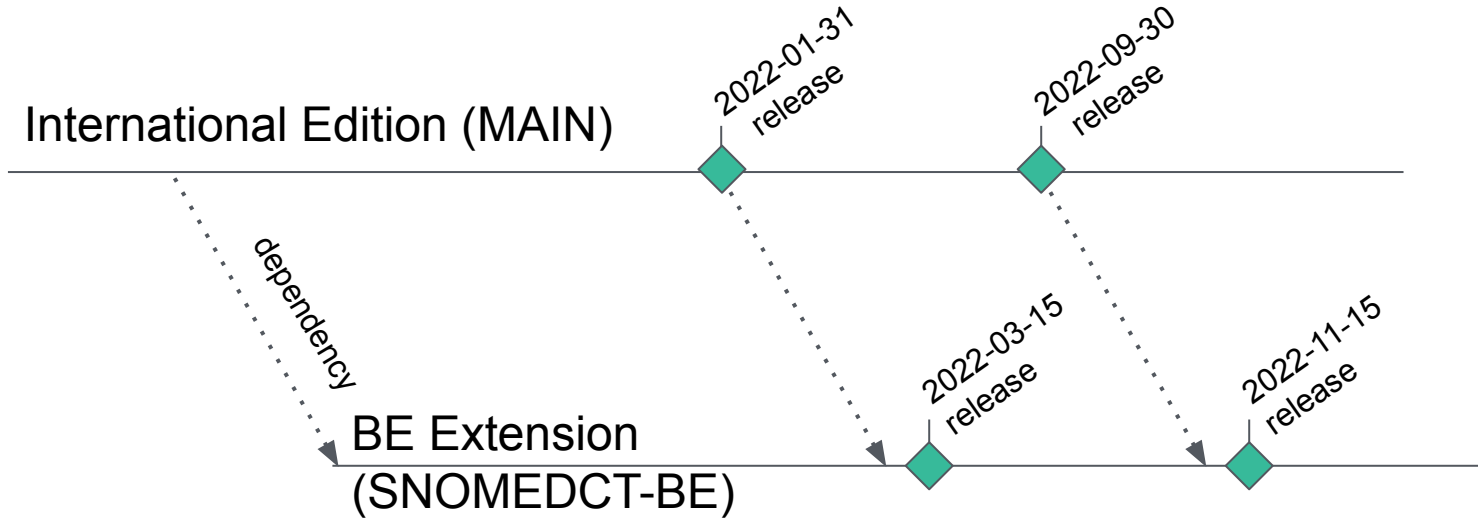
When a new SNOMED CT release becomes available you can import that too. You will still have access to previously imported content.

Upgrading an extension is a three step process:

1. Import the ***Snapshot*** of the new International Edition release into **MAIN**
2. Upgrade the Belgian Code System to depend on the new Int. release
3. Import the ***Snapshot*** of the new extension release onto the Belgian extension branch

Snowstorm - Version Control

- The content of SNOMED releases and extensions are managed like source code repository.
- The content of each International Edition release is imported to MAIN, then the Extension branch is rebased/updated and new Extension content imported.



Snowstorm in Production

Snowstorm in Production

Points to consider:

- What security measures are appropriate?
 - Firewall
 - Read-Only Mode
- Is redundancy needed?
 - Consider a cluster of two or more instances
 - Disaster recovery options (script + backup/restore?)
- Monitoring
 - Snowstorm + Elasticsearch
- How much traffic do you need to support?
 - Consider horizontal scaling

A medical professional in blue scrubs is shown from the chest down, holding a tablet. A futuristic digital overlay is superimposed on the image, featuring a globe, hexagonal patterns, and various medical icons like a cross, a pill, and a syringe. The word "MEDICAL" is repeated in several places within the overlay. The overall color scheme is a monochromatic blue with white and light blue highlights.

Demonstrations

Demonstrations

SNOMED CT Browser

UI Demo

The screenshot shows the SNOMED CT Browser interface. At the top, there are navigation links for 'Release: International Edition', 'Version: 2023-02-28', 'Perspective: Full', 'Feedback', and 'About'. Below this is a search bar with a 'Search' button and a 'Refset' button. The 'Options' panel on the left includes filters for 'Search: Prefix any order', 'Status: Active concepts only', 'Description type: All', 'Language Refsets', and 'Group by concept'. The main area displays 'Concept Details' for 'SNOMED CT Concept (SNOMED RT+CTV3)'. It shows a 'Parents' section with 'Clinical finding (finding)' and a 'Children (162)' section listing various clinical findings such as 'Able to thrive (finding)', 'Able to tolerate being cleaned during toileting (finding)', and 'Abnormal blood oxygen pressure (finding)'.

SNOMED
International

The screenshot shows the SNOMED CT Search Demo UI. At the top, it displays patient information: 'MEDD, Snowy', 'DOB: 2001-08-28', 'Age: 21', 'Sex: Male', and 'MRN: 123456'. Below this is a red banner indicating 'High Adverse Reaction Risks' for 'Penicillin'. The 'Patient Details' section includes 'Current Encounter' information: 'Date/Time: Fri Mar 17 2023 21:26:19 GMT+0100 (Central European Standard Time)'. The 'Allergies / Adverse Reactions' section lists 'Medication', 'Investigations', and 'Immunizations'. The 'Patient Summary' section includes 'Reason for Encounter', 'Diagnosis', 'Procedure', and 'Laterality'. The 'Encounter Notes' section has a 'Save' button. The 'Encounter History' section is a table with columns for 'Reason for Encounter', 'Diagnosis', 'Diagnosis Note', 'Procedure', 'Laterality', and 'Encounter Note'.

Best-practice Search *(If you are an end-user)*

- Text-based (minimize scrolling)
 - Group by concept
 - Multiple prefix any order
 - Sort results rationally
 - Frequency of use
 - Shortest matching term first
- Display pt in selected dialect (part of configuration)
- Potentially allow the display of other accepted terms
- Preconfigured constraints
 - Subtype hierarchy
 - Expression constraint (Set determined by rule)
 - Value set (subset)

Application Demo



<http://snomed.org/ui>

Driven by implicit ValueSets + text filter

A medical professional in blue scrubs is shown from the chest down, holding a tablet. The image is overlaid with a blue-tinted digital graphic featuring a globe, hexagonal patterns, and icons like a medical cross and a syringe. The word "MEDICAL" is repeated in several places within the graphic.

SNOMED International Training and Implementation Resources

Links to Further Information

SNOMED CT Starter Guide

- <http://snomed.org/sg>
Extensions & Customization

SNOMED CT Release File Specifications

- Reference Set Release Files Specification
<http://snomed.org/rfs-refsetspec>

SNOMED CT Terminology Services Guide

- Working with metadata
<http://snomed.org/tsg-metadata>

SNOMED CT Record Services Guide

- <http://snomed.org/rsg-comm>
Using Reference Sets to represent allowable value sets



Links to Further Information

SNOMED International Training & Terminology Services Certification Course

- <https://courses.ihtsdotools.org/>

SNOMED International Implementation Support

- <http://snomed.org/support>

Open Source Repositories

- <https://github.com/IHTSDO>

Getting in touch

- Technical: techsupport@snomed.org
- General: info@snomed.org



Links to Further Information

Mapping

- <https://mapping.ihtsdotools.org>
- <https://snap.snomedtools.org/>

SNOMED CT Browser

- <https://browser.ihtsdotools.org>

Enabling Data Analytics with SNOMED CT

- https://www.youtube.com/watch?v=9aSp31dJ0_E&t=9s

Reference set & translation tool

- <https://refset.ihtsdotools.org>

Release service

- [MLDS - https://mlds.ihtsdotools.org/](https://mlds.ihtsdotools.org/)



**Thank you for your
attention**

See you again Friday!