SNOMED International

Delivering SNOMED CT

Snowstorm
Open Source FHIR Terminology Server

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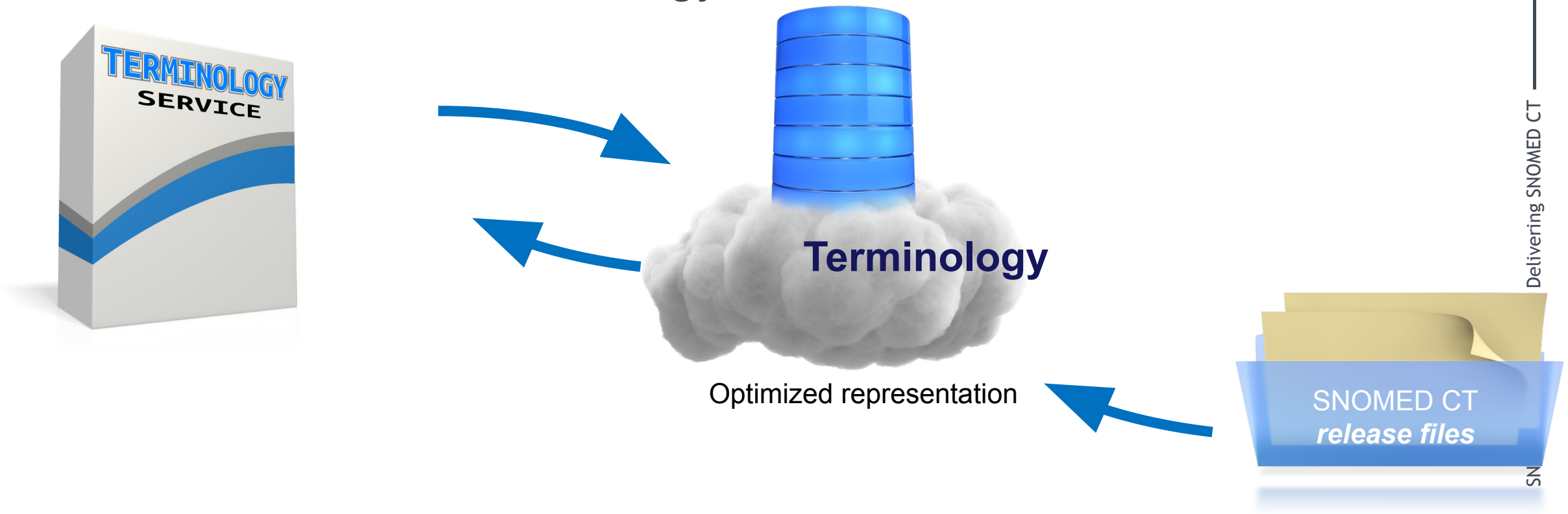
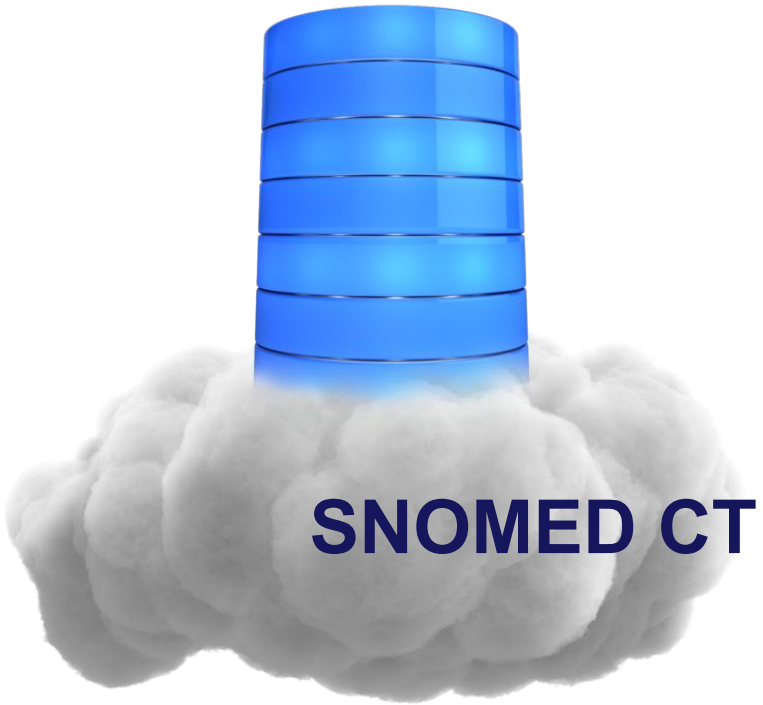
Definition

- Functions performed by software that interacts with one or more representations of a terminology to provide access to information derived from that terminology



SNOMED Specific Terminology Services

- Search SNOMED CT content
  - Using term matching
  - Using subtype hierarchy
  - Using defining relationships
- Retrieve data about selected concepts
  - Descriptions
  - Supertypes and subtypes
  - Defining relationships
- Execute SNOMED CT queries based on stored health record data
- Access maps to/from SNOMED CT





Terminology Service Types

Access

Logic

Update

Content Development

Customization

SNOMED International: Delivering SNOMED CT

Terminology Service Use Cases

- Common services may support different use cases



Clinical data capture

General SNOMED CT browsing

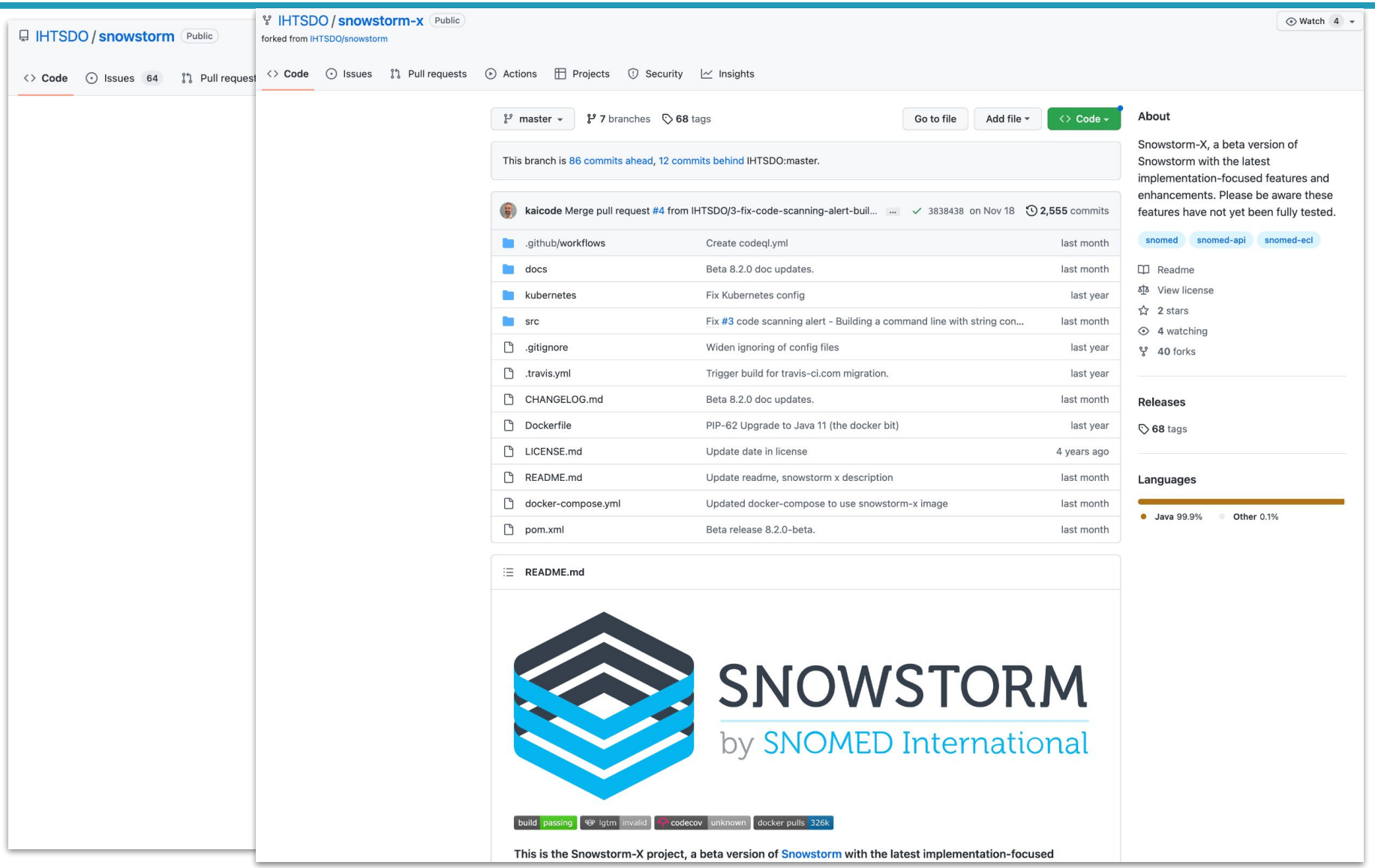
Writing queries
- For analytics
- For decision support rules

Introduction

- Snowstorm
  - https://github.com/IHTSDO/snowstorm
- Features
  - Provides terminology services for SNOMED CT
  - Simple to install and run
    - MacOS, Windows, and Linux
  - Compliant with expression constraint language
  - Supports FHIR terminology services
  - Scalability provided by Elasticsearch
- Tools which leverage Snowstorm
  - SNOMED International authoring platform
  - https://browser.ihtsdotools.org/



Open source repositories



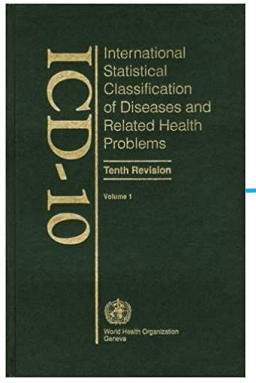
Snowstorm

- REST Application Programming Interfaces (APIs)
  - Snowstorm (native, Swagger)
  - FHIR (uses HAPI libraries)
- SNOMED International
  - Does not provide commercial support
  - Does provide publicly accessible APIs
    - To be used for investigation and educational purposes only
      - Not to be used as part of production health care systems
- Local installations
  - Required when integrating terminology services with EHR
- Licensed under Apache-2.0

Multiple terminologies

SNOMED CT
The global language of healthcare

LOINC®
from Regenstrief

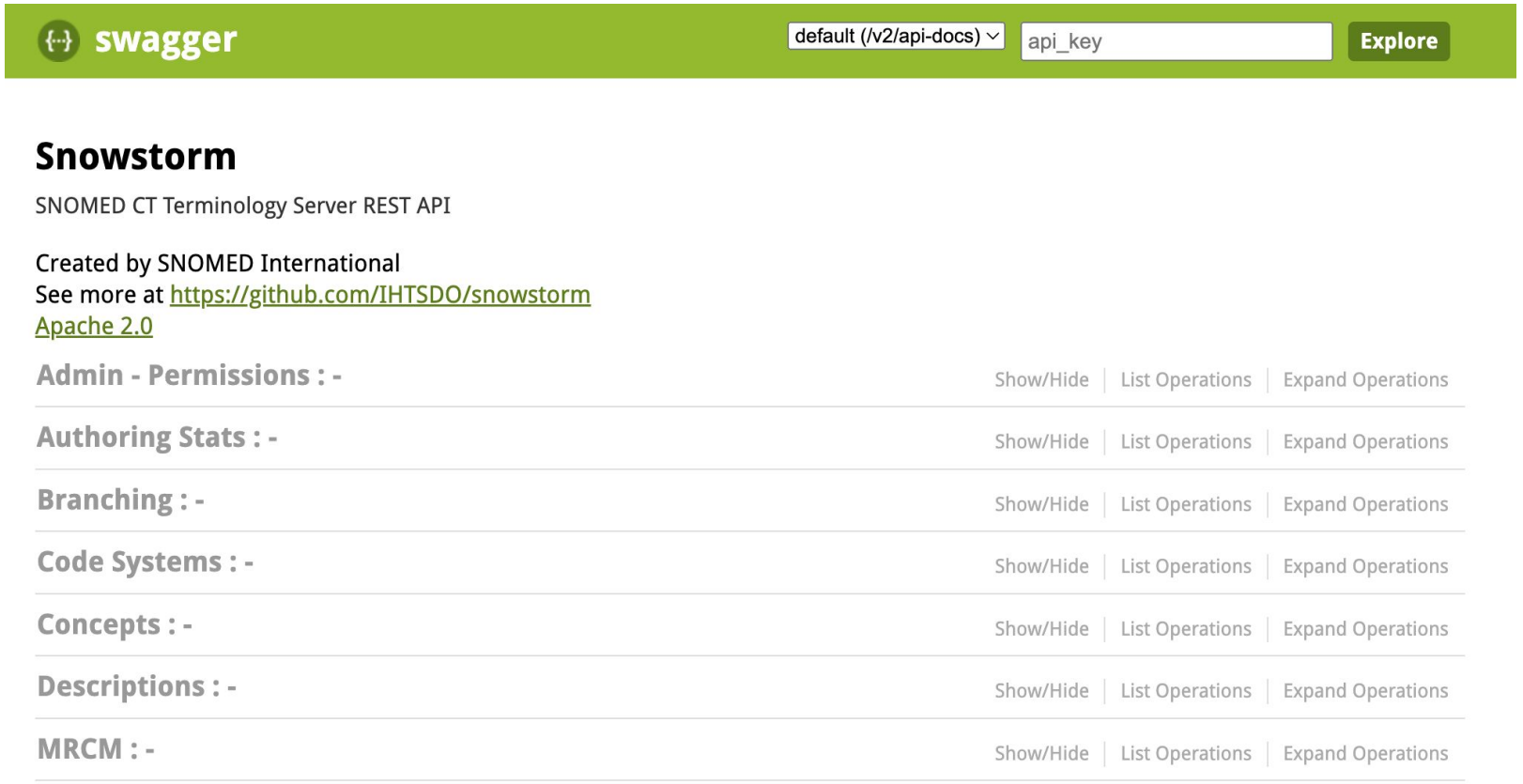


Códigos locales

SNOWSTORM
by SNOMED International

Snowstorm API Demonstration

- Note: API uses a Swagger interface
  - https://snowstorm-training.snomedtools.org/snowstorm/snomed-ct

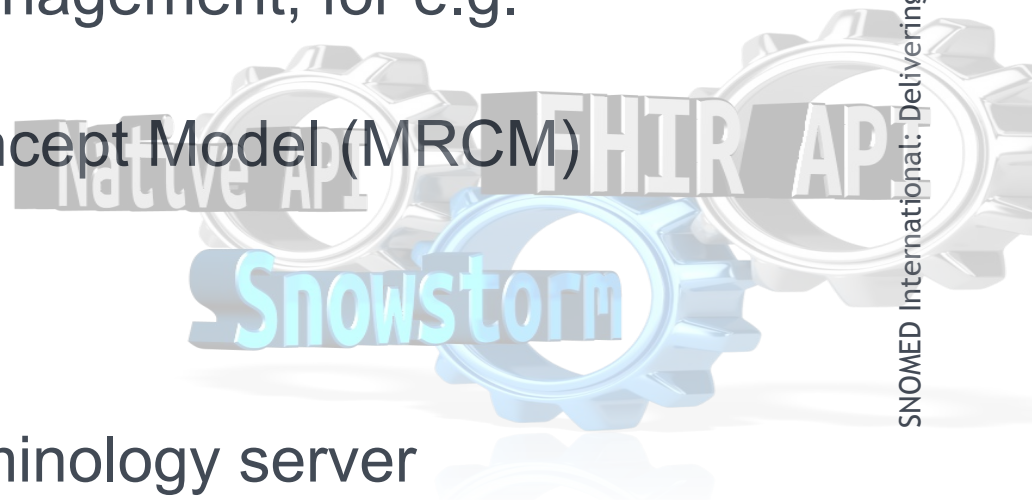


FHIR API Demonstration

- Note: Postman can be used to access Snowstorm FHIR API
  - Download API client here
    - http://postman.com/
  - Description of Snowstorm capabilities and sample requests
    - http://snomed.org/SnowstormPostman
  - Environment (server to submit requests)
    - https://snowstorm-training.snomedtools.org/fhir/

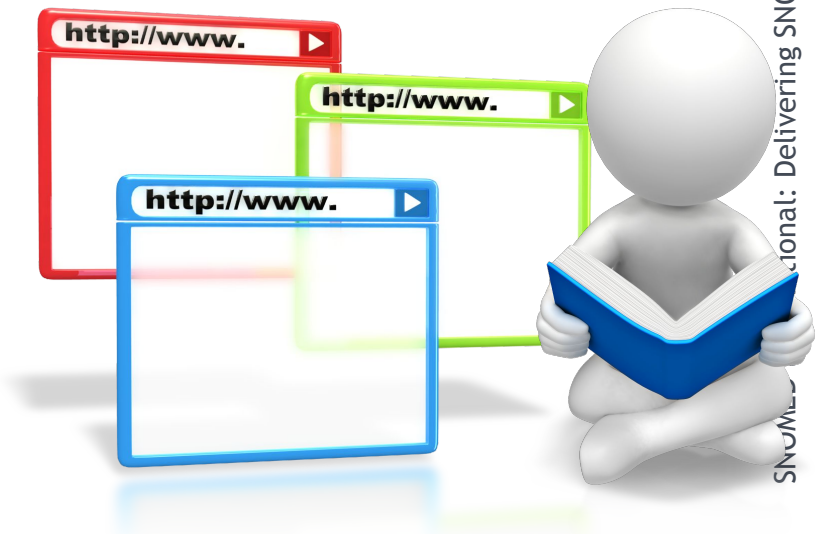
Choosing an API

- Use the **FHIR** API when
  - Accessing a 3rd party terminology server
  - Using more than one code system in the same terminology server
  - Require only basic operations common to many run-time systems, for e.g.
    - Checking the codes in a value set
    - Looking up the term for a code
- Use the **Snowstorm** API when
  - Performing more advanced terminology management, for e.g.
    - Those which require language preferences
  - Require access the Machine Readable Concept Model (MRCM)
  - Need to extend the terminology, for e.g.
    - Adding patient friendly terms, or new concepts
  - Need to extend the API with new services
  - You are only using SNOMED CT in the terminology server



Links to Further Information

- Snowstorm
  - https://github.com/IHTSDO/snowstorm
- Developer Training
  - http://snomed.org/dev-training



Accessing Snowstorm

- SNOMED International public instance
  - API
    - https://snowstorm-training.snomedtools.org/snowstorm/snomed-ct/
    - Includes documentation (Swagger UI)
  - Used for course certification
- Local instance
  - Code and installation instructions
    - https://github.com/IHTSDO/snowstorm
  - API
    - http://localhost:8080



Setting up a Local Instance

- Obtain RF2 release files
- Install Snowstorm
  - See https://github.com/IHTSDO/snowstorm for details
- Import RF2 release files using one of these approaches
  - Command line
    - `java -Xms2g -Xmx4g -jar snowstorm*.jar --import=<Absolute-path-of-SNOMED-CT-RF2-zip>`
  - REST interface
    - Use Swagger "Imports" endpoint
      1. Create import job
      2. Use job id to upload RF2 archive



Release File Types

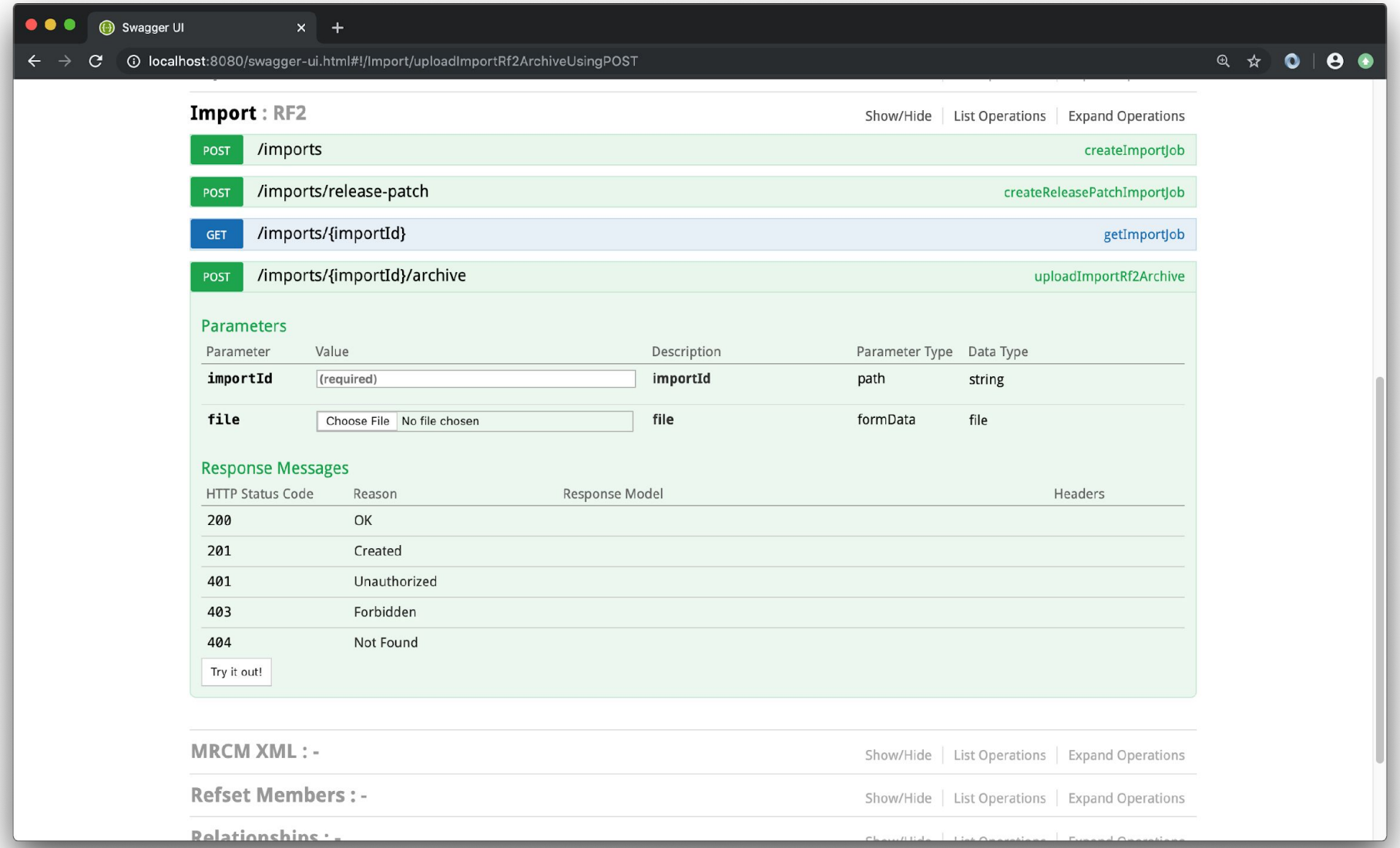
- Different release types can be imported
  - FULL, SNAPSHOT, or DELTA
- Snapshot loads only the current release
  - Outdated content not loaded
  - Faster to load than FULL
  - Recommended for development
- Entire load process takes about 30-60 mins depending on the system used



Command Line Demo



REST Interface Demo



FHIR Terminology Module

HL7 FHIR Release 4

Home | Getting Started | Documentation | Resources | Profiles | Extensions | Operations | Terminologies

Terminology

This page is part of the FHIR Specification (v4.0.1: R4 - Mixed Normative and STU). This is the current published version. For a full list of available versions, see the Directory of published versions

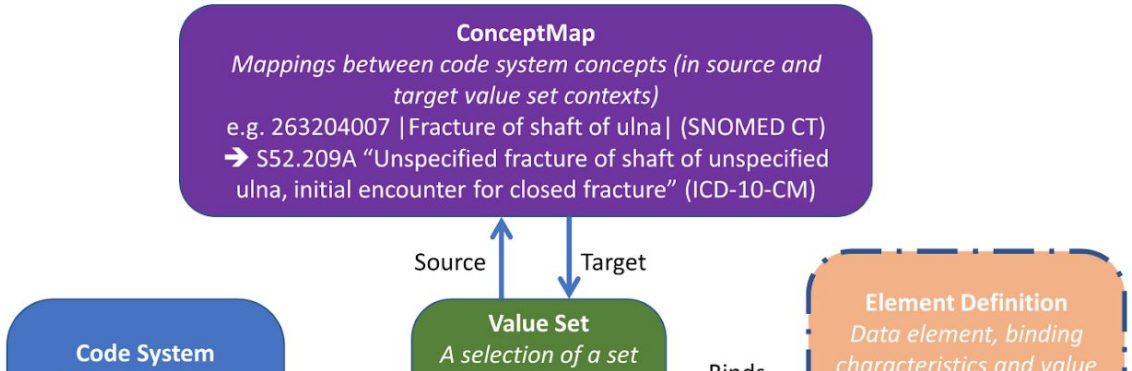
Work Group Vocabulary	Standards Status: Informative

4.0 Terminology Module

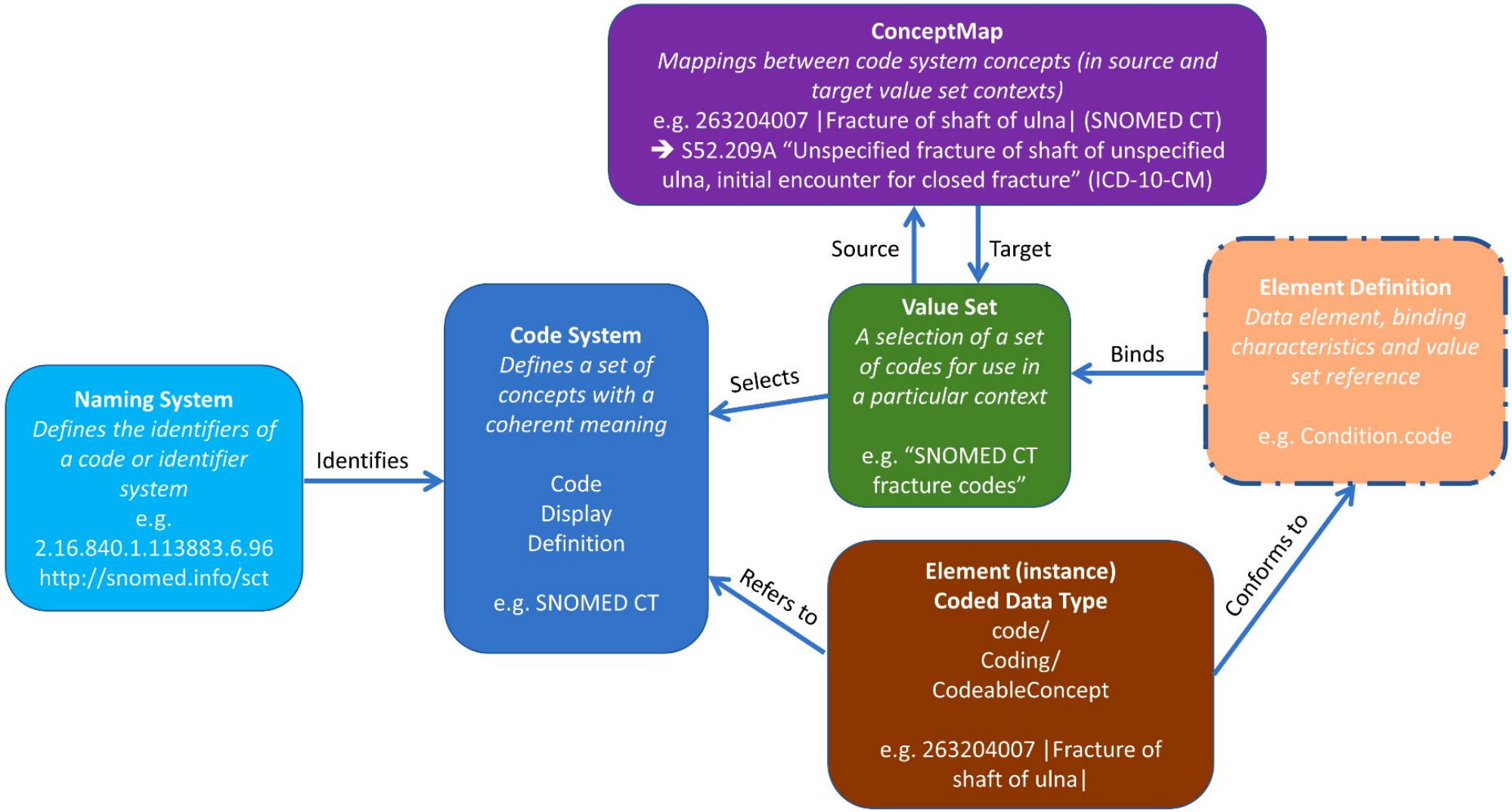
4.0.1 Introduction

The Terminology Module provides an overview and guide to the FHIR resources, operations, coded data types and externally-defined standard and FHIR-defined terminologies that are used for representing and communicating coded, structured data in the FHIR core specification and profiles. Collectively, these capabilities are used to provide the terminology service functionality required for supporting the use of coded data in FHIR resources throughout the specification as described in the other modules.

The primary terminology-related structures and their relationships are shown below:



FHIR Terminology Module



Operations

4.0.2 Index

The Terminology Module covers the following:

Resources

- CodeSystem
- ConceptMap
- TerminologyCapabilities
- ValueSet
- NamingSystem

Terminology Service

- Terminology Service Documentation

Operations

CodeSystem	ValueSet	ConceptMap
$lookup	$expand	$translate
$validate-code	$validate-code	$closure
$subsumes		
$find-matches		

Coded Data Types

- code
- Coding
- CodeableConcept

Data Types

- **Code** is considered a simple data type
  - Code by itself has limited use because we don't know what the code refers to
- **Coding** and **CodeableConcept** are complex data types
  - Coding is what we use to represent additional aspects of SNOMED CT concepts
    - Has the following structure
      - System
      - Version
      - Code
      - Display
  - CodeableConcept
    - Allows you to have many codings all expressing the same thing
- **Code** is used by **Coding** which is used by **CodeableConcept**

Data Types

```
"valueCodeableConcept": {
        "coding": [
            {
                "system": "http://snomed.info/sct",
                "code": "197433003",
                "display": "Polyp of gallbladder (disorder) "
            }, {
                "system": "http://hl7.org/fhir/sid/icd-10 ",
                "code": "K82.8",
                "display": "Other specified diseases of gallbladder "
            }
        ],
        "text": "Gallbladder polyp"
    }
```

RESTful API

- General purpose client/server interface
  - Used to push/pull data between FHIR compliant systems
- Transactions performed directly on server using an HTTP request/response
- FHIR resources have a set of defined interactions
  - Used to manage resources

Interaction	Description	HTTP Method
Read	Accesses the current contents of a resource	GET
Create	Creates a new resource in a server-assigned location	POST
Update	Creates a new current version of an existing resource	PUT
Delete	Removes an existing resource	DELETE

Table 1: Examples of FHIR resource interactions

SNOMED URIs

Form

The URIs that identify unversioned editions (i.e. editions) and versioned editions (i.e. versions) take the following respective forms:

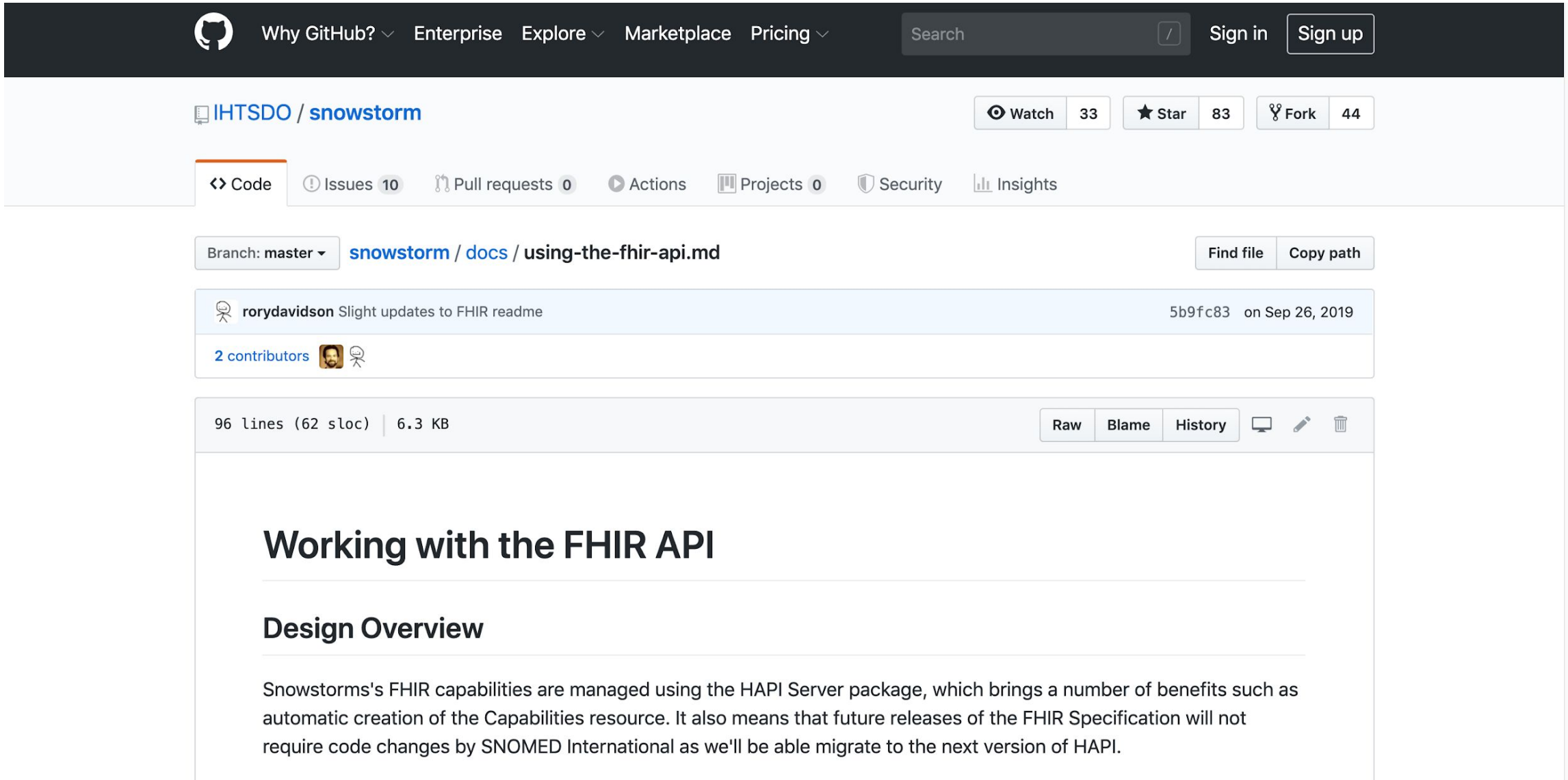
http://snomed.info/sct/{sctid}

http://snomed.info/sct/{sctid}/version/{timestamp}

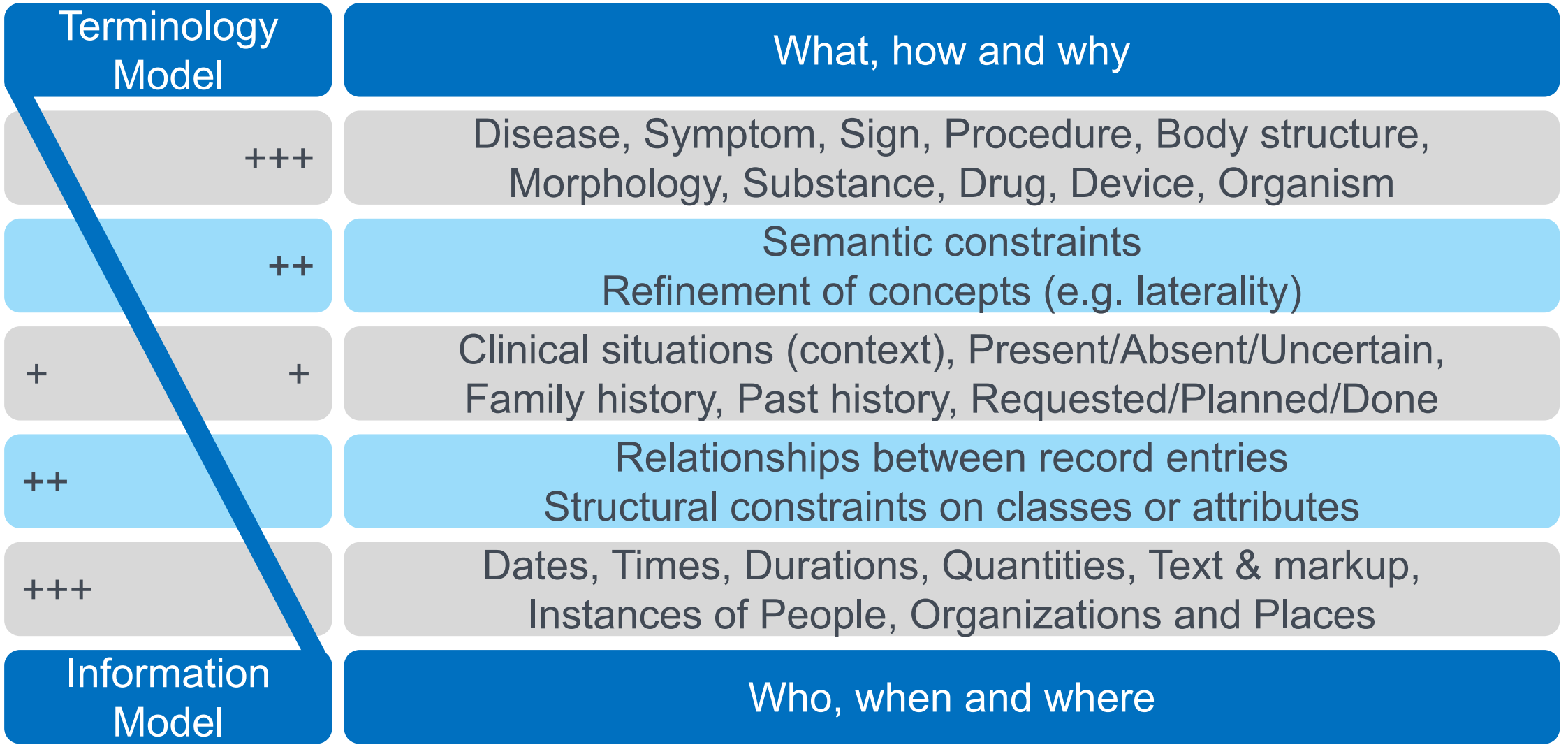
Table 2.1-1: Examples

Resource	URI
SNOMED CT International Edition	http://snomed.info/sct/900000000000207008
SNOMED CT International Edition, 20130731	http://snomed.info/sct/90000000000207008/version/20130731
SNOMED CT-AU	http://snomed.info/sct/32506021000036107
SNOMED CT-AU, 31 May 2013	http://snomed.info/sct/32506021000036107/version/20130531
SNOMED CT-AU, 30 Nov 2012	http://snomed.info/sct/32506021000036107/version/20121130
SNOMED CT-SE	http://snomed.info/sct/45991000052106

GitHub Snowstorm FHIR API



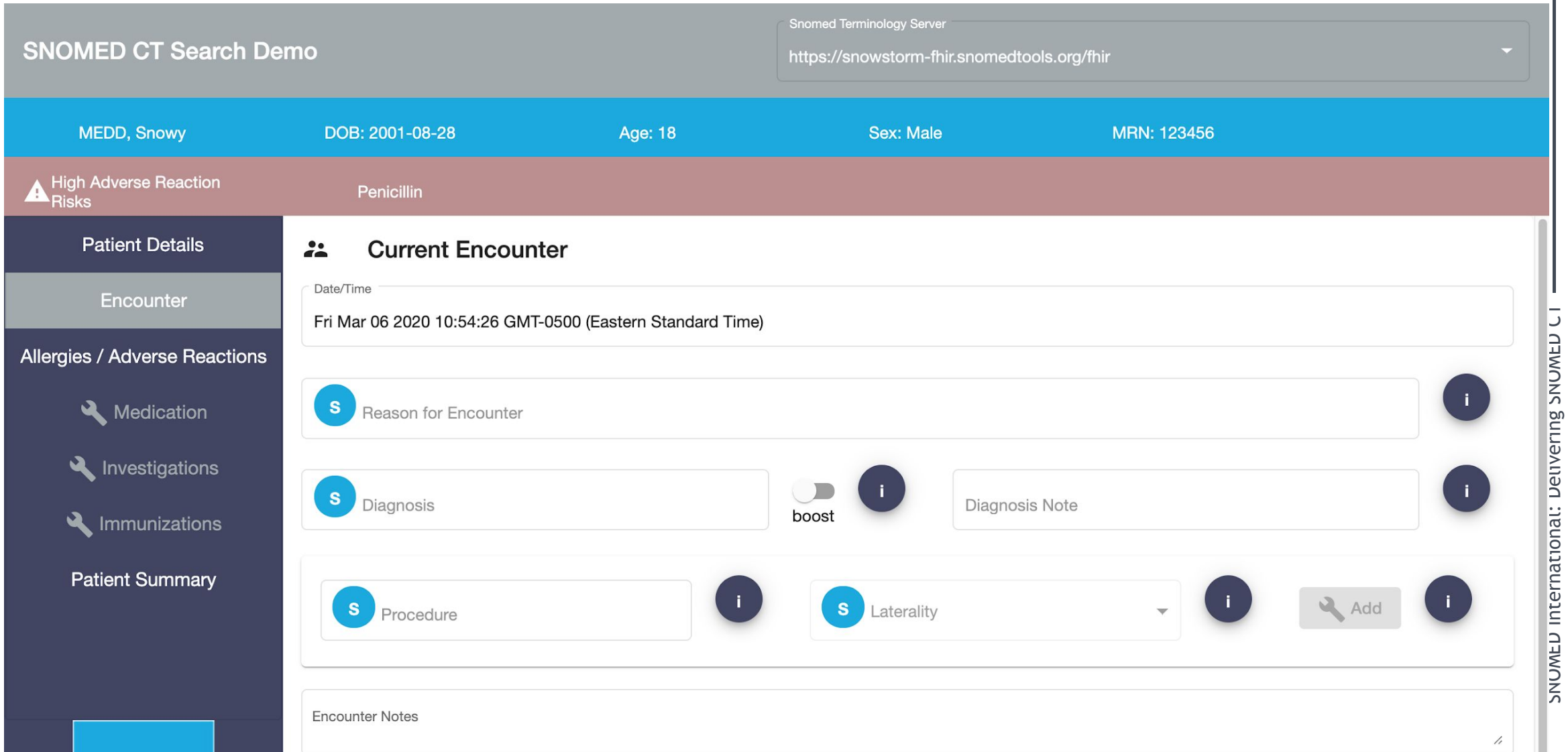
Spectrum of Strengths of Terminology and Information Models



SNOMED on FHIR Working Group

- Established in 2017 to support FHIR implementation
  - Which specifically uses SNOMED CT
  - Formed out of the partnership between SNOMED International and HL7 International
- Designed to be Member-driven
  - Co-chairs from Member organizations
  - Priorities based on Member's national implementation requirements
- Produces and publishes concrete deliverables such as
  - Profiles, value sets and a SNOMED FHIR Implementation Guide
- Progresses the collaborative work of using SNOMED CT with HL7 FHIR
- Meets regularly focusing on two streams
  - Terminology Services - concerned with server implementation behaviour
  - Terminology Binding - concerned with clinical Resources
- More information - http://snomed.org/fhir

UI Demo



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Links to Further Information

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  - https://github.com/IHTSDO/snowstorm
- SNOMED on FHIR
  - http://snomed.org/fhir
- SNOMED CT Search Demo
  - http://snomed.org/ui
- HL7 FHIR
  - http://hl7.org/FHIR



THANK YOU

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