



Technical Architecture & Vision

Dr. Jay Kola
Clinical Architect
Information Standards Division
MOH Holdings Pte Ltd
Singapore

Date : 28/06/2011

Outline

- What is Snofyre?
- How to use Snofyre?
- Snofyre Technical Architecture
- How to use Snofyre API?
- Relevance to Implementers
- Snofyre Community

Snofyre – Vision

What is Snofyre?

Snofyre – Background

- Snofyre: SNOmed Framework for querY and REtrieval
- By-product of work carried out at NHS CFH, UK on querying of SNOMED CT coded data.
- How do we demonstrate end to end ‘querying’?
 - SNOMED CT in anger!
- SNOMED CT related documentation: 1000+ pages
- Translate this ‘something that works’!

What is Snofyre?

- Obvious Answer: A demonstrator application for querying SNOMED CT encoded data
- Snofyre Application: Query authoring and execution interface for
 - Authoring queries using SNOMED CT concepts (or expressions)
 - Refine queries using subsumption, exclusion, etc
 - Executing queries defined SNOMED CT concepts against pre or post-coordinated SNOMED CT encoded data.
- Snofyre API – Collection of generic services that implement
 - SNOMED CT content access services
 - Search and User interface related services
 - Query execution and resolution services

What is Snofyre? - 2

- Educational artefact
 - Example implementation of SNOMED CT related application services.
- A rapid prototyping application
 - Generates data for a given clinical example; for example you can easily generate patient records that contain Diabetes
- Snofyre is NOT:
 - A reference implementation for SNOMED CT
 - A production ready application

What is Snofyre? - 3

- Reflects an understanding of:
 - Terminology (SNOMED CT)
 - Software development
 - Clinical data analytics
- Some stats...

Project Cost

This calculator estimates how much it would cost to hire a team to write this project from scratch.

Include	Markup And Code
Codebase	52,907 LOC
Effort (est.)	12 Person Years
Avg. Salary	\$ 55000 /year
\$686,923	

Snofyre, updated 25 Jun 2011 more at [ohloh](#)

Lines of Code By Language

Language	Code Lines
Java	33,714
XML	18,787
HTML	364
DOS batch script	20
Groovy	16
shell script	5
MetaFont	1

Snofyre – Hands on

How to use Snofyre

Snofyre App Tasks

- Launch Snofyre
- Simple Query Creation & Execution
 - Create new query for patients who have Myocardial Infarction
 - Execute this query (Select Query Menu → Execute Query)
- Simple Query Creation, Save and Load
 - Create a new query for patients who have Diabetes
 - Save this query to a file called '*diabetes.xml*' on your Desktop.
(Select File Menu → Save Query)
 - Clear this query, by clicking on the '**New Query**' button.
 - Now Load the stored query from the file on your Desktop.
(Select File Menu → Load Query from file)
- Complex Query Creation and Execution
 - Create new query for patients who have Myocardial Infarction with 'Severity' attribute value 'Mild'
 - Execute this query

Snofyre App Tasks - 2

- Logical Query Creation and Execution
 - Create new query for patients who have Myocardial Infarction **AND** Asthma
 - Execute this query
 - Load the existing query for patients who have Myocardial Infarction **OR** Asthma (MI-or-Asthma.xml file in *'queries'* folder)
 - Execute this query
- Data Generation
 - Create a query for patients with 'Myocardial Infarction'
 - Generate 10 records that contain MI or any of its types
 - Store this query to your Desktop
- Exporting Query Execution Results
 - Load the previously stored 'Myocardial Infarction' query.
 - Execute the 'Myocardial Infarction' query from previous example; verify results returned
 - Export the results to a file on your Desktop

Snofyre – Technical Architecture

What's under the hood?

Snofyre - Overview

The screenshot displays the Snofyre application interface, which is built on the Sappheiros Desktop UI framework. The interface includes a menu bar (File, Query, Data, Tools, View, Help) and a toolbar with various icons. A vertical sidebar on the left is labeled "3 : Query Authoring". The main workspace is divided into two panels: "Query Expression" and "Results Panel".

Query Expression Panel:

Active Query
ALL patients who have *Sudden onset AND/OR short duration* , *Fatal* , *Myocardial infarction* or ANY of it its types

Results Panel:

Query Results
Number of record entries satisfying criteria in the query : 13
Time taken to return results for query : 191 milliseconds
☐ Display only unique patient count

The results are displayed in a table with two columns: "Free text entry" and "Normal Form".

Free text entry	Normal Form
Acute fulminat	502005=1813100
Acute fulminat	502005=1813100
Acute fulminat	502005=1813100
Acute fulminat	502005=1813100
Acute fulminat	502005=1813100
Acute fulminat	502005=1813100
Acute fulminat	502005=1813100
Acute fulminat	502005=1813100
Acute fulminat	502005=1813100
Acute fulminating , Fatal , Myocardial infarction	64572001 : 246112005=399166001 , 263502005=1813100
Acute fulminating , Fatal , Myocardial infarction	64572001 : 246112005=399166001 , 263502005=1813100
Acute fulminating , Fatal , Myocardial infarction	64572001 : 246112005=399166001 , 263502005=1813100

At the bottom of the interface, there are two tabs: "2 : Data Generation" and "1 : Results Explanation". A status bar at the very bottom indicates "Finished executing query".

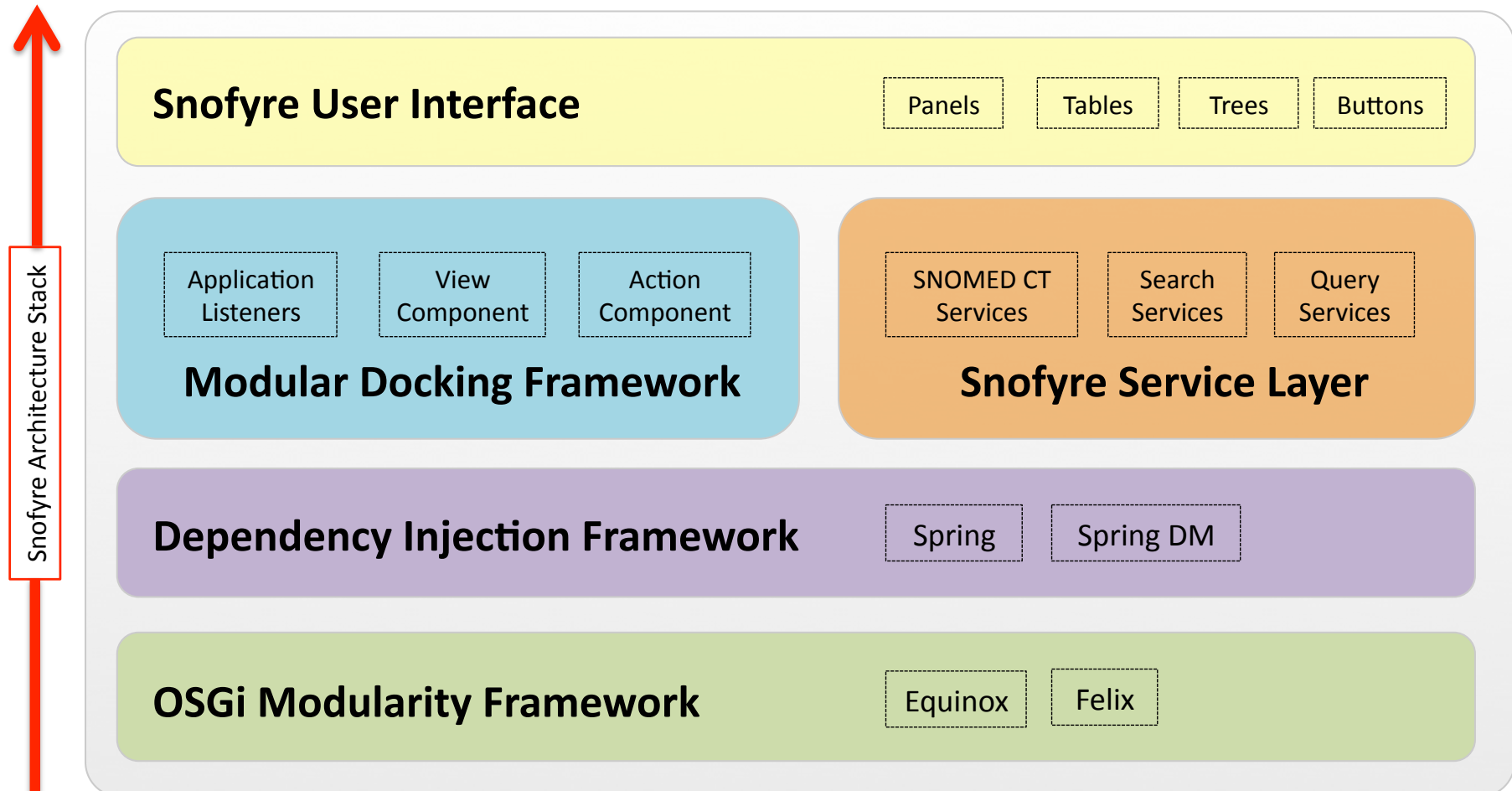
Built on top of reusable services!

1. SNOMED CT Services
2. Search Services + User Interface
3. Query Services

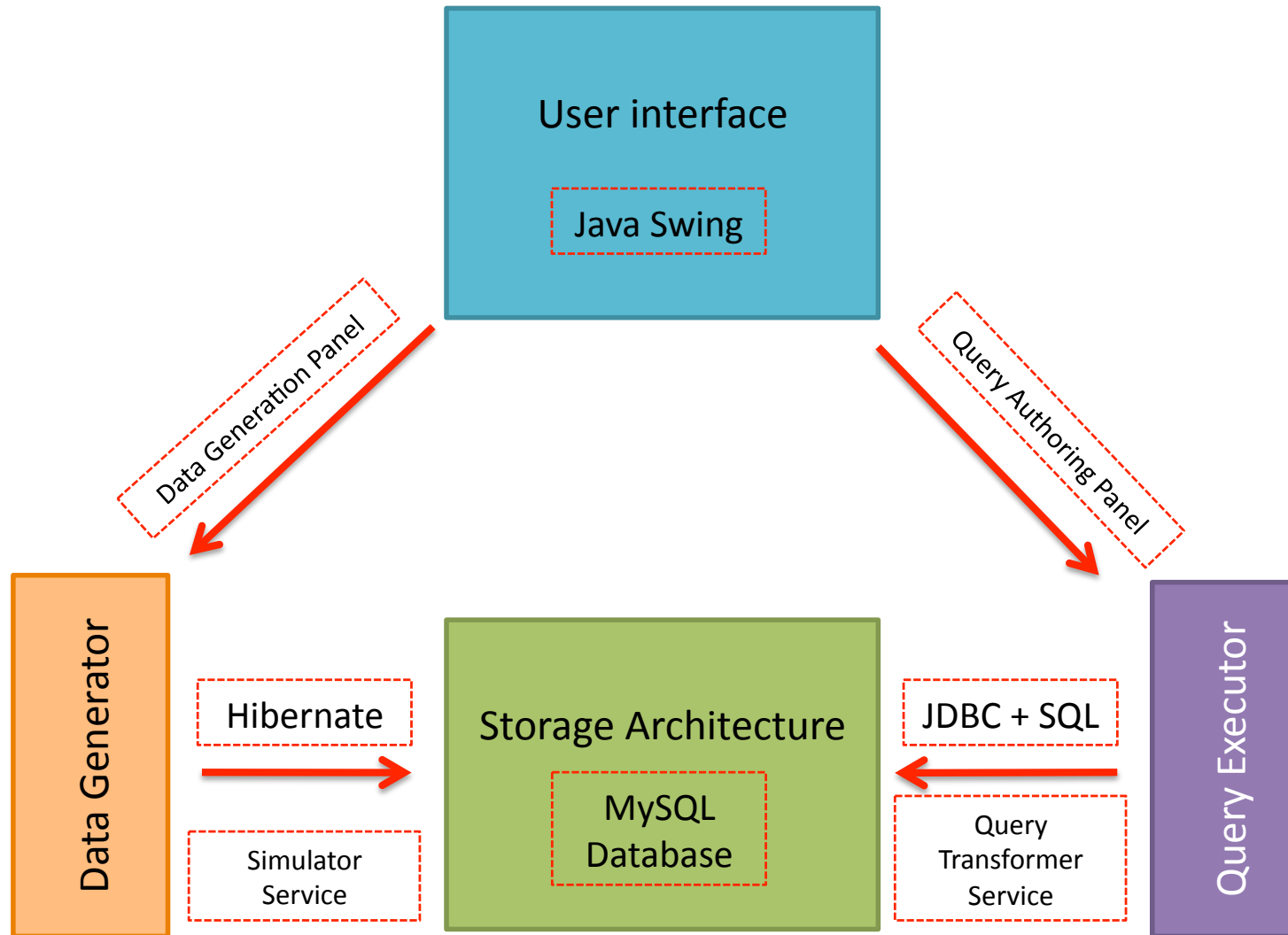
Snofyre - Overview

- When you refer to Snofyre; you could refer to
 - Snofyre Application
 - Snofyre API
- **Application** - Modular, OSGi Java application
 - Eclipse's framework
 - Easy to integrate into an Eclipse RCP
- **API** - Service oriented architecture
 - Services are functional units
 - OSGi services : Eclipse equinox services
 - Can be redeployed as a web services (web app)
- Dynamic behaviour
 - OSGi + Spring Dynamic Modules
- Frameworks used
 - Hibernate, Spring, Spring DM, Apache libraries...

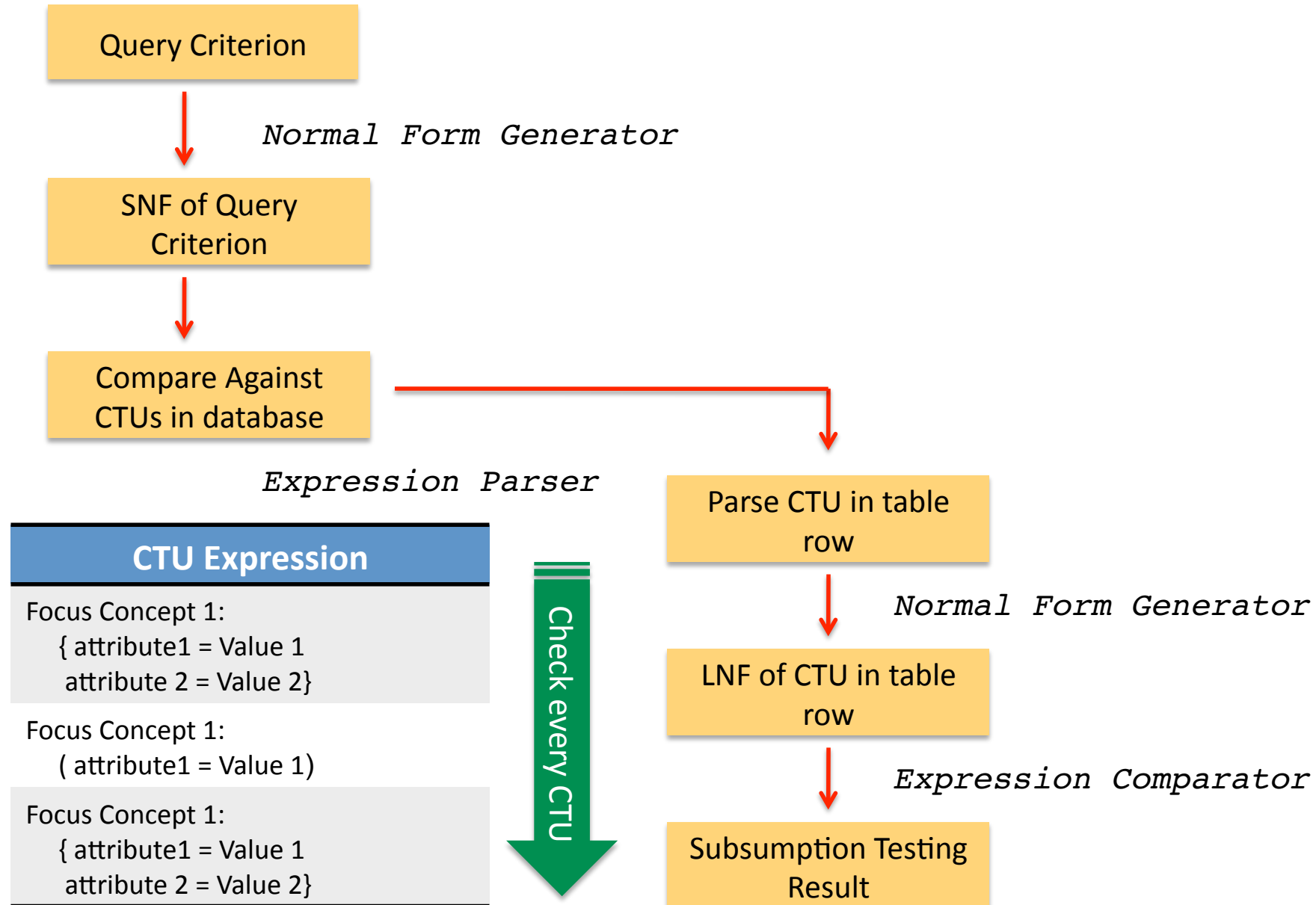
Application Stack Overview



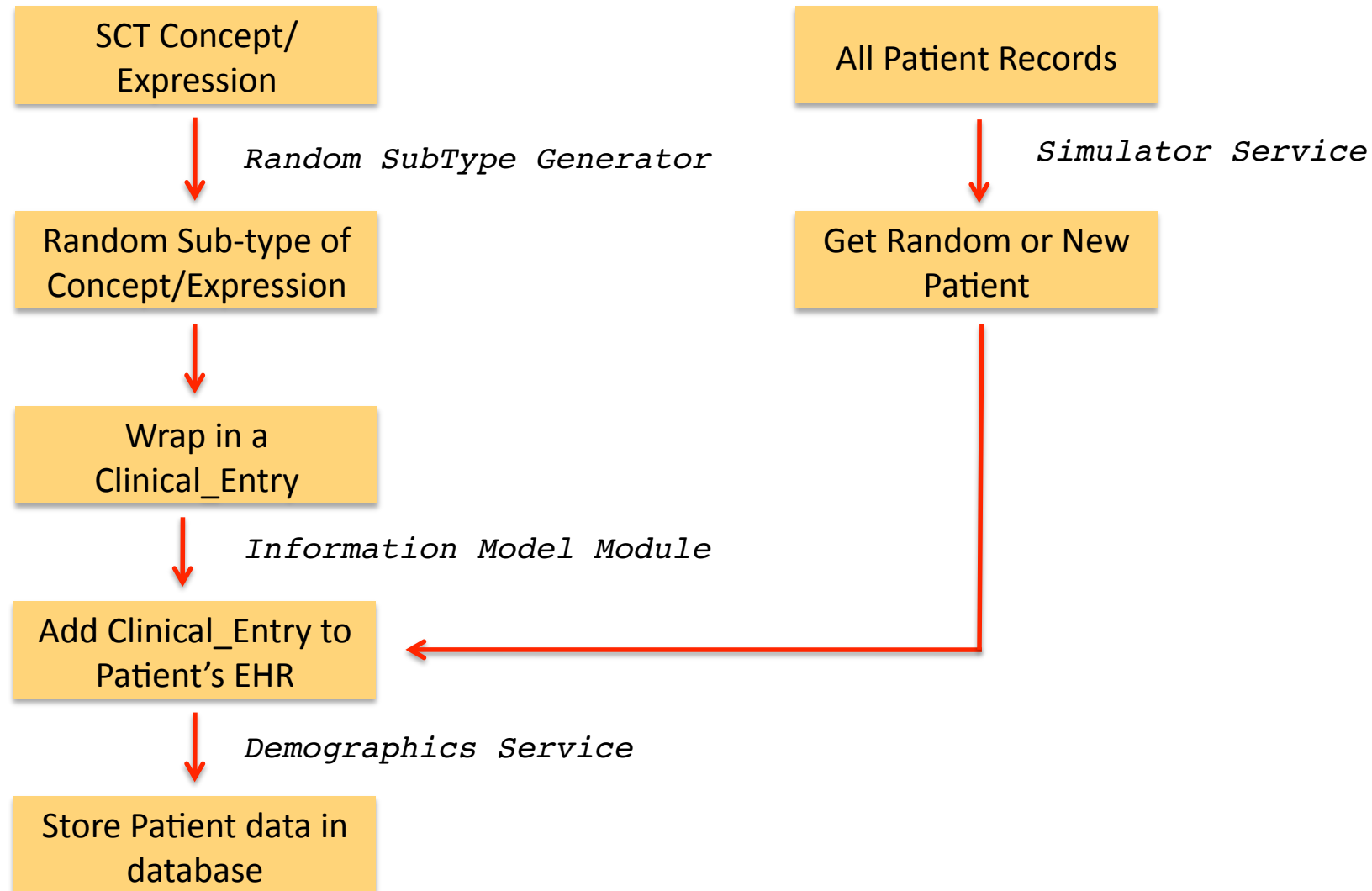
Data Flow Overview



Query Execution Process



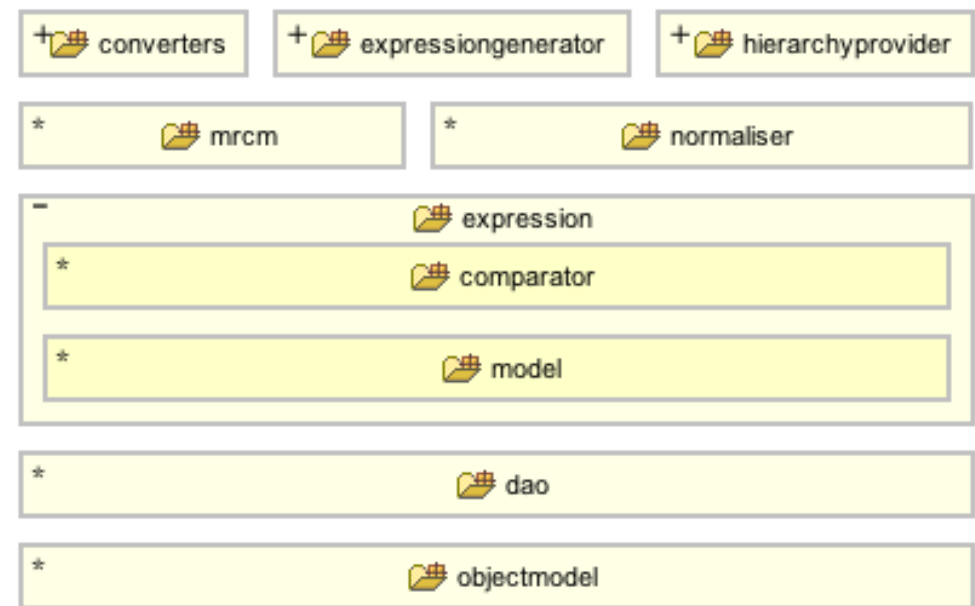
Data Generation Process



Snofyre- Functional Overview

SNOMED CT Service Layer

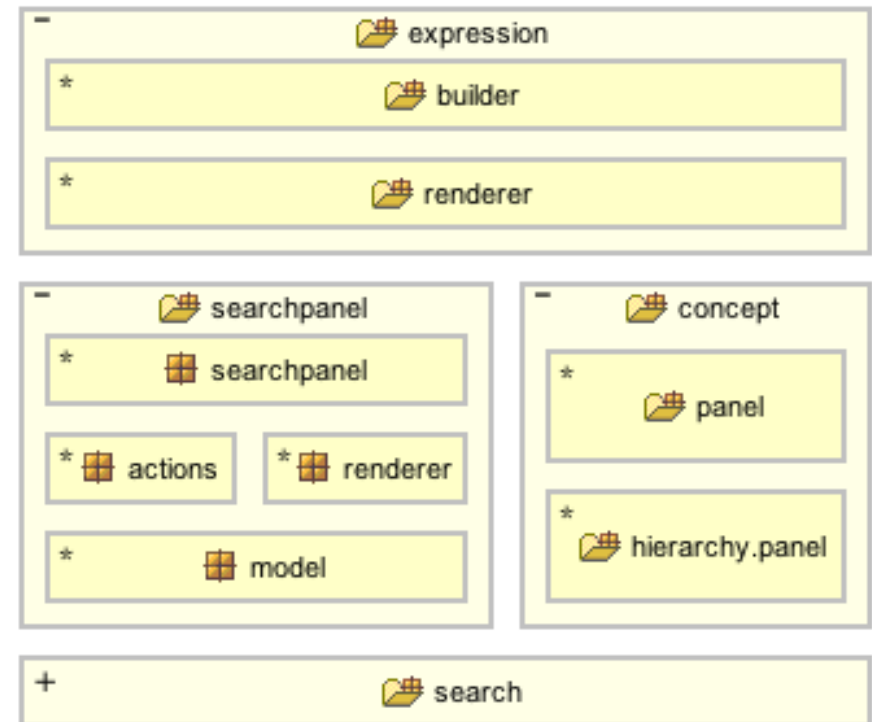
- Represent SNOMED CT
- Access to SNOMED CT
- Represent SNOMED CT post-coordinated expressions
- Generate Normal Forms
- Compositional Grammar Converter (+ parser)
- Compare post-coordinated expression
- Sanctioned attributes - MRCM



Snofyre - Functional Overview 2

Search and User Interface Layer

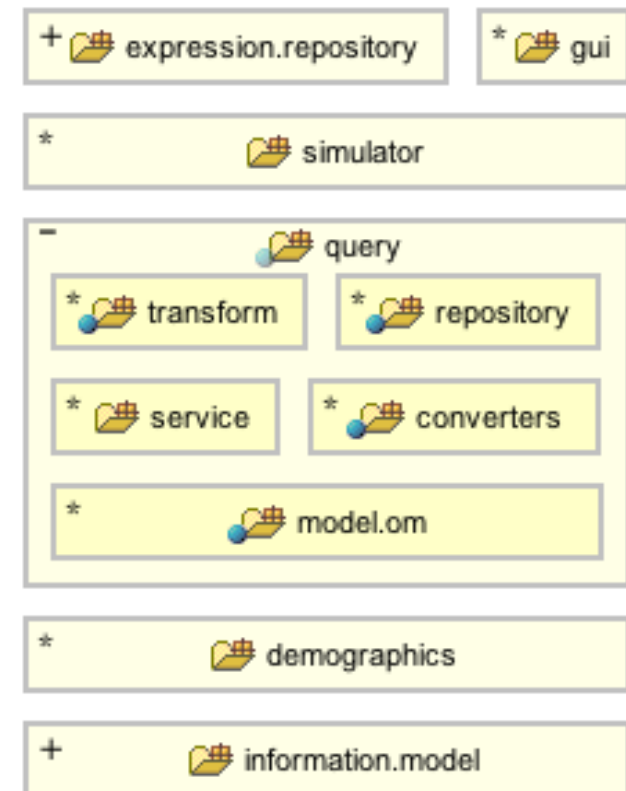
- Search Service for SNOMED CT terms
- Search interface (with filters) + results
- Render terms and concept hierarchies
- Render and build post-coordinated expressions



Snofyre - Functional Overview 3

Application Layer

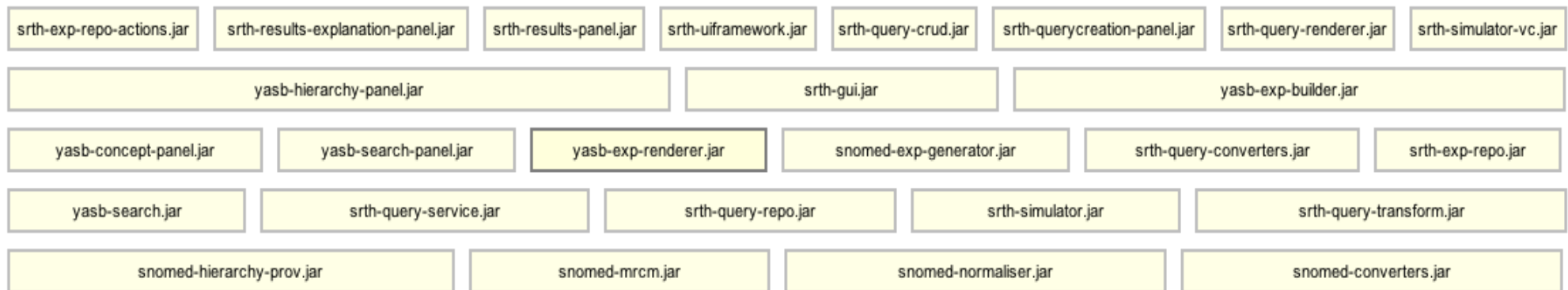
- Represent queries (? Metadata)
- Author queries
- Human friendly rendering of queries
- Store and access queries
- Information Model (+ demographics)
- Query Transform (to SQL) and Execution
- Data generation



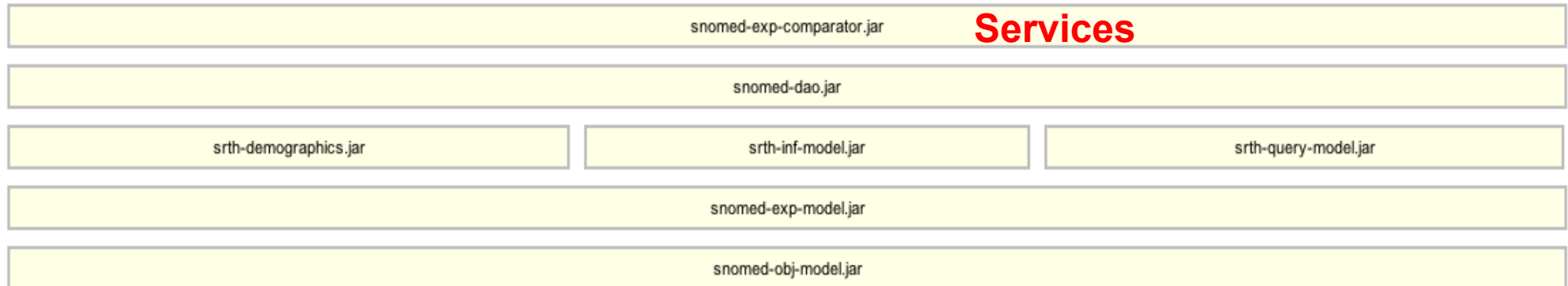
Snofyre - Functional Overview 4

Entire Application Stack

User Interface



Services



Object Model

Snofyre API – Hands on

How to use Snofyre API

Snofyre API Tasks

- To do this task, you'll need to be 'SNOMED CT Application Developers'!!
- Install Maven
- Install Subversion
- Check out Snofyre Code from the Snofyre Repo
- Compile using `mvn clean install`
- Now create a class 'Hello Services'
- Import
`uk.nhs.cfh.dsp.snomed.dao.TerminologyService....`
- So and so forth...

Snofyre API Tasks - 2

- To do this task, you'll need to be 'SNOMED CT Application Developers'!!
- ~~Install Maven~~
- ~~Install Subversion~~
- ~~Check out~~ **Don't need all this for this task!** ~~Repo at~~
- ~~Compile us~~ **1. We can use the bundled Scripting console!**
- ~~Now creat~~ **2. Easy peasy!**
- ~~Import~~
~~uk.nhs.cfh.dsp.snomed.dao.TerminologyService....~~
- ~~.... So and so forth...~~

Snofyre API Tasks - 3

- To do this task, you'll need the Snofyre Scripting Console
- Tools → Scripting Console
- Wait...
- Minimise Snofyre

Snofyre API Tasks - 4

- In the console, type
 - `Println 'Hello Snofyre';`
 - Press the Enter Key
- Type
 - `def concept =
terminologyDAO.getTerminologyConcept
("22298006");`
 - `println concept.getFullySpecifiedName();`
- Now some more advanced examples...
 - Get the normal form of Myocardial Infarction

Snofyre API Tasks - 5

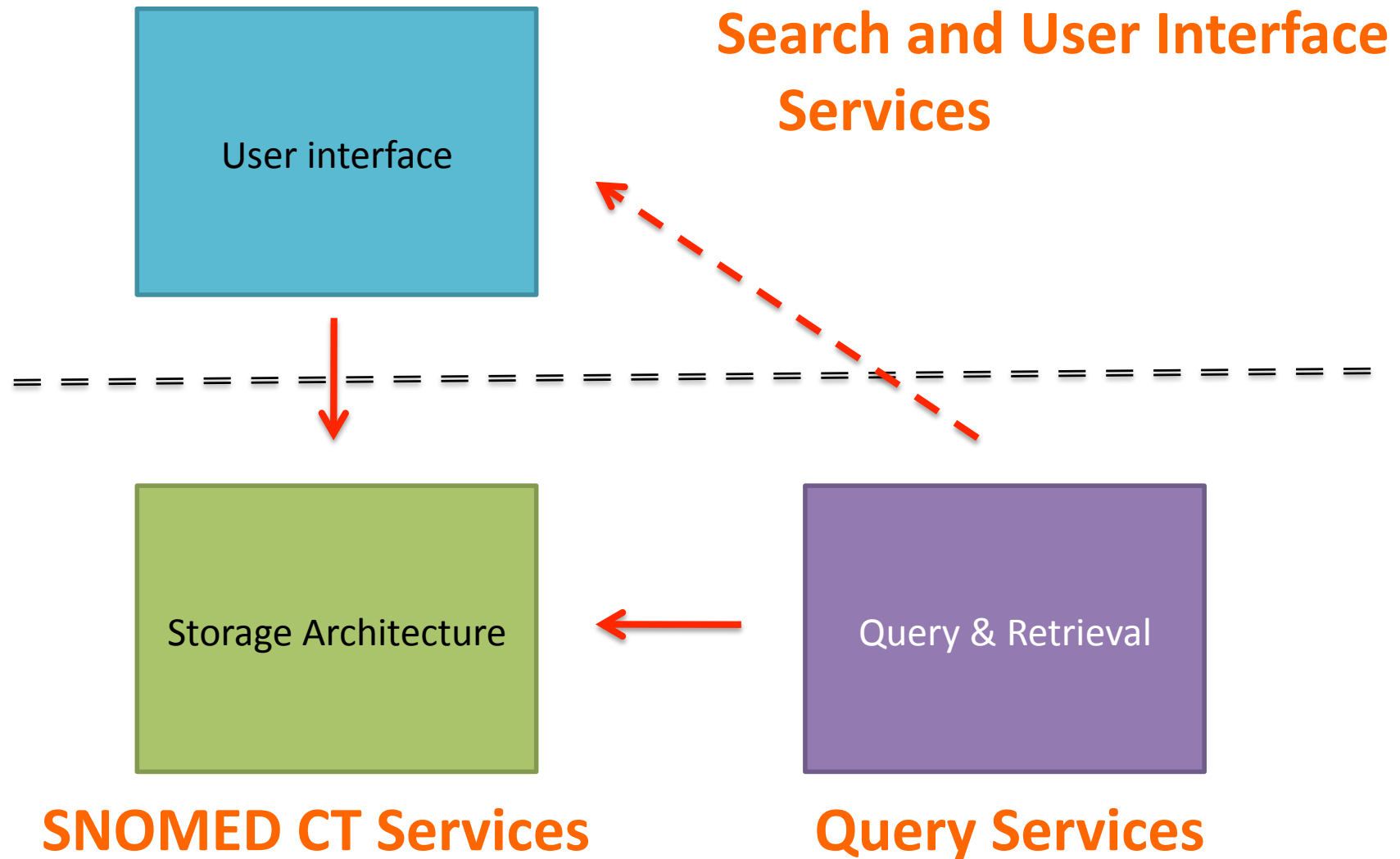
- Services look up table...
- Refer to Snofyre Functional Services Manual
- Who'll be the first one to get all children and descendants of Myocardial Infarction (22298006)?

Service Name	Service Description
terminologyDAO	Access to SNOMED CT content
normalFormGenerator	Generates Normal Forms for Concepts/Expressions
hierarchyProvider	Provides hierarchy look up for SNOMED CT concepts
cgfConverter	Converts a concept/expression into its compositional grammar form
situationWrapper	Wraps concept/expression in a Situation With Explicit Context wrapper
randomSubtypeGenerator	Returns a random subtype for a given concept or expression

Snofyre – Relevance to Implementers

What can SNOMED CT implementers
expect from Snofyre

How can I use Snofyre?



How can I use Snofyre? - 2

- Educational artefact
 - Understand how SNOMED CT content is organised...
 - Example implementation of SNOMED CT related application services.
 - Can explore SNOMED CT search functionality
 - Rendering of expressions + concepts
 - Understand downstream effects of authoring or modeling
- A rapid prototyping application
 - User engagement; end to end demonstration
 - Generates data for a given clinical example; for example you can easily generate patient records that contain Diabetes (or any of its types) + Ulcer of lower limb (including any of its types)

How can I use Snofyre? - 3

- Is Snofyre a terminology server?
 - Yes an incomplete implementation, if Terminology Server = Set of functional services to manipulate SNOMED CT
 - No, if you want a ready to use 'out of the box' product
- How does Snofyre relate to CTS 2?
 - CTS 2 is a draft specification
 - Snofyre only covers terminology related services – no messaging services
 - Focused on SNOMED CT – not part of CTS 2?
- Can I use Snofyre to create subsets/refsets?
 - No, Snofyre was not created to be an 'authoring' tool
 - Yes, Snofyre does create subsets/refsets but does not have a way of exporting them out of the box
- Does Snofyre support my favourite feature?
 - Please ask us on the community site

Snofyre community

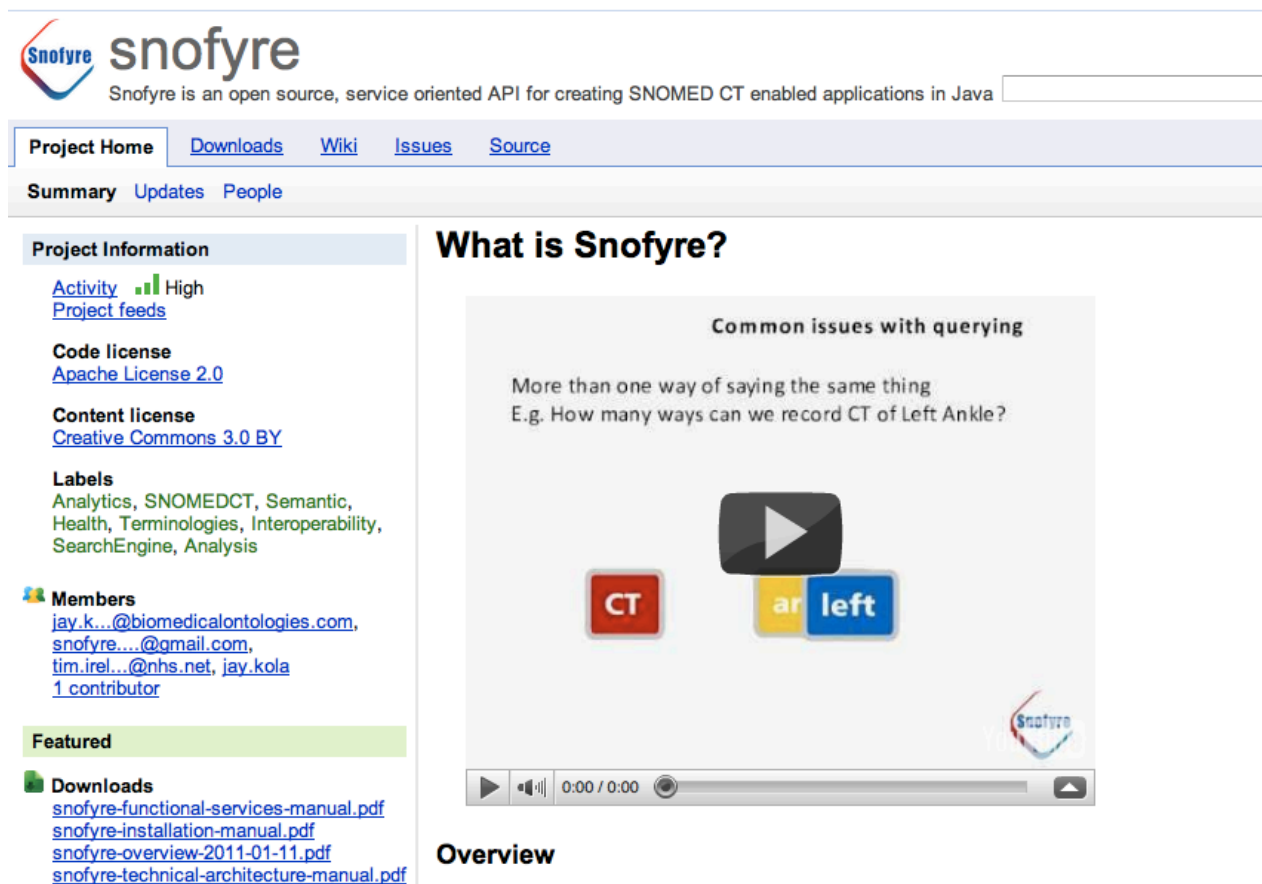
What to expect and how to contribute

Where to find the goodies?

- All project output available:
 - <http://code.google.com/p/snofyre>
 - Licensing
 - Code: Apache 2 License
 - Documentation: Open Government License
- Resources available
 - Source code
 - Snofyre Application
 - Snofyre API
 - Documentation
 - Snofyre Functional Services Manual
 - <http://snofyre.googlecode.com/files/snofyre-functional-service-manual.pdf>
 - Snofyre Installation Manual
 - <http://snofyre.googlecode.com/files/snofyre-installation-manual.pdf>
 - Snofyre User Manual
 - <http://snofyre.googlecode.com/files/snofyre-user-manual.pdf>
 - Snofyre Developer Manual (not yet available...)


Where to find the goodies? - 2

- And here are the actual goodies... 😊
 - <http://code.google.com/p/snofyre>



The screenshot shows the Google Code project page for Snofyre. The header features the Snofyre logo and a description: "Snofyre is an open source, service oriented API for creating SNOMED CT enabled applications in Java". Below the header is a navigation bar with links for Project Home, Downloads, Wiki, Issues, and Source. The main content area is divided into two columns. The left column contains project information such as Activity (High), Project feeds, Code license (Apache License 2.0), Content license (Creative Commons 3.0 BY), Labels (Analytics, SNOMEDCT, Semantic, Health, Terminologies, Interoperability, SearchEngine, Analysis), Members (jay.k...@biomedicalontologies.com, snofyre...@gmail.com, tim.irel...@nhs.net, jay.kola, 1 contributor), and a Featured section. The right column is titled "What is Snofyre?" and contains a video player. The video player shows a slide titled "Common issues with querying" with the text "More than one way of saying the same thing" and "E.g. How many ways can we record CT of Left Ankle?". Below the text are three colored boxes: a red box with "CT", a yellow box with "ar", and a blue box with "left". A play button is centered over these boxes. The video player controls at the bottom show a progress bar at 0:00 / 0:00. Below the video player is the word "Overview".

Project Information

- [Activity](#)  High
- [Project feeds](#)
- Code license**
[Apache License 2.0](#)
- Content license**
[Creative Commons 3.0 BY](#)
- Labels**
Analytics, SNOMEDCT, Semantic, Health, Terminologies, Interoperability, SearchEngine, Analysis
- Members**
[jay.k...@biomedicalontologies.com](#),
[snofyre...@gmail.com](#),
[tim.irel...@nhs.net](#), [jay.kola](#)
1 contributor
- Featured**
- Downloads**
[snofyre-functional-services-manual.pdf](#)
[snofyre-installation-manual.pdf](#)
[snofyre-overview-2011-01-11.pdf](#)
[snofyre-technical-architecture-manual.pdf](#)

What is Snofyre?

Common issues with querying

More than one way of saying the same thing
E.g. How many ways can we record CT of Left Ankle?

CT ar left

Overview

How to contribute?

- User Discussions
 - <http://groups.google.com/group/snofyre-users>
- Developer Discussions
 - <http://groups.google.com/group/snofyre-dev>
- Reporting Issues
 - <http://code.google.com/p/snofyre/issues/list>
- Please join the community... 😊
 - Open for all to join!

- Credits & Acknowledgements

- Department of Health Informatics Directorate, UK
- MOH Holdings Pte Ltd, Singapore

Email: jay.kola@biomedicalontologies.com

Thank you!

Questions?