



ASSISTANCE  
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HÔPITAUX  
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## i2b2 implemented over SMART-on-FHIR

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- ▶ i2b2 is a key leader with 200 implementations over the world
- ▶ Federation tools federate multiple i2b2 instances (Shrine, Insite, TrinetX)
- ▶ Analytic tools extend i2b2 (transmart, i2b2-transmart) to handle omics

→ Improving i2b2 should improve derived tools

# Problem

i2b2 room of improvement



## Data Federation

ETL processes are time/space/humans consuming

i2b2 needs a dedicated informatic team

Terminology Mapping tools in their infancy

## Data Variety

RDBMs based i2b2 star schema cannot handle every types

Dedicated technology emmerge faster than i2b2 can exploit them

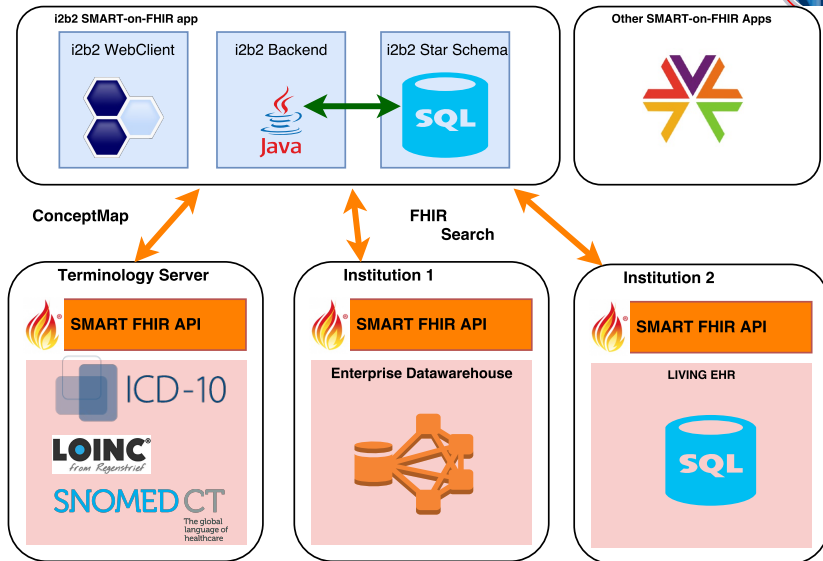


- ▶ FHIR specifies how EHR should share data (clinical, imaging, genomics)
- ▶ FHIR specifies both a *Search* & a *Terminology Mapping* API
- ▶ EHR vendors are more & more FHIR conformant
- ▶ SMART-on-FHIR specifies how Apps should consume data (50 apps)

→ Let's i2b2 be a SMART-on-FHIR app !

# Methods

## i2b2-FHIR



## Change made to CRC cell

- ▶ New pm\_cell\_data entry to point to URL of FHIR
- ▶ By using the project\_path can configure to use different FHIR API for different projects
- ▶ Easy to change without restarting i2b2
- ▶ Limited to one FHIR API per project

## Change made to PM cell

- ▶ New class written that extends Panel Items
- ▶ Any ontology item that begins with FHIR is sent to the new class
- ▶ The Item Code, constraint value and date constraints are sent to the FHIR API
- ▶ ...

# Results

## Screenshot



**Query Tool**

Query Name: Glucose-Circula@11:28:27

Temporal Constraint: Treat all groups independently

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently			Treat Independently			Treat Independently		
Glucose (Group:GLU) < 100 mg/dl [12/01/1979 to 9/27/2015] GLUCOSE (LOINC:6777-7) GLUCOSE @11AM, SERUM (LOINC:16166-1) GLUCOSE @4PM			Circulatory system Acute Rheumatic fever Arterial vascular disease Cerebrovascular disease					

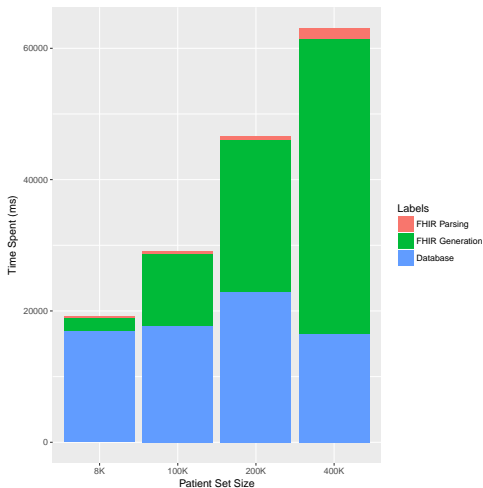
Run Query Clear 2 Groups New Group

Show Query Status Graph Results Query Report

**Finished Query: "Glucose-Circula@11:28:27"** [2.8 secs]  
Compute Time: 0.9 secs

**Number of patients for "Glucose-Circula@11:28:27"**  
patient\_count: 8±3

→ Mixed Query is Working (star schema/FHIR endpoint)



5B physiological table

- ▶ FHIR generation step bottleneck
- ▶ under the minute
- ▶ sub-linear performances

→ Bridging the gap (i2b2 / big-data platforms)



## Work done:

- ▶ Ontology Model
- ▶ Querying FHIR API
- ▶ Mixed star schema & FHIR API & No-SQL DBs

## Roadmap:

- ▶ Oauth2 securisation
- ▶ Multiple FHIR endpoint
- ▶ Performance optimisations (parallel FHIR API calls)
- ▶ Release as a SMART-on-FHIR app

# Conclusion



i2b2-FHIR opens new area:

- ▶ Data federation
- ▶ Data Volume handling

→ Work in progress to release in future i2b2 version

Thank you

*Core i2b2* [www.i2b2.org/software](http://www.i2b2.org/software)

*FHIR API* <https://github.com/parisni/i2b2-fhir-search>

*FHIR i2b2* <https://github.com/mikemendis/i2b2-fhir-search>