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i2b2 impemented over SMART-on-FHIR

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Context
Cohort Discovery

- 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

$\rightarrow$ 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

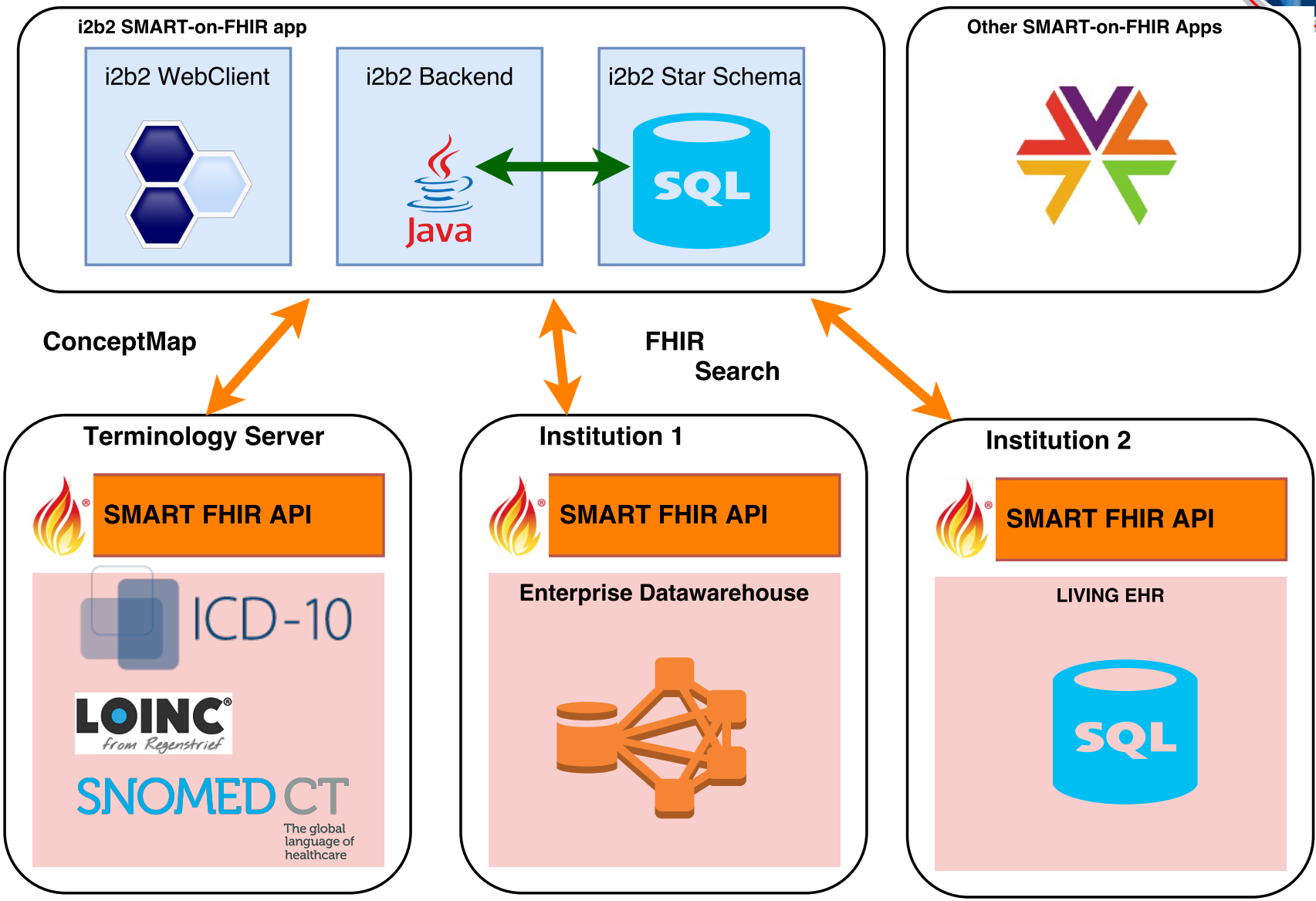
- RDBMs based i2b2 star schema cannot handle every types
- Dedicated technology emmerge faster than i2b2 can exploit them

Solution
SMART-on-FHIR

- 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)

$\rightarrow$ Let's i2b2 be a SMART-on-FHIR app !

Methods
i2b2-FHIR



Results
Implementation

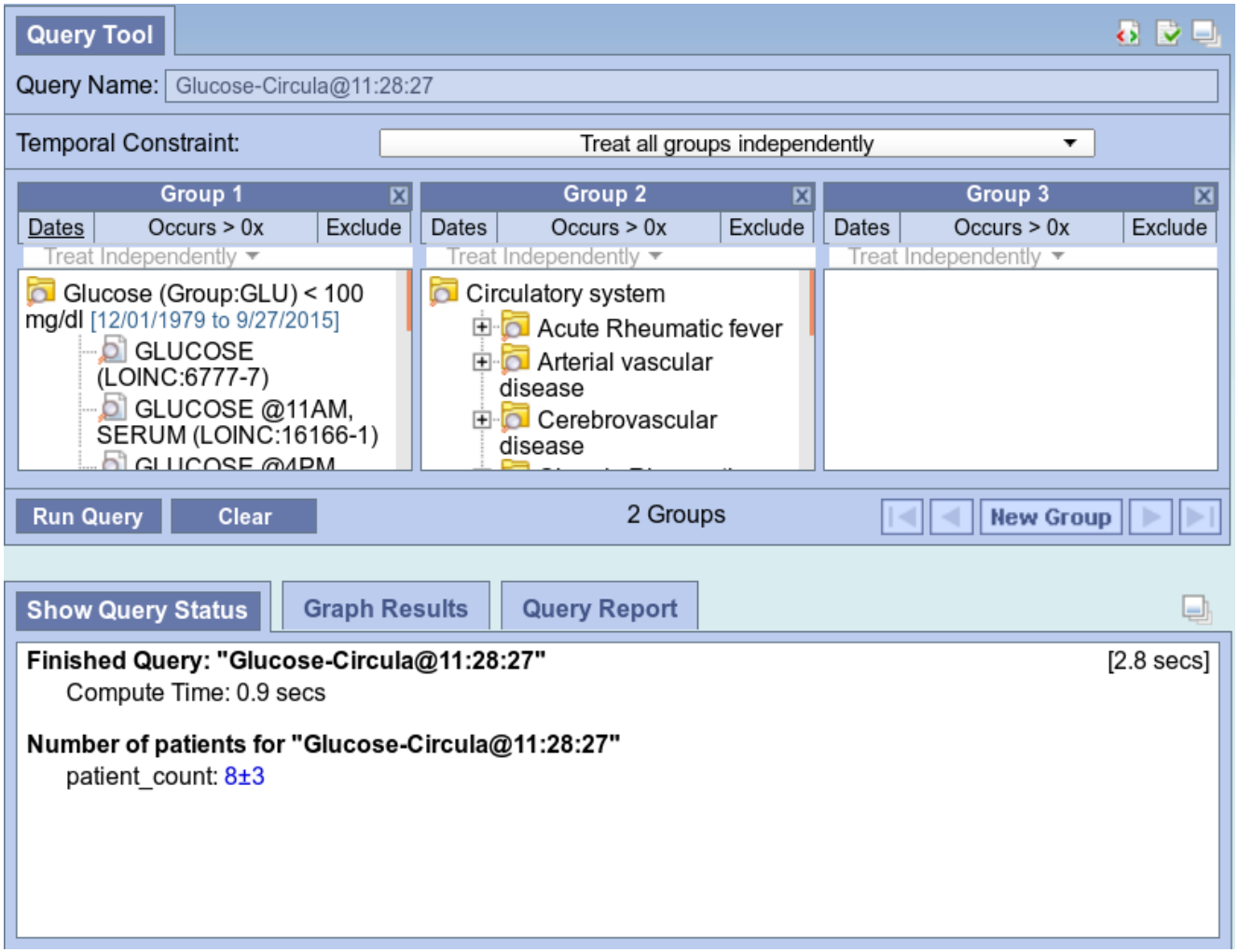
Change made to CRC cell

- 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

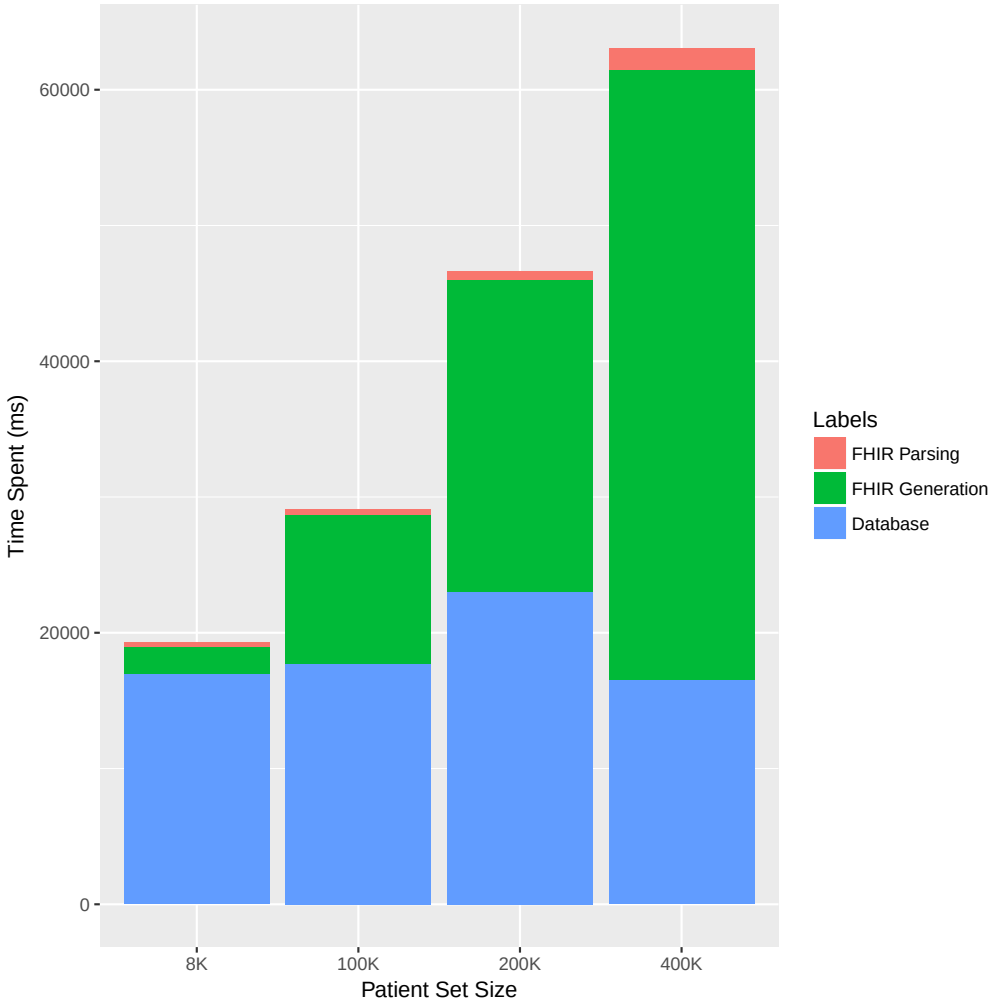
- New class written that extends Panel Items
- Any ontology item that begins with FHIR is sent to the new class
- The Item Code, constraint value and date contraints are sent to the FHIR API
- . . .

Results
Screenshot



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

Results
Benchmarks



5B physiological table

- FHIR generation step bottlneck
- under the minute
- sub-linear performances

$\rightarrow$ Bridging the gap (i2b2 / big-data platforms)

Discussion

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 Volumne handling

$\rightarrow$ Work in progress to release in future i2b2 version

Thank you

Core i2b2 www.i2b2.org/software
FHIR API https://github.com/parisni/i2b2-fhir-search
FHIR i2b2 https://github.com/mikemendis/i2b2-fhir-search