Federating Clinical and Biospecimen Data Using FURTHeR

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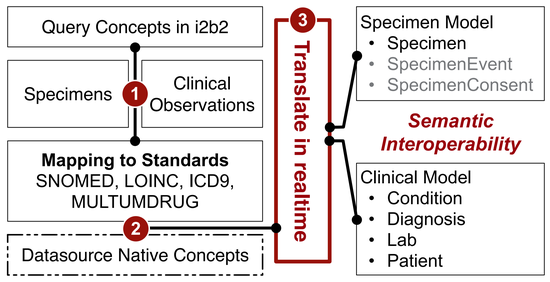
Introduction

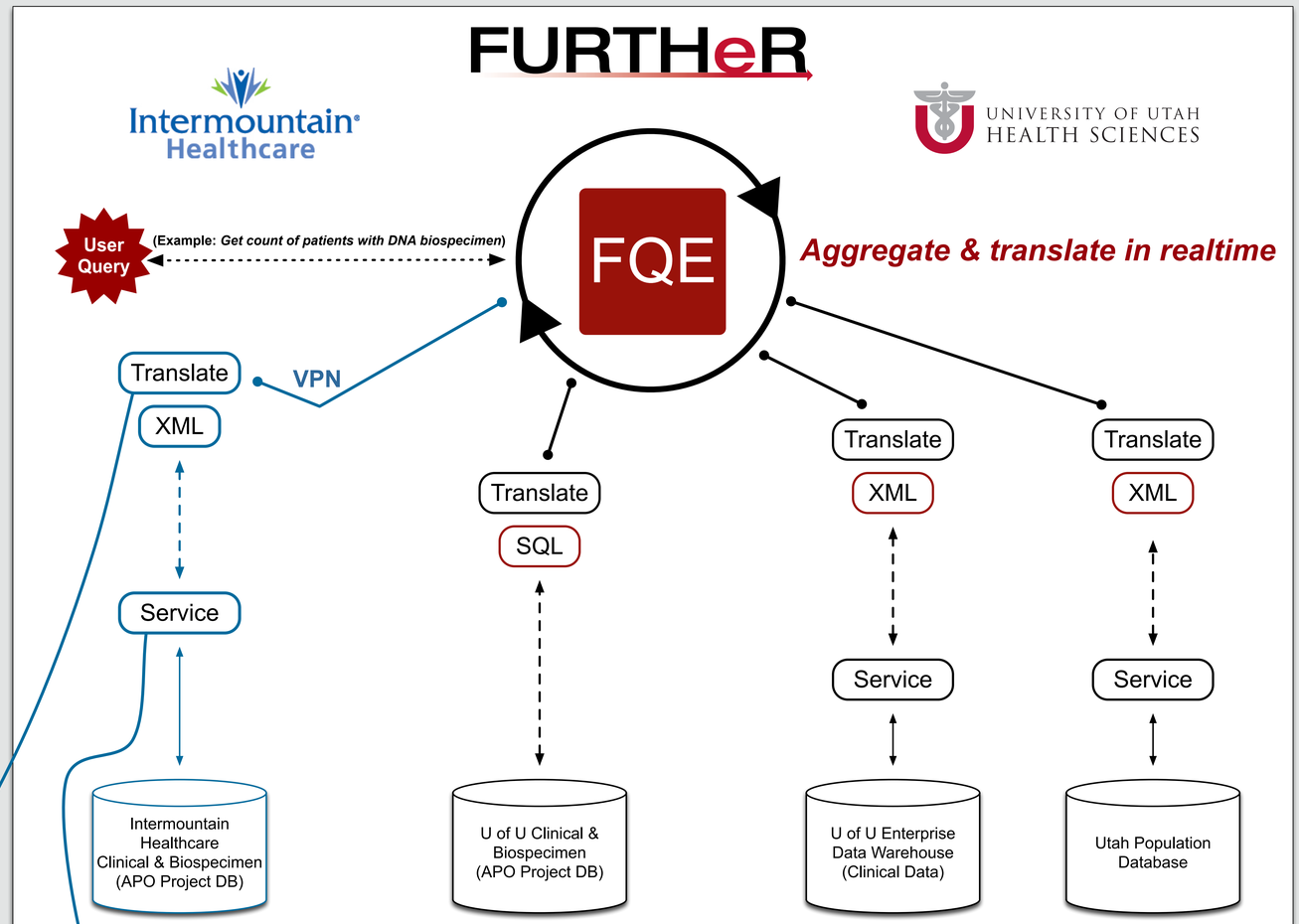
- FURTHeR empowers researchers with a linked virtual repository integrating **biological sample**, **clinical** and **demographic** data in real time.
- Researchers at the University of Utah and Intermountain Healthcare (IH) need a generalized method to interrogate clinical and biospecimen data.
- The project utilizes a pilot study of pre-eclampsia and adverse pregnancy outcomes (APO).
- Data is securely transmitted to a common analytical model to aggregate and display results.
- Biospecimen management efforts are facilitated by The Utah Biohealth Initiative.

Modeling & Terminology

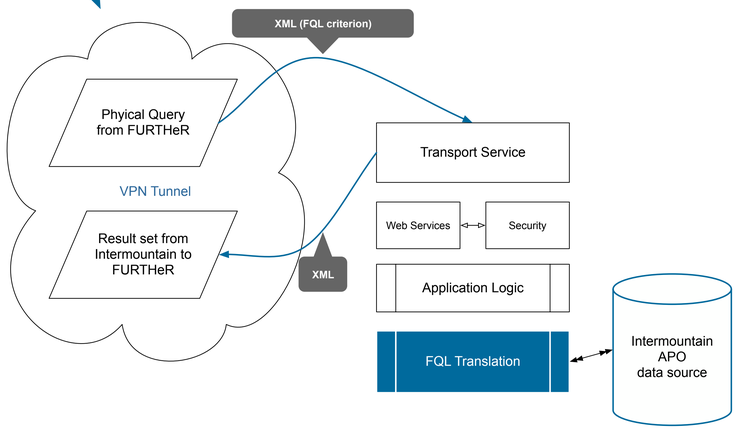


Conclusion

Two sizable health care providers can federate heterogeneous clinical and biospecimen data resources in a secure and scalable way utilizing the FURTHeR architecture.



APO project application messaging for FURTHeR & Intermountain



Requesting Query:
The query from FURTHeR takes advantage of Hibernate object relational mapping idioms marshalled in XML.

Result Set:
The result set coming back to FURTHeR can be any structured representation of the entities. (In this case XML.)

Methods

- Using a modified version of i2b2, an investigator submits a query to FURTHeR which distributes the query utilizing a **federated query engine (FQE)** to the participating data sources.
- Clinical and biospecimen data from IH are retrieved by FURTHeR using an externally facing web service over a secure VPN session. IH receives a native FURTHeR XML query translated to its physical storage model.
- Results returned to FURTHeR use data source adapters and mappings to standard terminologies such as CPT, ICD, LOINC, and SNOMED CT, to translate the results to a **common clinical and biospecimen model** for federation.
- Data from the participating sources enables clinicians to determine aggregate counts of patients with, in this example, a diagnosis of pre-eclampsia, related biospecimens and other phenotypic descriptors.

Acknowledgements

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FURTHeR

This project incorporates all the benefits of FURTHeR. It empowers researchers to search data that resides at Intermountain Healthcare and The University of Utah all in realtime from one interface. We worked with clinical researchers and informaticians at both institutions to successfully connect and translate queries to differing data models, utilizing the FURTHeR architecture. We used terminology standards and cutting edge enterprise software engineering.

The goal of this project is to lay the ground work for access to broad generalized data sources at both institutions. As we worked through each stage of the project we expanded the core capability in security, terminology, translation and aggregation services to produce a robust feature set to query the data sources.

Federated Utah Research & Translational Health e-Repository

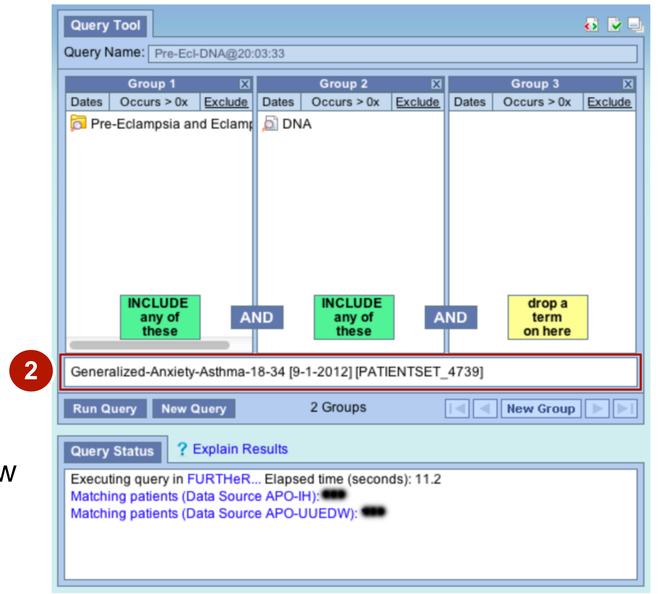
FURTHeR is the data and knowledge management infrastructure for the Center for Clinical and Translational Science (CCTS) at the University of Utah. The objective of FURTHeR is to deliver innovative and practical software tools and services that can directly support data and knowledge access, integration, and discovery.

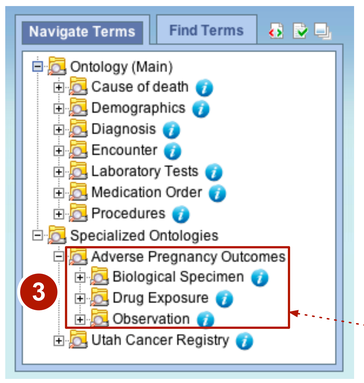
further.utah.edu

Query Tool Enhancements for biospecimen and interative queries

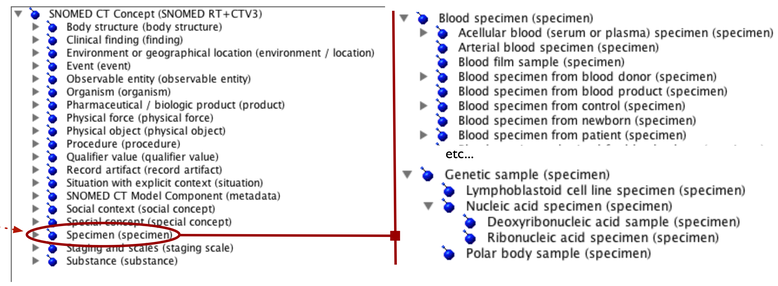
1. Data Sources: Intermountain Healthcare and U of U added as sources for clinical and biospecimen data for the APO study.

2. User directed query: Use a previous result set of patients to query against the available data sources. Once a previous query has finished a researcher can build a new query with different criteria to associate with a previous result.





3. Biospecimen search criteria run as: "Find by patients that have a biospecimen of a specified type."



Biomedical Informatics at the University of Utah School of Medicine

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The Department of Biomedical Informatics was established in 1964 at the University of Utah. Located in Salt Lake City, the department is internationally recognized as a leader in biomedical informatics research and education.

The department has a National Library of Medicine (NLM) training grant to support its educational programs. Master of Science (MS), Non-Thesis Master of Science, Certificate and Doctor of Philosophy (PhD) degree programs are offered along with short-term traineeships for students and visiting fellows. Research affiliations include the University of Utah Health Sciences Center, Intermountain Health Care facilities, the Veterans Administration Medical Center, HealthInsight (the Peer Review Organization for Utah and Nevada), and the Utah Department of Health. As one of the largest biomedical informatics training programs in the world, the department's faculty and students are a diverse group with a wide range of experience and interests.

The Department is recognized as one of the most prestigious training programs for informatics in the world. The Department has granted hundreds of Ph.D. degrees and M.S. degrees. These alumni have gone on to key positions in academia, clinical medicine, government, and private industry. The Department routinely draws international scholars (both faculty and students) from across North America, South America, Europe, Asia, and Africa, including Fulbright scholars.

The breadth and depth of research opportunities at The University of Utah is unmatched because of close relationships with collaborating institutions, state and local public health agencies and access to the world's finest genealogy database, the Utah Population Database. New cutting edge projects are developing the next generation research infrastructure. The program is unique for its strength in each of the primary teaching and research areas: clinical informatics, informatics for translational and clinical research and public health informatics. Abundant research opportunities focusing on federated search, medical decision support, public health surveillance, and grid computing, to name a few, are supported in conjunction with The University of Utah Center for Translational and Clinical Science, renewed funding for a Center of Excellence in Public Health Informatics and a highly competitive National Library of Medicine Training Grant. Real-world clinical informatics research is ongoing at several of our collaborating institutions: Intermountain Healthcare, home of the renown HELP electronic medical record, University of Utah Health Care, Huntsman Cancer Institute, Salt Lake City VA Medical Center, and the Utah Department of Health.