

Cross-Network Directory Service: Enabling Meaningful Collaboration Across Organizations



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Project Highlights

Diversity of electronic health data sources creates challenges to identify data resources and potential collaborators.

We implemented an open source web services system that enables:

- Extensible metadata data model
- Discovery of data sources
- Governance rules
- Cross-network communication

Future work includes engaging with stakeholders to promote metadata curation, establishing governance rules, and implementing the service in a production environment.

Objective

- Design and implement a fully functional prototype open-source tool, the Cross-Network Directory Service (CNDS), which overcomes challenges in connecting researchers and data holders
- Demonstrate the ability of CNDS to connect the Sentinel and PCORnet networks both for mutual discovery of research capabilities and for sending each other data requests and tracking responses
- Extend the leading query health application used in large-scale distributed healthcare research (PopMedNet™) to address these challenges

Background

Existing large-scale distributed health data networks are disconnected, yet address related questions of healthcare research and public policy.

Current challenges include:

1. Diversity of electronic health data sources creates challenges to identify data resources and potential collaborators.
2. Networks have different governance policies and different requirements for participation.
3. There is no mechanism for broadcasting research capabilities — the types of data available and the research and clinical expertise of their staffs — in a way that facilitates sharing of resources and gives network participants control over who sees what.
4. Between networks there is no secure and reliable means of making data requests.
5. There are no operational standards or metrics for describing data at a level that enables researchers to judge fitness-for-use of others' data sources.
6. There is no reliable mechanism for sending queries that will execute correctly across networks with different common data models.

Methods

CNDS has 4 components:

1. Governance
2. Registration
3. Discovery
4. Communication

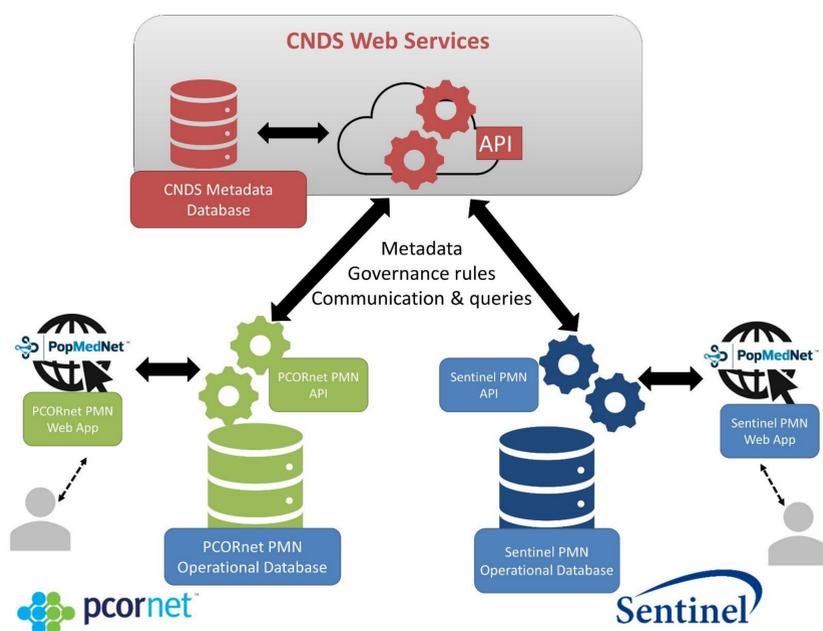
The project had 3 workstreams:

1. **Develop a data model** that includes: CNDS entities (user, organization, data source), metadata domains that change and vary by entity, and visibility governance.
2. **Design and develop flexible software**, based on PopMedNet, that makes changes to the metadata easy and automatically renders user interfaces driven by the underlying metadata. The system is powered by standard web services and an Application Programming Interface (API).
3. Implement technology that **seamlessly respects the governance of multiple PMN instances** (e.g. Sentinel and PCORnet) allowing administrators to determine who can discover and query their resources.

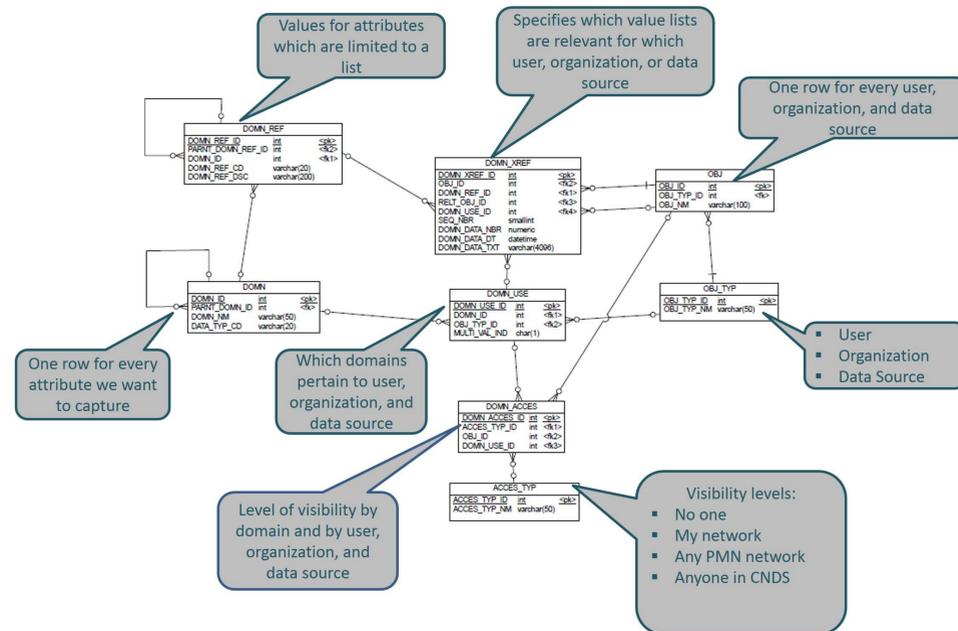
Implementation & Results

- The data model has been successfully integrated with the CNDS infrastructure that uses web services based on PopMedNet (PMN) version 6.0.
- The metadata management module, search functionality, and cross-network query capability have been implemented and validated in the CNDS test environments.
- We have demonstrated the ability to send a data query from a CNDS Sentinel network to the PCORnet network without disrupting existing workflows, while adhering to the governance policies for both networks. Specifically, the system is being implemented in a way that maps request types and electronic workflows between the PCORnet and Sentinel PMN instances. Users can distinguish cross-network data requests from those that they are contractually committed to respond to. There is functionality to customize workflows and related software-enabled governance for cross-network queries (e.g. organizations can customize the visibility of their metadata at a very granular level).

CNDS Architecture



Metadata Data Model



Conclusion

- CNDS services include a robust metadata model that is extensible to accommodate a virtually unlimited inventory of metadata fields, without requiring further software development, and user interfaces that are programmatically generated based on the contents of the metadata model.
- Future work includes: software development to integrate CNDS into the main line of the PopMedNet software code; enhancing the Discovery functionality; implementing in production; engaging with stakeholders to promote metadata curation; establishing a CNDS coordinating center and governance rules.
- The web service uses standard APIs and could be integrated with other software applications in addition to PopMedNet.
- Despite considerable overlap between their common data models (CDMs), PCORnet and Sentinel data partners cannot send requests to each other. CNDS delivers a framework that enables such cross-network communication.