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Overview For Developers

Spin is a general framework for constructing federated networks of data sources. Spin's core feature is data-agnostic support for broadcasting queries and aggregating results, allowing collections of data sources to be treated as a single conceptual unit. These data sources may be located anywhere, as long as they're accessible via a network.

Spin evolved from the Shared Pathology Information Network (SPIN), a federated database and query tool for data about pathology specimens. Over time, one of the core problems solved by Spin - broadcasting queries and aggregating results - came up several times, and the data-agnostic parts of SPIN were extracted and developed into the Spin framework. Spin provides a plug-in architecture for interfacing with specific data sources, and a general client API for querying networks.

Nothing in the Spin framework is specific to biomedical research, but Spin developed out of the biomedical research community. Early use cases dealt with protected, identifying data about hospital patients, which shaped the Spin's design.

Core Features

- Runs on the JVM
- Broadcasting queries and aggregating results
- Flexible routing with support for multiple network topologies: hub-and-spoke, fully-meshed, trees, and more.
- Pluggable federated authentication and authorization
- Robust behavior in the face of nodes coming on and offline.
- Support for encrypting results.

Motivation

For decades, health information systems have been rapidly deployed across the nation serving a wide range of clinical, research, and public health applications. Because these efforts reflect the various needs and prerogatives of each institution, real-time query and aggregation of heterogeneous databases has become increasingly difficult. As a result, few investigators are able to obtain the sample sizes necessary for robust analysis.

Approach

SPIN has addressed these challenges with five principles:

- (1) Ensure full autonomy for care providers participating with peer institutions
- (2) Reassert care provider IRBs as stewards of patient privacy and research benefit
- (3) Protect patient privacy using de-identification toolkits
- (4) Provide investigators with real-time aggregated views of de-identified data
- (5) Develop software to help institutions participate quickly

Uses of SPIN technology

for Clinical and Translational Research

Obtaining sufficient patient-samples remains one of the largest challenges in population health studies. SPIN provides the p2p connectivity for the [Shared Health Research Informatics Network](#).

for Cancer Research Requiring Human Specimens

Many scientists are calling for a closer connection between research and routine care delivery. Human specimens are routinely collected yet infrequently shared for research studies such as biomarker discovery and validation. While many reports suggest that access to well-characterized human tissues represents a valuable research resource in the post-genomic era, few studies have access to tissue quantities large enough for high- throughput experimentation. Similarly, the related clinical information remains invaluable yet oftentimes inaccessible to investigators. To address these needs, SPIN enables the [Pathology Specimen Locator](#) to support translational research activities which require access to human specimens and related clinical information.

for Real-Time Syndromic Biosurveillance

Modern biosurveillance applications look for unusual patterns of disease with respect to geographic regions and seasonal trends. Using SPIN, the [AEGIS](#) system [demonstrated near real-time situational awareness for public health departments](#). SPIN enables patient de-identification and reasserts hospitals as stewards of patient privacy while allowing emergency investigations to occur on only those cases which signal public health outbreaks.

for Biomedical Research Resources Discovery

SPIN provides the federated search of institutional databases in the [Eagle-I consortium](#).