

SpringerMaterials Accelerates Research With Intelligent Search

Stardog's Knowledge Graph Provides Data Context and Infrastructure Flexibility

SPRINGER NATURE



Overview



The Challenge

The robust data infrastructure supporting the SpringerMaterials database product needed more flexibility to scale to user demand



The Solution

Stardog's knowledge graph platform powers a multi-store architecture enabling intelligent search across different data sets and storage technologies



The Results

Researchers have a single, unified view of data covering more than 290,000 materials resulting in fast and accurate searches, new ways to analyze data, and easy integration of data into research

Springer Nature advances discovery by publishing robust and insightful research, supporting the development of new areas of knowledge and responding to the needs of the research community. With over 175 years of experience in academic and professional publishing, Springer Nature is a global market leader at a scale unrivaled by most academic publishers. Springer Nature receives more than one million article submissions and publishes over 300,000 articles across almost 3,000 journals and 13,000 books per year. In 2016, Springer Nature expanded their portfolio to include subscription based datasets and databases. Their [Database and Solutions](#) offering provides consistent, complete, and on-demand data from a combination of diverse data sources centered around a particular topic. Subscribing to these datasets, academic, government, and

corporate researchers utilize the most up-to-date information without taking on the sometimes onerous maintenance those data solutions require. Using an online portal, users search for topics and entities and can interact with data to get the comprehensive and connected information they need to further their research.

Within the Database and Solutions portfolio, [SpringerMaterials](#) is the world's largest research platform dedicated to organic and inorganic materials. SpringerMaterials provides curated and comprehensive data and search results from a dozen data collections to researchers across the world. Combining the wide range of data sources utilized by materials researchers, the platform is the comprehensive go-to resource for users to search and uncover relationships within the complex web of materials data.



*Deploying on Stardog fosters the idea of reusability among the mapping and vocabularies within the database products. **Stardog makes large-scale graph data management possible for Springer Nature – and propels our data-modelling and data-integration efforts to a completely new level.***

*Marcel Karnstedt Hulpus,
Director Data & Knowledge Technologies DRG
at Springer Nature*

Challenge

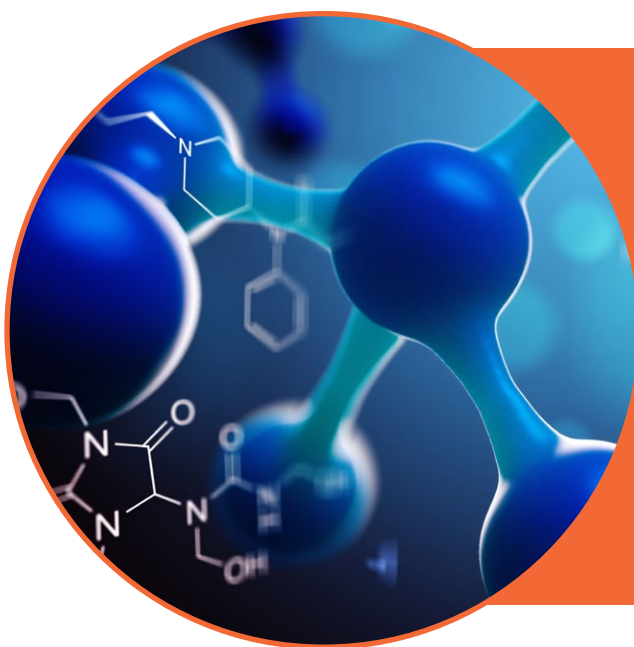
To provide a seamless experience across all the data sources within SpringerMaterials, the Database Group manages the tools and infrastructure that serve as the backbone to the platform. To bring together the variety of discrete data sources that are incorporated into SpringerMaterials, the DG team originally relied on robust XML document store and keyword/element builds. However, the legacy infrastructure required time-intensive updates and was outgrown by the demands of users and internal needs. As the team brought on more data sources to integrate into the platform, developed novel features for search and interaction, and updated existing data with new research, the connections within the infrastructure strained under the pressure of the ever-evolving data slowing down SpringerMaterials release cadence.

It became obvious that the intelligent search functionality subscribers relied on could no longer be supported by the existing data structure. Although there was robust data underlying each search, there was potential to develop infrastructure that permits users to see the dynamic connections within and relationships between different materials, properties, and publications. The limitations to smart search also prevented organic exploration within the data and obscured the data links that provide context to the researchers. To meet the internal maintenance and development needs of the Database Group, and allow external users to maximize the value from their immense pool of data within SpringerMaterials, the team needed to refine and replace their traditional XML document store backend.

Solution

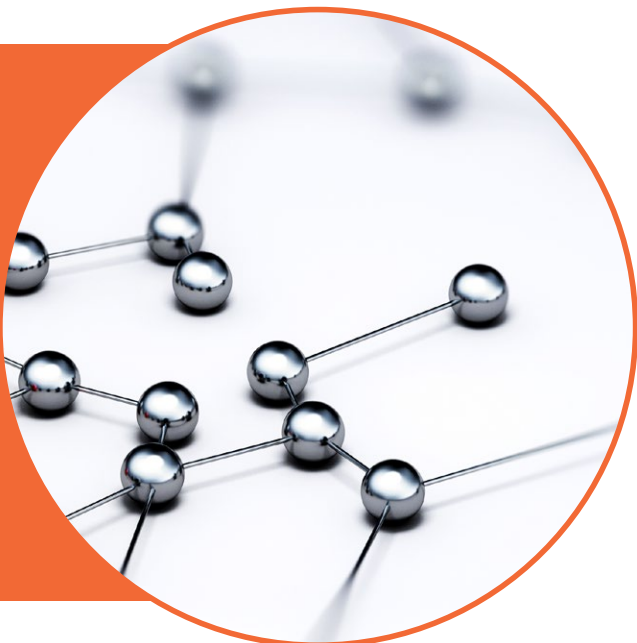
To meet end-user and internal requirements, the Database Group needed a flexible and dynamic data infrastructure that allowed easy iterations and updates within existing data while also providing context embedded within search results to end-users. By unifying their data in a knowledge graph, the Database Group created a single declarative model to bring all the connections between the content into a unified view.

Going live 18 months after inception, the SpringerMaterials knowledge graph contains 100 million triples spanning data sources like the Landolt-Börnstein series, Springer Handbooks, and relational databases that cover topics from corrosion to polymers. With Stardog's native flexibility and scalability, the Database Group team updates the knowledge graph on quarterly intervals and rolls out functionality enhancements without the constraints the previous infrastructure put on the team. Further, sub-second query times get users the information they need seemingly instantaneously.



The flexibility and dynamic connections inherent within the SpringerMaterials knowledge graph now power an intelligent search capability that understands user's intent and can uncover complex relationships from simple keywords. Built alongside the knowledge graph, these new intelligent search features now include:

- On-the-fly interpretation of search context and users' intent
- Adaptive ranking of results based on search context
- Entity-based search and explore capabilities
- Reverse search to find substances based on property values
- Smart light-weight inference on substance and property identifiers
- Plug and play integration of external knowledge models
- Dynamically created landing pages



Results

With 50,000 users, SpringerMaterials can facilitate and enhance materials research by providing their subscribers on-demand and interconnected information. Users can now:

- Access one of the most comprehensive, multidisciplinary collections of materials property data—more than 290,000 materials—across the research sciences
- Expedite research with time-saving queries that provide accurate and focused search results
- Easily integrate materials data into various research workflows

Going forward, the Database Group will expand the connections within the data beyond the data sources within SpringerMaterials to the data sources that span the rest of the Database and Solutions offerings. Two other Springer Nature databases, [Springer Nature Experiments](#) and [Nano](#) — a Nature Research solution, are also powered by Stardog. In the future, users will be able to federate their searches across all of their database subscriptions. The native flexibility of a knowledge graph allows Springer Nature to make continuous additions and adjustments to the data as more discoveries are made, their proprietary datasets grow, and new data sources emerge.

Learn more at stardog.com