

12.2.4 B2i Healthcare

B2i Healthcare provides tools and services to maximize SNOMED CT's utility. B2i Healthcare Pte Ltd (B2i) is a boutique software engineering firm specialized in SNOMED CT and healthcare information standards and exchange. B2i provide products to simplify SNOMED CT adoption and offer software development services to support healthcare IT needs.¹

For more information please visit <http://www.b2international.com>.

Snow Owl is a clinical terminology platform developed by B2i Healthcare. The Snow Owl technology family is deployed in over 2,500 locations in 83+ countries worldwide. The Snow Owl® terminology server has been licensed by SNOMED International to form the basis of SNOMED International Terminology Server.

Snow Owl Terminology Server

The Snow Owl® terminology server scales from a small kernel embedded in single-user products to n-tier clusters supporting hundreds of concurrent users. Clients can easily access and query SNOMED CT, LOINC, ATC, ICD-10, and dozens of additional terminologies via REST or Java APIs. Collaborative distributed authoring is also supported, including creating and maintaining local code systems, mapping between terminologies, and creating terminology subsets.

Terminology server features include:

- Extensive support for expression constraints and semantic queries, including Extended SNOMED CT Compositional Grammar and Groovy scripts.
- Distributed revision control system supports large teams of authors and reviewers working on independent branches.
- Full support for SNOMED CT logical definitions (OWL 2 EL) with extended support for extensions using advanced description logic features (OWL 2 DL) including datatype properties, universal restriction, disjunction, etc.
- Standard distribution formats (e.g. SNOMED RF2, ICD-10 ClaML, LOINC csv)
- Traditional, white-label (embedded within client product), and source code licenses available.

The Singapore Drug Dictionary (SDD) is the biggest SNOMED CT extension - larger than SNOMED CT International release itself. To support medication safety initiatives like medication management and adverse drug event surveillance, the drug ontology makes use of Snow Owl's extended description logic support.

Snow Owl IDE

The Snow Owl IDE (Integrated Development Environment) simplifies developer tasks related to terminology tooling. The architecture allows customized extensions to integrate tooling needs within a single platform.

The IDE embeds a terminology server and simplifies common terminology maintenance, ETL, and other tasks. Customized authoring environments support developing a library of queries (SNOMED CT expression constraints) using the Simple or Extended SNOMED CT Compositional Grammars and Groovy scripting. Files can be exported in a variety of formats like OWL 2, SNOMED CT RF1 and RF2, ClaML, spreadsheets and text files. Custom formats can also be created that support direct import and export to proprietary EHR and terminology applications.

Typical vendor deployments: EHR vendors use Snow Owl to create and maintain their local terminologies and mappings to reference terminologies like SNOMED CT. Snow Owl IDE allows exporting this in a format consumable by the proprietary EHR system format. The Snow Owl IDE has been built into proprietary tooling combining information modelling with ontology development.

Snow Owl Collaborative Authoring Platform

Snow Owl's collaborative terminology authoring platform maintains terminology artefacts developed by a team and supported by business workflows. The platform consists of the terminology server with remote clients collaborating with independent authoring workflows. The platform integrates with external task management systems like Bugzilla and JIRA.

Features:

- Full support for creating SNOMED CT extensions, including RF1 and RF2, all subset and mapping RF2 reference set types, modules, and full change history to 2002.
- Support for dozens of terminologies and any local code systems.
- Creation of value sets including mixing and matching codes from different code systems.
- Import existing value sets from the USA National Library of Medicine's Value Set Authority Center.
- Creation of mapping sets between any two terminologies or mapping local code systems to reference terminologies like SNOMED CT and LOINC.
- Configurable workflow support for authoring use cases like single, dual, and dual independent authoring.
- Support for terminology-specific workflows and editing restrictions.

The Singapore Ministry of Health Holdings uses Snow Owl to maintain their national SNOMED CT extension and local code systems as well as multi-terminology value sets and mappings used in their National Healthcare Data Dictionary.

Snow Owl Meaningful Query

The international adoption of SNOMED CT and related healthcare ontologies has provided the logical definitions that enable a new breed of queries. Unfortunately, it's challenging to run ad hoc queries that make use of the full semantics of the underlying EHRs. Operational stores have the data, but in a variety of structures that can't act on the semantic relationships between healthcare terms. Data warehouses can query only aggregated data that has been placed into predefined buckets which don't provide the scale of complexity inherent in the original data. And multiple information models represent the same semantic meaning in different ways.

Snow Owl Meaningful Query (MQ) allows semantic EHR queries on operational data stores without requiring predefined structures like data warehouses or the presence of a single unified healthcare information model. The system is optimized specifically for *ad hoc* queries of hundreds of millions of electronic health records. We combine ontological reasoning over the EHRs with more traditional query methods to incorporate demographic and ancillary data.

This query interface is being rolled out to all Singapore public hospitals and the national procurement office to allow search and retrieval of pharmaceuticals contained within the Singapore Drug Dictionary ontology. All lexical and semantic properties can be searched, including datatype properties and mappings to local code systems, external terminologies like ATC, and internal procurement codes.

Footnotes

RefNotes

- 1 www.b2international.com