

Components

The following gives a brief description of the components of BrainML. A [more detailed description](#) is also available, as is an overview of BrainML's [purpose](#) and [architecture](#).

1. BrainMetaL

BrainMetaL provides a basic set of tags that are applicable to most areas of neuroscience (as well as many areas outside of neuroscience). Most tags can only be used in one way under the rules of XML Schema. Some others though can be used in multiple ways, but *should* be used in particular ways in order to support processing by BrainML-aware software. In some cases the software will enforce these conventions, while in others a degree of latitude is allowed in order to avoid limiting the data exchanged using BrainML or the processing model that applications use.

Vocabulary

Lists of controlled vocabulary terms may be created in XML following a particular schema. The terms are organized by ISA hierarchy and domain of applicability. Models may specify that particular fields are to take their values from controlled vocabulary from a particular domain of applicability.

Units

As with controlled vocabulary, lists of units may be created in XML following a particular schema. There is no ISA or domain of applicability organization in this case. (In a future version applicability specification by dimension may be added.) Models may specify that particular fields are to take units.

Links

In addition to inheritance and aggregation, models may declare that entities are related to one another without specifying anything further about the relationship. In this case, a special `<link>` element is placed in instance documents as a child of the "from" end of the link, naming the "to" end by XML ID.

Citations

BrainMetaL defines a default bibliographic citation format suitable for journal articles, book chapters and proceedings papers, books, and theses. If it is desired for some reason to use a different format, an external schema may be referenced and its format used inside a special "wrapper" tag.

Data Containers

BrainMetaL defines general purpose containers for one- and multi-dimensional

(rectangular and non-rectangular) data. The available representation choices are decimal, integer, and string. The available formats are tagged (full structure in the XML), compact (comma-separated values and similar), and binary (Base64-encoded blocks). Decimal numbers may be arbitrary precision, however applications are not guaranteed to support any more than IEEE double precision. This is also the format the binary data uses for decimal. Likewise, for integers, application and binary support is for 64-bit integers.

Quintessence

While it is neither possible nor desirable to provide an exhaustive data model for all of neuroscience, it *is* possible to provide a basic set of very general categories under which other entities can be defined. This basic *ontology* is helpful in providing some minimal structure that can serve as an organizational seed for both BrainML models and applications. BrainMetaL provides this seed in the form of the *Quintessence* definitions, five top-level basic categories relating generally to neuroscience data: *data*, *entity*, *reference*, *method*, and *model*.

2. BrainML (Base Distribution)

BrainML is the extensible system of XML schemas built on top of BrainMetaL (i.e., using BrainMetaL tags) together with conforming instance documents. A set of additional tag definitions is provided with the BrainML specification to aid in building neuroscience models. Unlike some of the BrainMetaL parts, the use of these is governed strictly by XML Schema rules rather than convention.

Experiment / View / Trace

BrainML defines structure for data representation over and above that defined in BrainMetaL. A set of tags is provided for representing an *experiment* as a set of one or more *views* each composed of one or more *traces* (which themselves may be single or multi-dimensional). This tag also acts as a generic package for a data submission (to a repository) containing the tags defined below.

Recording Site / Source / Location

BrainML defines tags for representing the recording site of a neurophysiology experiment. These are defined at a general level, and are expected to be refined by specific data models for actual use (see, e.g, the [cortical](#) model. The motivation for the general tags is to allow applications a means of recognizing recording sites generically even when the details actually used for representation can change.

Protocol

Similarly to recording site, a tag for experimental Protocol is defined.