Usage Scenarios

The following outlines specific scenarios involving BrainML in support of interchange and interoperability within or between neuroinformatics resources.

1. Client-Server Communications

The simplest use of BrainML is a single neuroscience data repository providing a web interface. The server uses BrainML as an intermediate stage when providing query results, and accepts data submissions in BrainML format. The advantages gained from using BrainML as opposed to an ordinary XML or a non-XML format are based on the use of XML Schema and the systematicity of BrainML in which different data models are expressed using the same underlying framework.

- Submissions can be checked for consistency / completeness using standard XML Schema validation software, independently of what BrainML model is used.
- Query results can be formatted for simple display independently of the BrainML model used.
- Most of the processing of BrainML can be handled in a generic way, based on BrainML itself, rather than the specific model used. This allows the data model to evolve with only minor changes to the hosting software required. BrainML provides a versioning mechanism so that software can easily determine whether it is compatible with a given data document.
- BrainML is an open, self-documenting format, so it is easy for third parties to write software for interfacing to the repository.

2. Generic Data Handling Capabilities

In neuroscience, the diversity of preparations and experimental methods exceeds the diversity of data types collected. Thus we expect that aspects of data models for describing things like recording sites and recording technique will vary between communities while aspects for describing the actual data values (time series, image array, etc.) often remain constant. BrainML is designed to allow reuse of model components for such common elements when creating new data models without compromising the ability to represent new specialized forms of data. This can potentially allow client client tools designed to work with the common components to work with a variety of data models.

- The "virtual oscilloscope" module built into the query tool at neurodatabase.org is capable of reading the BrainML base data container format, including structures for a variety of time series traces, histograms, and X-Y plots. It is expected this data container format will be

shared by many data models independently of their other characteristics, all of which the viewer module will be able to handle.

- A tool being developed by Bruxton Corporation will also operate on the data container format, but functioning to transfer the data to analysis programs such as MATLAB and SigmaPlot.
- Finally, the Laboratory of Neuroinformatics is developing a library of diverse analytical routines under a common interface to operate on neurophysiology data. An tool will be built to load BrainML data container data to be processed by this analytical library.

3. Multi-Repository Integration

The ability of BrainML models to share common components can support some forms of integration across neuroscience data repositories. For example, a single client interface can initiate a search across multiple repositories based on common components, such as authors, data types, recording sites, or techniques. The search may return back results from different data models, however the client interface can still parse the responses based on the basic BrainML format and conventions, and organize the results according to the components it does understand. In addition, utilization of the raw data may be aided if the BrainML data container format is used for all the data sets.

If a collection of neuroscience repositories all provide BrainML interfaces, this shared basic structure can be used to catalog the repositories in a single index, searchable by content. This would support the creation of meta-resources like the SFN Neuroscience Database Gateway and the in-development Neuroscience Information Framework.