

Hypatheon: A Searchable Database Capability for Formalized Mathematics

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Making the Most of the PVS Libraries

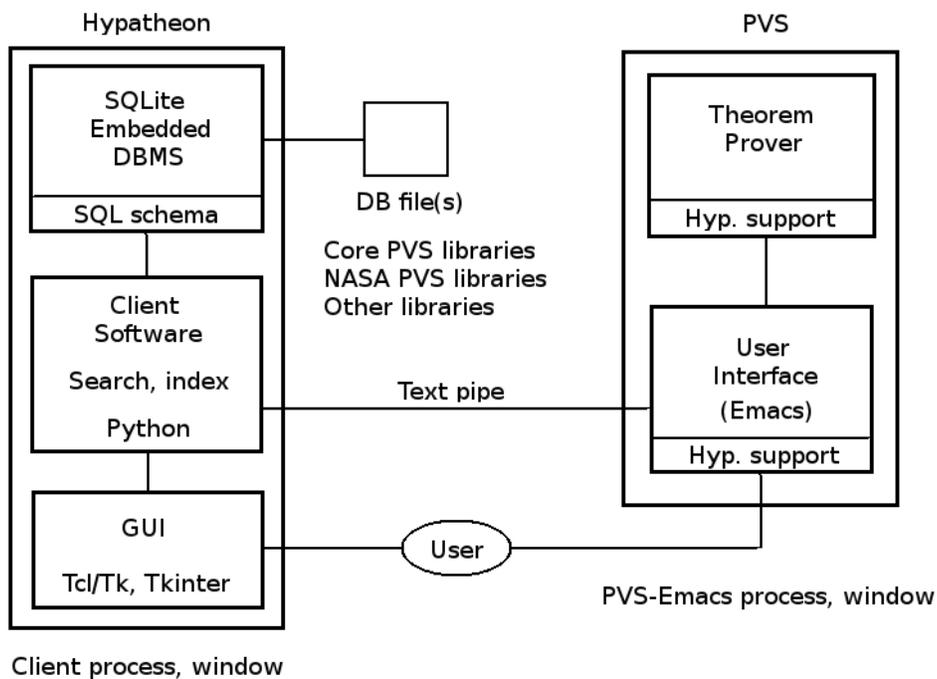
- The PVS library collection is a great asset.
- But, we don't want to spend too much time...
 - Searching for mathematical knowledge in the libraries.
 - Teaching the prover about facts that are already there.
- So we're providing some automation to help:
 - A database capability to collect and organize PVS entities.
 - Tools to search these databases and present the results.
 - A direct connection to PVS so the tools can offer “proof-side assistance.”
- We have developed the Hypatheon capability to achieve these goals.
 - Originated in 2003 as a small project aiming to build a web service.
 - Downsized in recent years to a more modest, self-contained implementation.

Desktop Version of Hyatheon

Current approach is to host Hyatheon entirely on the desktop.

- It runs as a separate process with the SQLite embedded database engine.
 - Normally as a client/helper application for the PVS-Emacs process.
 - If desired, it can also run in stand-alone mode.
- Queries are initiated in the client.
 - Search engine-style results are displayed in the client window.
 - User can examine lemmas and other declarations in context.
- User can select a lemma to use; a command is then formatted and sent directly to the prover.
- Indexing support is also provided.
 - Library distributions (e.g., NASA libraries) or user/project libraries.

Hyatheon Architecture



Database Objects

Hypatheon indexes and searches for these PVS entities:

- Libraries (core + user-developed)
- Modules
 - Theories
 - Datatypes
- Steps (prover commands)
 - Primitive rules
 - Defined rules
 - Strategies
- Declarations
 - Formulas
 - Functions
 - Constants
 - Judgements
 - Types
- Proofs
 - Formula proofs
 - Judgement proofs

Demo

Hypatheon demo (20 minutes).

Status

- Open-source release of Hypatheon is imminent.
 - Will be available to all PVS users.
 - Pre-built databases to be included with NASA PVS libraries.
 - Users can index their own libraries/theories.
- Performance goal is to support:
 - 1 K libraries
 - 10 K theories
 - 100 K function definitions
 - 1 M theorems (formulas)
- User participation is encouraged.
 - Development of new PVS libraries
 - Contributions to Mathematical Knowledge Management
 - Feedback on Hypatheon