



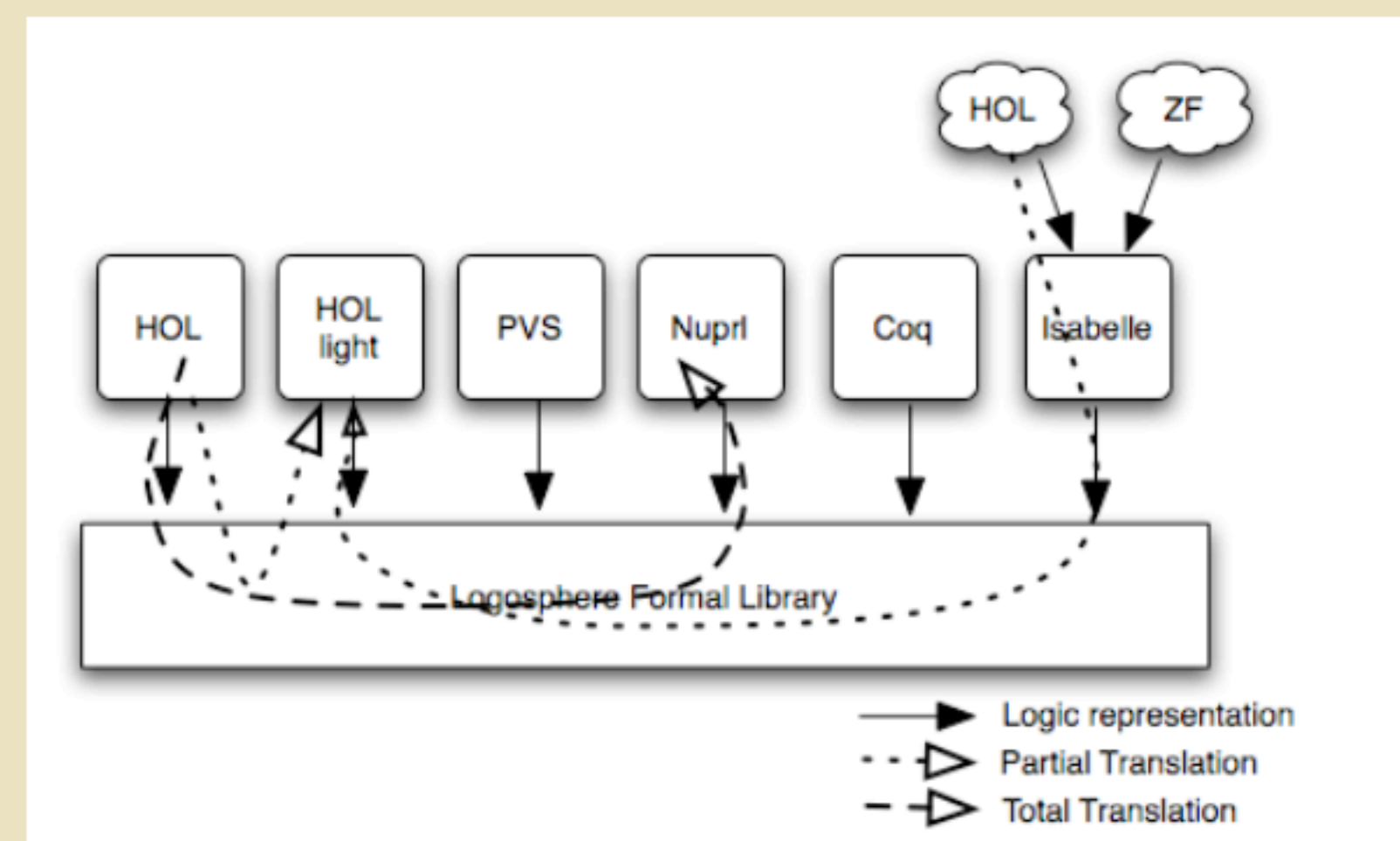
A Formal Digital Library

We design and implement a digital library of formal proof, bringing together different proof assistants and theorem provers, with the goal to facilitate the exchange of mathematical knowledge.

Project Focus

1. Technology to consider proofs as syntactic objects that can be used as easily as integers, floats, lists, or trees.
2. Practical applications in the world of formal methods.

Logosphere enables industries that employ formal methods, such as INTEL, AMD, and NASA to draw on formerly inaccessible mathematical facts and their meaning.



Sample proof assistants and theory translations

Approach and Impact

New Approach

- Logical framework
- Proof transformations
- No universal logic

Research Impact

- Sharing of proof libraries
- Proof assistant integration
- Use of formal methods

Logical Framework LF

- Dependent type theory
- Judgments-as-types
- Hypothetical derivations-as-functions
- Foundationally uncommitted
- Proof compression
- Module system
- Twelf basis to the internal engine

Proof Translations Language

- Meta logic to LF
- Curry Howard isomorphism
- Supports total and partial translations

Library Implementation

- Formalization of PVS
- Translation of Isabelle/HOL into HOLlight
- Formalized proof of Keplers conjecture
- Formalization of HOL-Nuprl connection

Decision Procedures

- Proof extraction
- SRI's Yices SMT solver

Applications

- Absence of malware guarantees
- API-level vulnerability
- Logic of Authorization
- Electronic Voting

```
lemma4: transtm (H:tm A) N -> transtp A T -> !- N # T -> type.  
lemma5 : |- H -> transsen H T -> !- M # T -> type.
```