The Trellys Project

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Trellys

- A multi-year, multi-institution, coordinated project to develop the dependently-typed programming language Trellys
- A Community-Based Design process – inspired by the Haskell Committee in the 1980s
- NSF funded project to coordinate the effort
  - Portland State University (Tim Sheard)
  - University of Iowa (Aaron Stump)
  - University of Pennsylvania (Stephanie Weirich)

Letters of Support

- Andreas Abel , Munich
- Thorsten Altenkirch, Nottingham
- Lennart Augustsson, Standard Chartered Bank
- Bruno Barras, INRIA Saclay
- Edwin Brady, St. Andrews
- Peter Dybjer , Chalmers
- Cormac Flanagan, UC Santa Cruz
- Conor McBride , Strathclyde
- Greg Morrisett , Harvard
- Ulf Norell, Chalmers
- Simon Peyton Jones, Microsoft Research
- Frank Pfenning, CMU
- Brigitte Pientka, McGill
- Philip Wadler, Edinburgh
- Hongwei Xi, Boston U.

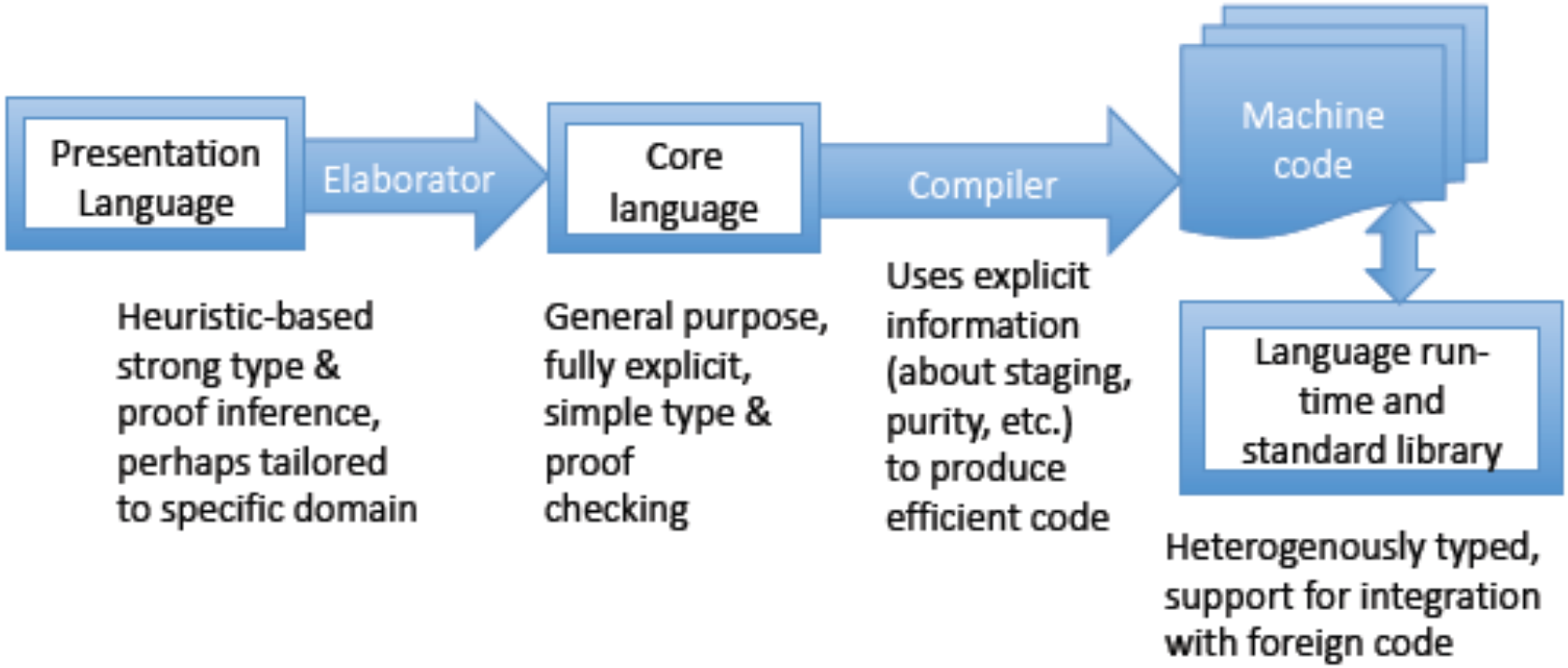
Goals

- Build tools to support the cost-effective construction of functionally correct software systems – A dependently typed programming language

Why dependent types?

- Verification at the source level, part of the development process
- Verification is incremental, richer types means more properties. Pay as you go
- Verification is modular, unrelated changes do not invalidate proofs

Trellys Platform Architecture



Core Language

- Focus of initial design effort Fall 2009
- Explicitly typed
- Call-by-value semantics
- Full-spectrum dependency
- Explicit erasure annotations
  - Equality defined in terms of implicit language
- Termination analysis to enforce logical consistency
- Compatible with classical reasoning

Presentation Language

- Text based universal language
- Programs are written, not extracted
- Typing annotations are minimal
- Many type casts are inferred in translation to core

Compilation

- Type-preserving compilation
- Goal: to reflect (observational) equalities deep into the compilation pipeline
- Programs marked explicitly as erasable are removed, leading to efficient code

Core Language: Design Questions

- What sort of termination analysis to use?
  - If any!
  - Not clear there is a sweet spot
- How expressive should we make the logic/language?
  - Can we make *:* compatible with termination analysis
- Should we separate proofs from programs?
  - Is a proof just a terminating, irrelevant expression, or do we need finer distinctions
- What notion of equality should we use for conversion?
  - Must be compatible with the operational semantics

Community based effort

- Small group of external experts (Simon Peyton Jones, Wouter Swierstra, Conor McBride, Bruno Barras) assisting with initial core language design
- A wider call for participants to review core-language effort in the Summer 2010
- A open call for participants in a Trellys workshop in January 2011
- Regular meetings throughout duration of project