DATA 61

Eisbach

A proof method language for Isabelle

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Isabelle Concepts

Isar, Proof Methods, and ML

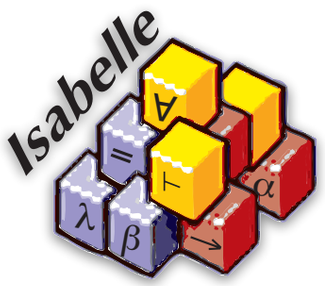
Isabelle Stack

jEdit (Scala)

Isar

Isabelle/ML

Poly/ML



Isabelle/Isar

theorem *Knaster-Tarski'*:
  assumes *mono*[*intro*!]: $\bigwedge x\ y.\ x \leq y \Longrightarrow f\ x \leq f\ y$
 shows $f\ (\bigsqcap\ \{x.\ f\ x \leq x\}) = \bigsqcap\ (\{x.\ f\ x \leq x\})$ (**is** $f\ ?a = ?a$)
proof −
 have $*$: $f\ ?a \leq ?a$ **by** (*clarsimp*,*rule order.trans*, *fastforce*)
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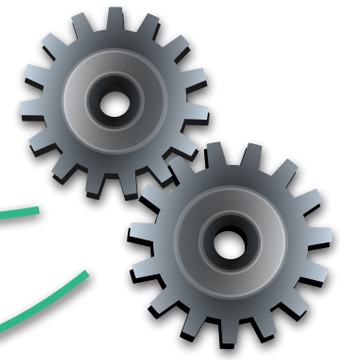

Proof Methods

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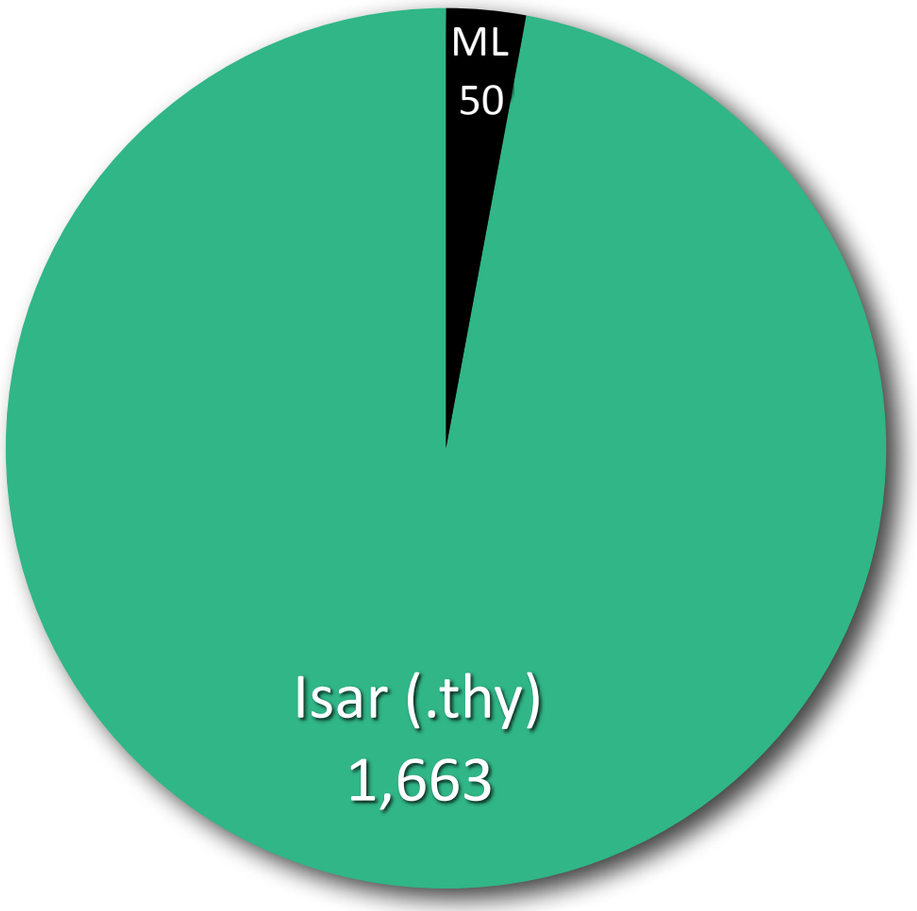
  - often break with API changes

Isar vs. ML



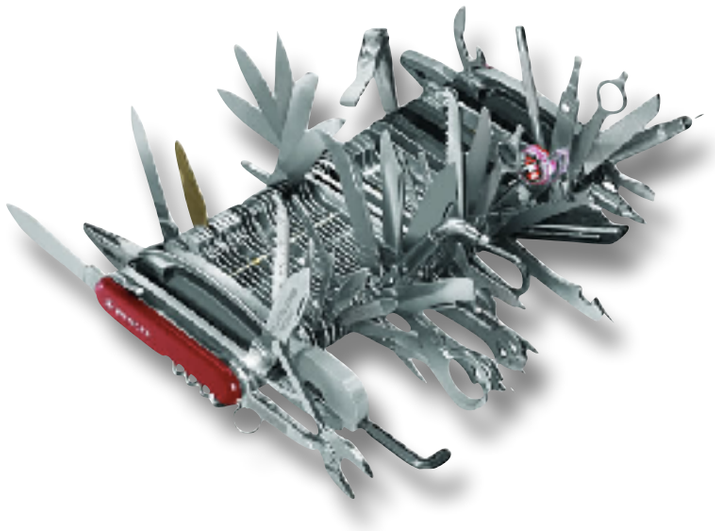
seL4

Our experience

- Full functional correctness proof
  - Open source proof and code
  - http://seL4.systems for more info

- Isabelle proof methods developed
  - wp/wpc
  - vcg for monadic hoare logic
  - sep-cancel, sep_solve …
  - automating separation logic

- Proof Engineers want more!



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Eisbach

Easy Custom Proof Methods

Schwabinger Bach
Hirschau
Tennis Hirschau
Isarring
Gyßlingstraße
Eisbach
Isar
Heinrich-Mann-Allee
Pienzenauerstraße
Dehmelstraße
Mauerkircherstraße
Opitzstraße
Steubstraße
Felix-Dahn-Straße
Redwitzstraße
Flemingstraße
Reuchlinstraße
Münchner Kreis für Volksmusik Lied...
Seestadl im
HVB Club
Freizeit
BIL Leasing GmbH &
4C Catering Service

Isar


Eisbach
Isar
Schwabinger Bach
Hirschau
Tennis Hirschau
Isarring
Gyßlingstraße
Eisbach
Isar
Heinrich-Mann-Allee
Pienzenauerstraße
Opitzstraße
Dehmelstraße
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Demo

Tactic languages are not new

- Ltac
  - Untyped High-level tactic language for Coq
  - Goal matching, iteration, recursion

- VeriML
  - Dependently typed tactic language
  - Provides strong static guarantees

- Mtac
  - Typed tactic language for Coq
  - Leverages built-in Coq notion of computation
  - Strong static guarantees

What distinguishes Eisbach?

- Extensive backtracking support
  - In Isabelle’s combinators and match method
- Named theorems
  - Efficient and convenient databases of facts
- Powerful pattern matching
  - Using Isabelle’s unifier
- Extensible
  - Language extensions can be built as proof methods (in ML)
  - e.g. match is simply another proof method

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Thank You!

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