Paral-ITP Front-End Technologies

and Isabelle Prover Architecture

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Overview

Relevant work packages

PA-Isabelle: Continued efforts on scalability beyond 8–16 cores

FT-PIDE: Concrete Prover IDE implementations
(integration of prover with editor front-end)

- official Isabelle/jEdit (stable releases: 2011-1, 2012, 2013):
  full-scale Prover IDE, ready for use in production
- experimental CoqPIDE (summer 2013, paper Feb. 2013):
  full PIDE protocol stack, minimal semantic content (CoqIde lexer)
- external CLIDE (by C. Lüth and M. Ring, Bremen):
  Web application based on Isabelle/Scala, Play, Coffescript

FT-Agents: Add-on tools for augmented prover interaction
(automated provers and disprovers, e.g. Sledgehammer, Quickcheck)

PA-Isabelle

Scalability beyond 8–16 cores

Main challenges:

1. ML platform: multi-threading and parallel memory management
   external contribution of Poly/ML 5.5.0 (by David Matthews 2012), support for large immutable heap content with on-line sharing
2. Application structure: degree of task parallelism within the prover
   some tuning in 2012, further reforms in Jan/Feb 2013 (see below)
3. Test hardware: still on 8 core Xeon (hyperthreading) from 2009
   first tests with 16 core Xeon of LRI failed: odd hardware parameters, odd KVM configuration

Shared-memory multiprocessing for ITP

Paper: submitted to ITP 2013

http://www4.in.tum.de/~wenzelm/papers/itp-smp.pdf

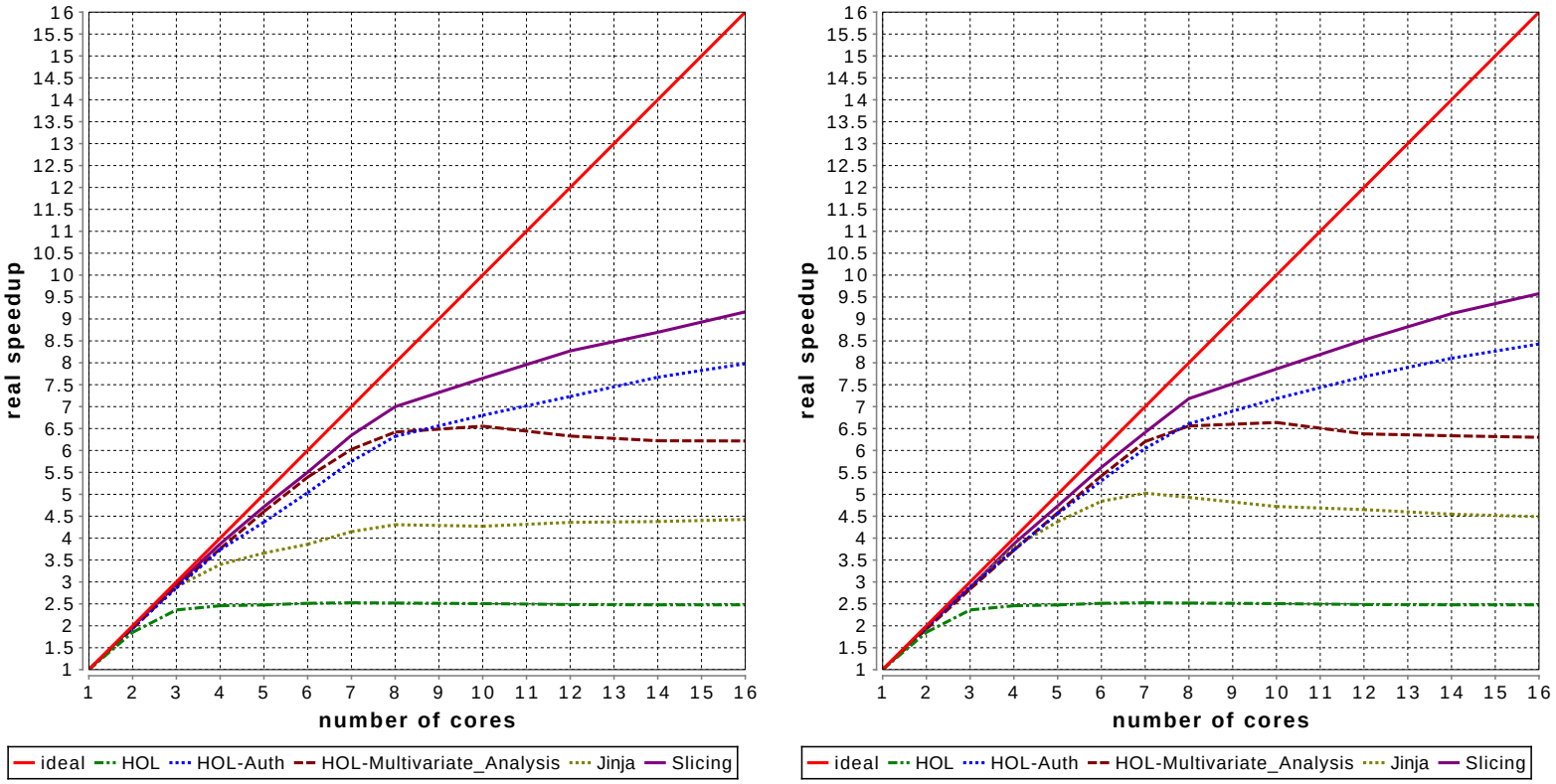
Measurements:

http://paral-itp.lri.fr/software.html

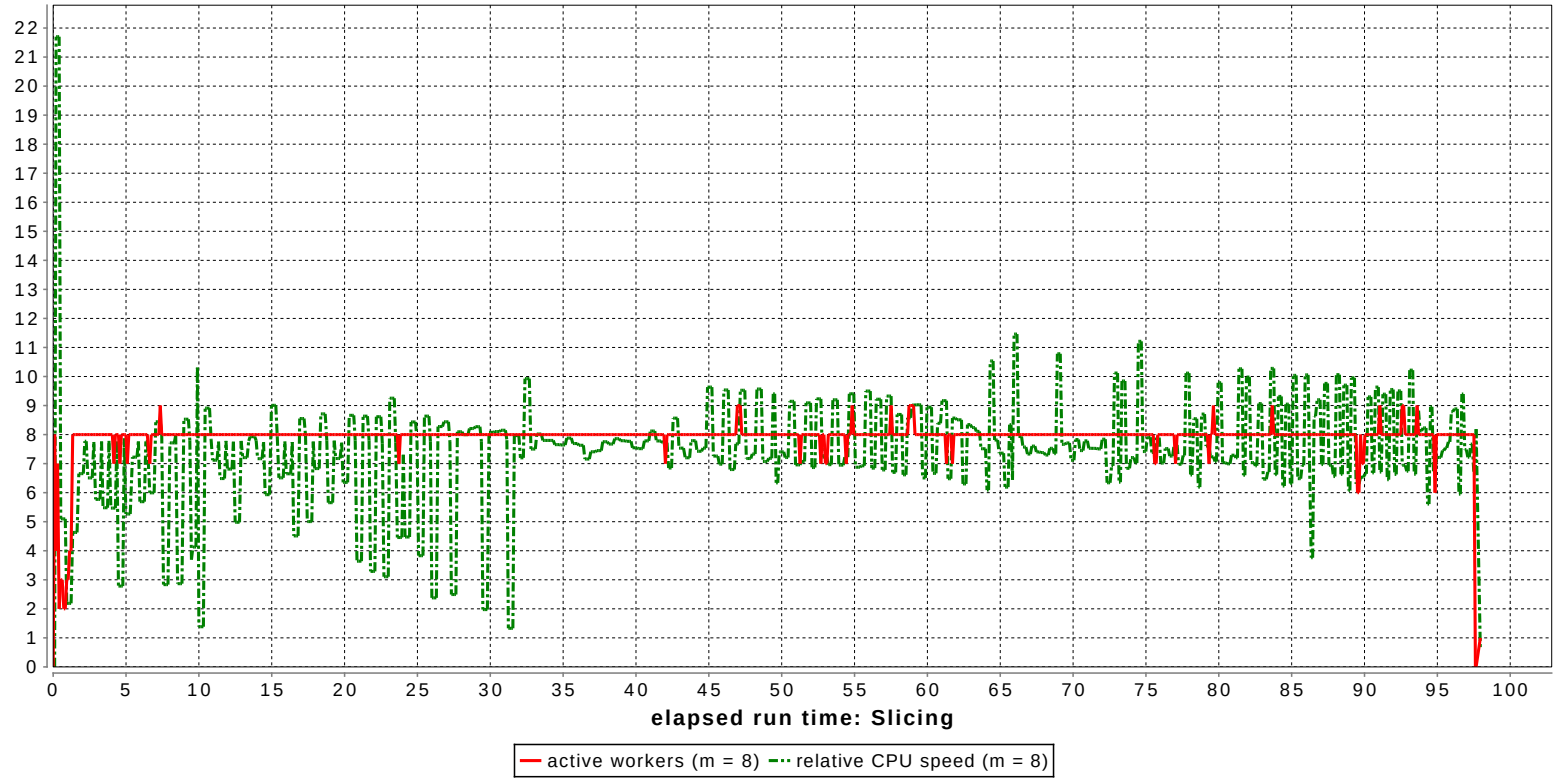
Ongoing improvements:

- detailed statistics of ML threads, memory, tasks etc.
- forked diagnostic commands
  (slow print statements, experimental evaluations)
- subproof parallelization based on nested structure of Isar proofs
  (not just top-most and inner-most proofs as before)
- "prescient" scheduling based on elapsed time from old version
  (determines fork of subproofs and task priority)

Parallel performance in March 2013



Saturation of worker threads and CPUs



FT-PIDE

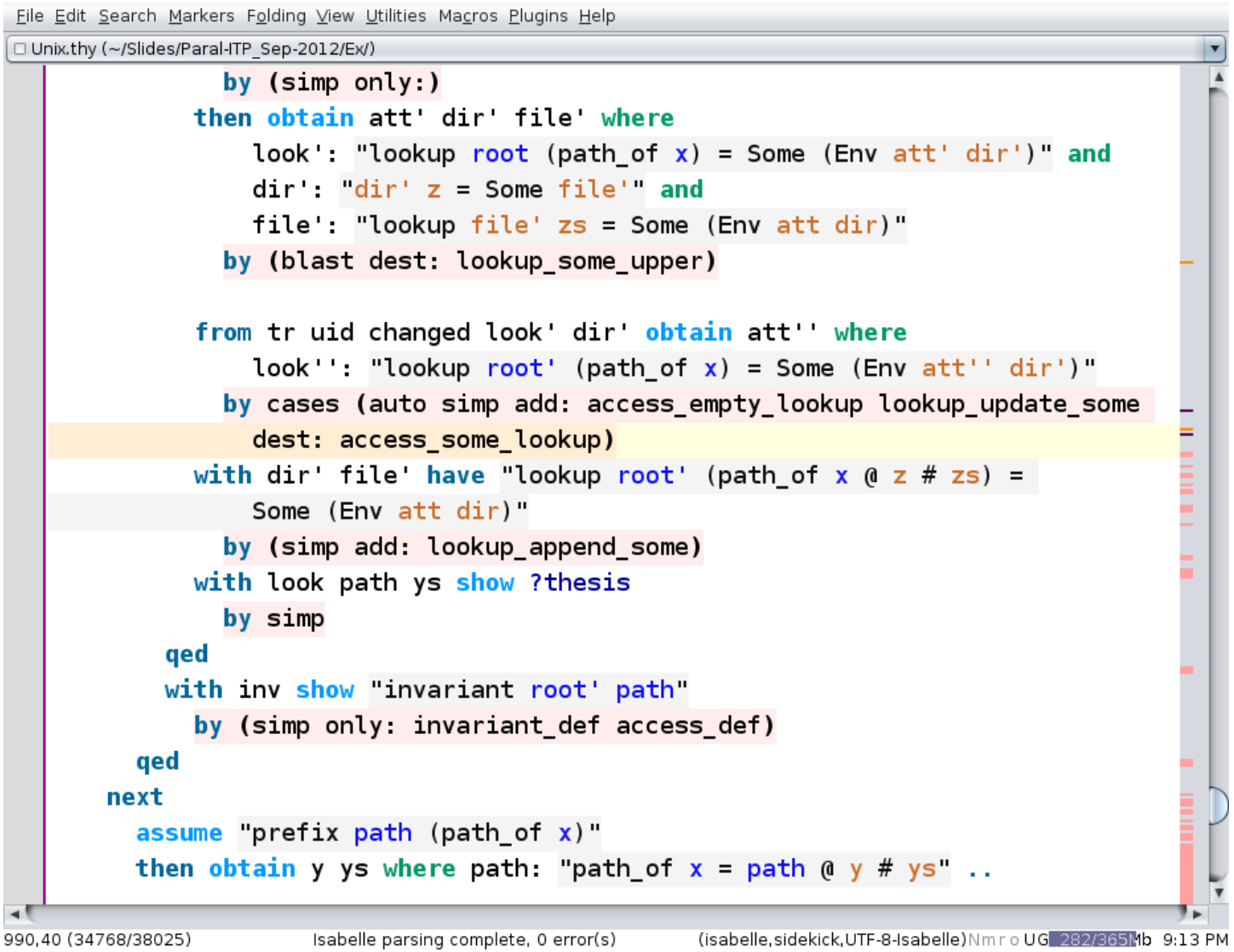
Isabelle/jEdit in Isabelle2013

Isabelle2013 (February 2013):

- 3rd stable release of Isabelle/jEdit Prover IDE
- 2nd stable release on Windows (improved scalability / robustness)
- substantial consolidation of parallel Isabelle and PIDE front-end
  $\longrightarrow$ inflow of fresh and naive users

Technical side-conditions:

- Poly/ML 5.5.0 — continued heroic efforts by David Matthews
- Scala 2.9.x and 2.10.x — continued strides towards higher-order functional-object-oriented programming for the masses (on JVM)
- Java 1.7.9, .11, .13, .15, .17, . . . — continued patching by Oracle


File Edit Search Markers Folding View Utilities Macros Plugins Help
Unix.thy (~/Slides/Paral-ITP_Sep-2012/Ex/)
by (simp only:)
then obtain att' dir' file' where
look': "lookup root (path_of x) = Some (Env att' dir')" and
dir': "dir' z = Some file'" and
file': "lookup file' zs = Some (Env att dir)"
by (blast dest: lookup_some_upper)
from tr uid changed look' dir' obtain att'' where
look'': "lookup root' (path_of x) = Some (Env att'' dir')"
by cases (auto simp add: access_empty_lookup lookup_update_some
dest: access_some_lookup)
with dir' file' have "lookup root' (path_of x @ z # zs) =
Some (Env att dir)"
by (simp add: lookup_append_some)
with look path ys show ?thesis
by simp
qed
with inv show "invariant root' path"
by (simp only: invariant_def access_def)
qed
next
assume "prefix path (path_of x)"
then obtain y ys where path: "path_of x = path @ y # ys" ..
990,40 (34768/38025)
Isabelle parsing complete, 0 error(s)
(isabelle,sidekick,UTF-8-Isabelle)Nmr o UG 282/365Mb 9:13 PM

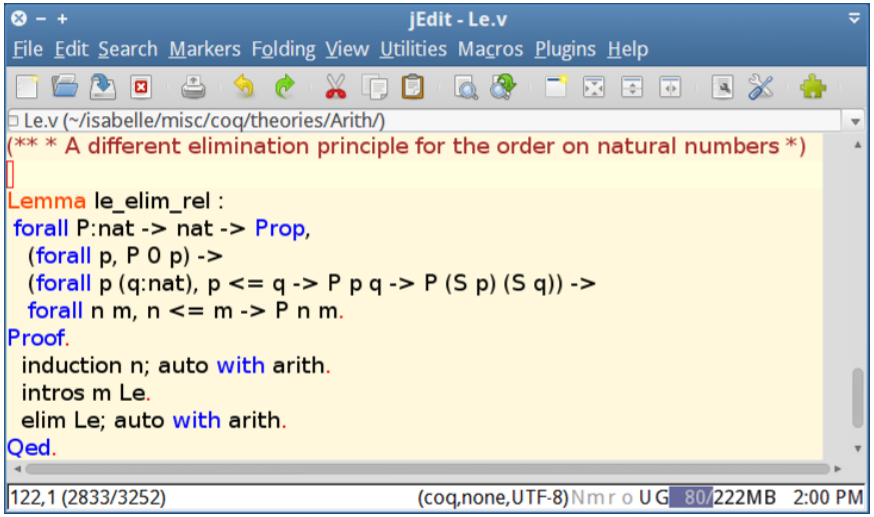
Technical problems of Java 7

- Oracle is under constant attack and busy patching security holes (instead of putting client-side into shape: Swing, JFX)
- JFX / HTML5 is there but requires work to make it usable
  $\longrightarrow$ better use `Rich_Text_Area` of jEdit
- Java 7 on Mac OS X works mostly, but is not fully realiable yet
- Java 7 on Linux works mostly, but is unsupported by "alternative" desktops and window managers (*awesome*, *xmonad*)
- Java 7 an Windows works, but does not support directory names with Chinese characters
- OpenJDK community neither better nor worse than Oracle, (Java support on *Linux Mint* particularly bad)

Experimental CoqPIDE (summer / winter 2012)

Paper: submitted to ITP 2013 as "rough diamond"

http://www4.in.tum.de/~wenzelm/papers/coqpide.pdf



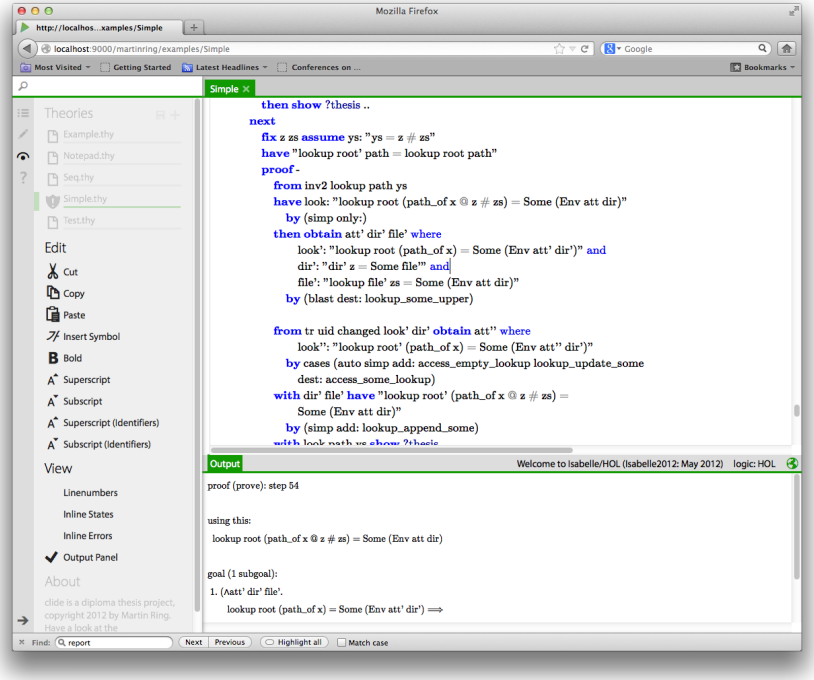
Sources:

https://bitbucket.org/makarius/isabelle2013-coq

https://bitbucket.org/makarius/coq-pide

CLIDE (C. Lüth and M. Ring, Bremen)

Idea: Isabelle/Scala/PIDE framework as basis for Web Application (using Scala, Play framework, Coffescript)



$\longrightarrow$ demonstrates generality of PIDE front-end technology

FT-Agents

Document-centric dialogs

Approach:

1. dialog id within document model (assignable)
2. rendered with special color scheme
3. activation click:
   (a) augment document content (bypassing round-trip)
   (b) tell prover about dialog result

Applications:

- BASIC input
- interactive Simplifier trace (still crude)
- external applications via monolog (e.g. old graph browser)