





















Ten Years of Agda2

Andreas Abel¹

¹Department of Computer Science and Engineering
Chalmers and Gothenburg University, Sweden

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Agda meetings (AIMs)

		2004	Oct	 Gothenburg (I)
Apr	 Osaka (II)	2005	Sep	 Gothenburg (III)
spring	 Osaka (VI)	2006	fall	 Gothenburg (V)
May	 Gothenburg (VI)	2007	Nov	 Osaka (VII)
Jun	 Gothenburg (VIII)	2008	Nov	 Sendai (IX)
		2009	Sep	 Gothenburg (X)
Mar	 Awaji (XI)	2010	Sep	 Nottingham (XII)
Apr	 Gothenburg (XIII)	2011	Sep	 Shonan (XIV)
Feb	 Fischbachau (XV)	2012	Oct	 Copenhagen (XVI)
May	 Shonan (XVII)	2013	Sep	 Gothenburg (XVIII)
May	 Paris (XIX)	2014	Oct	 Tallinn (XX)

Agda 2: Beginnings

- 2004 Prototype *AgdaLight* started in the *Cover* project: Thierry, Ulf, and me.
- 2005 Nisse formalizes LF in AgdaLight.
- 2005 September: Jeff Polakow and Ulf discuss the design of Agda 2. Coding starts.
- 2006 Agda 2 is implemented.
- 2007 Release of Agda 2.0.0 after AIM6 (May 2007).
- 2007 Sep: Agda Language Review.

Agda 2.0.0 Feature list

- Inductive families.
- The `with`-construct (magic from 2.1.0).
- Records.
- Termination checker for structural recursion.
- The Alonzo compiler.
- Fancy coloured Emacs mode.

Agda 2.2.0 (Mar 2009) – 2.2.4

- Coverage checker and interactive case splitting (C-c C-c)
- codata
- Sized types
- MAlonzo compiler and Haskell FFI
- Unicode syntax and Agda input mode
- HTML rendering
- Standard library
- Windows installer and hackage

Agda 2.2.6 (Dec 2009)

- Universe polymorphism: AIM 8 (May 2008) – AIM 10 (Sep 2009)
- Records: constructors and hidden fields
- `rewrite`
- `trustMe`
- `intro` command
- Relocatable interface files containing highlighting info
- Retired: Agate and Alonzo compilers

Agda 2.2.8 (Sep 2010, post AIM 12)

- Record pattern matching
- Non-dependent irrelevance
- `syntax`
- Musical coinduction
- Reflection: `quote`, `quoteGoal`
- Auto (Agsy) (C-c C-a)

Agda 2.2.10 (Feb 2011)

- `--without-K` without foundation
- Epic compiler

Agda 2.3.0 (Nov 2011, post AIM 13/14)

- Mutual definitions without `mutual` keyword
- Pattern matching lambdas (extended lambdas)
- Record update
- Unification improvements following Abel/Pientka (TLCA 2011)
- Instance arguments
- Dependent irrelevance
- Reflection: `unquote`, `quoteTerm`
- JavaScript compiler

Agda 2.3.2 (Nov 2012)

- Let record patterns
- Pattern synonyms
- Qualified infix operators
- Anonymous parameterized modules
- Smarter coverage checker
- Interactive syntax highlighting
- \LaTeX backend

Agda 2.4.0 (June 2014)

- Development now using git on `github.com`
- Levels defined in `Agda.Primitive`
- Copatterns
- Anonymous top level module
- Lets in telescopes
- Proper `--without-K`
- Generate helper function (`C-c C-h`)
- Improvements, improvements, ...

Agda 2.4.2 (August 2014)

- Recursive instance search
- `tactic` keyword
- Unquoting declarations

Agda: Outside View

- A language to formalize math and computer science
- A language to write papers (ca. 100 on the wiki)
- A language for teaching (15 courses on the wiki)
- A brand: *Coq and Agda*
- A user community
Martin Escardo, Wolfram Kahl, Dan Licata, Serge Mechveliani, Andy Pitts ...

Agda: Inside View

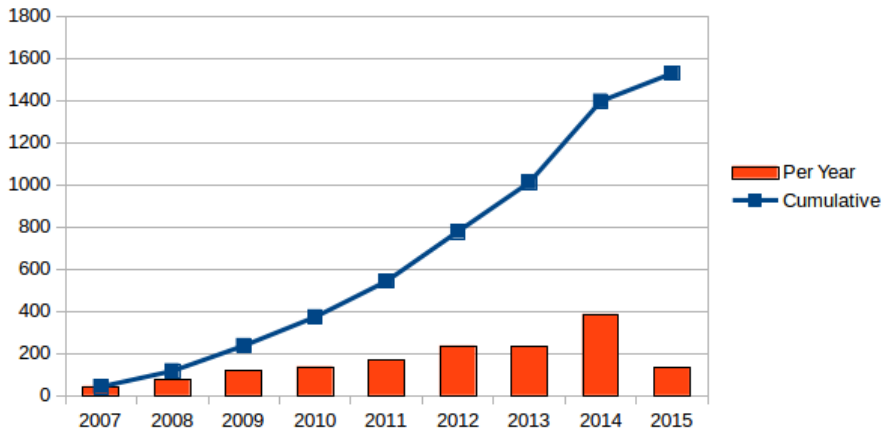
- 3 main developers (part-time)
- 1 packaging, integration, and release engineer (part-time)
- a dozen contributors (sporadically active)
- a long tail of single-patch submitters
- 93.000 loc (3.4MB) [2014: 70.000 loc]
- 1528 issues on the bug tracker (249 open) [2014: 1076 (165)]

2007-2010	100 bugs/year
2010-2013	200 bugs/year
2013-	300 bugs/year ?

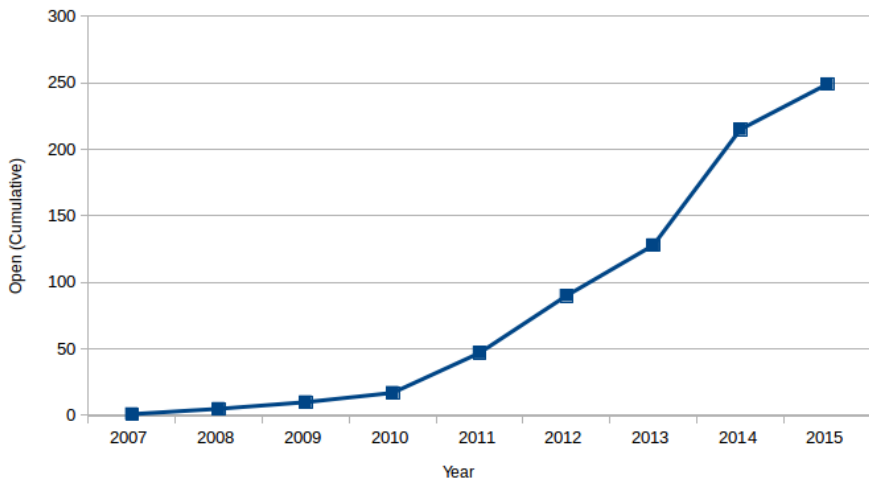
Agda: Where do the 93kloc come from?

Component	loc ('15)	loc ('14)
Utility functions	8000	4100
Syntax (parsing, printing, scope checking)	19000	16000
Type checker (+ eval, coverage)	39000	30000
Termination checker	5800	4600
Interaction (+ highlighting, imports)	7400	6600
Agsy	4200	4100
Compiler	8000	5200

All Agda Issues



Open Issues (May 2015)



Bug fixing is sometimes like Whack-A-Mole



Long on the Wish List

- User manual
- Packaging
- Type classes (WIP)
- Universe cumulativity
- Reflection/tactics (WIP)
- Efficient type-checking
- Usable compiler (WIP)

Core Language / Internal Syntax

- Sharing
- Independent checking
- Termination certificates
- Shared optimizations/transformations used by compiler backends

Research topics

- Equality (HoTT, OTT)
- Parametricity/colors
- Sized dependent types
- Proof/instance search and unification
- Foundation for hidden/named arguments (Msc: Marcus, Jesper)
- Telescopes/ Σ -types at framework level
- Printing