The Haskell Ecosystem

Erik Rantapaa   Chris Wilson

What is Haskell?

- functional / pure
- lazy
- statically typed
- versatile types
- type inference
- compiled
- interpreted

- succinct
- safe
- garbage collected
- elegant concurrency
- lightweight threads
- easy FFI to C libraries
- general purpose
- competitive with C / Java
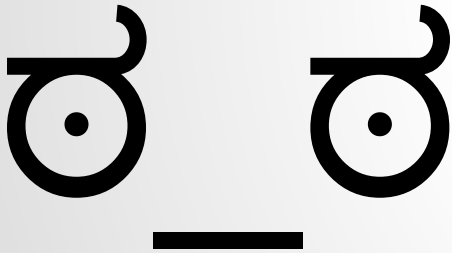
Some Applications

- [xmonad](#)

- [pandoc](#)

- [darcs](#)

- [git-annex](#)

- [gitit](#)

- [detexify](#)

- [lex-pass](#) (Facebook)

- [angel](#) (Bump)

Brief History of Haskell

1990 - A committee formed by Simon Peyton-Jones, Paul Hudak, Philip Wadler, Ashton Kutcher, and People for the Ethical Treatment of Animals creates Haskell, a pure, non-strict, functional language. Haskell gets some resistance due to the complexity of using monads to control side effects. Wadler tries to appease critics by explaining that "a monad is a monoid in the category of endofunctors, what's the problem?"

Brief History of Haskell

"a monad is a monoid in the category of endofunctors, what's the problem?"

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Brief History of Haskell (really)

1987 - committee formed

1990 - Haskell Report 1.0
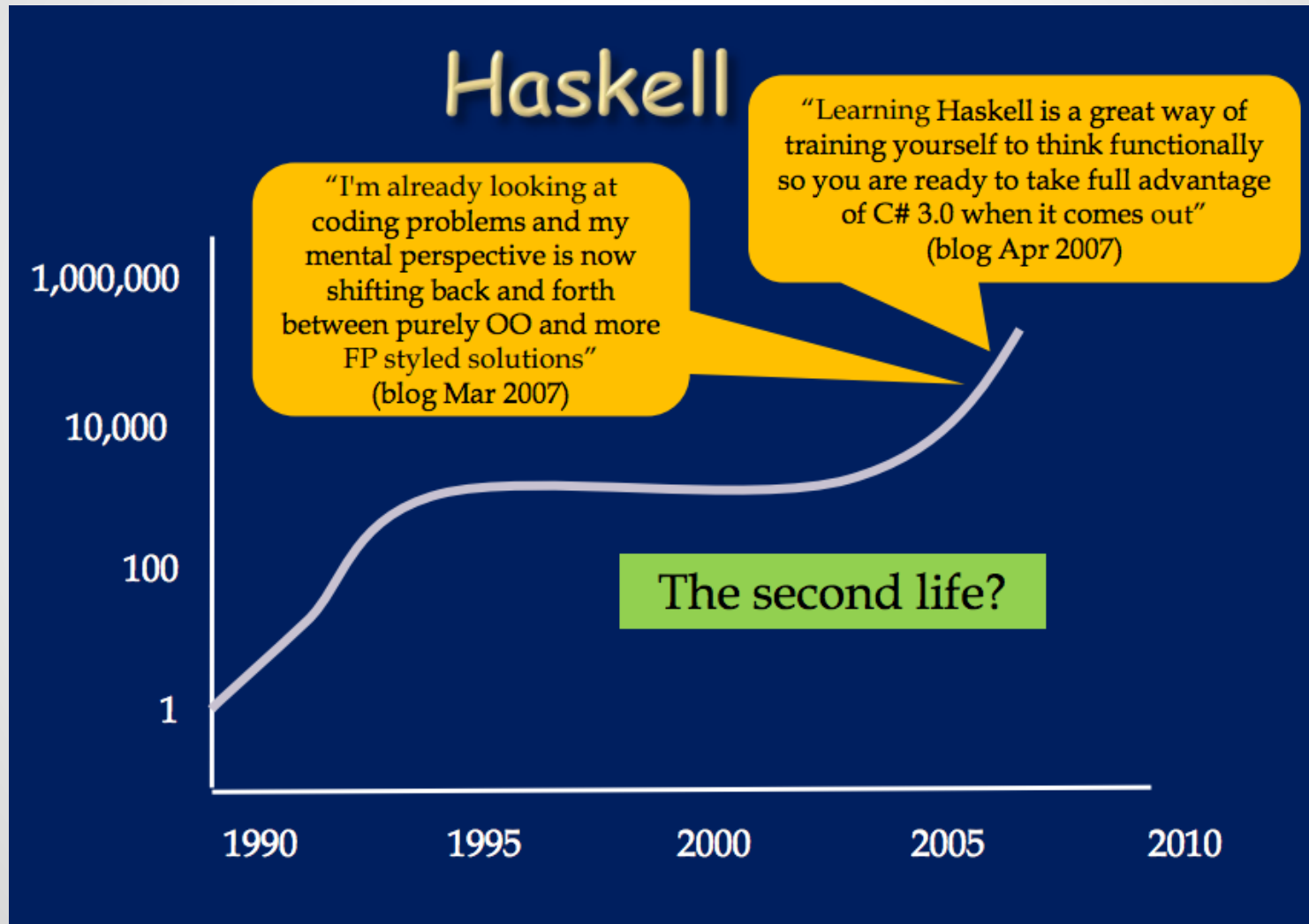
1997 - Haskell Report 1.4

1999 - Haskell 98

2000 - haskell-cafe / #haskell

2006 - Haskell Prime committee formed

2010 - Haskell 2010

Brief History of Haskell

Implementations

- GHC
  - flagship implementation
  - supports Haskell 2010 + many extensions
- JHC / AJHC
  - compile to standard C
  - suitable for embedded systems
- Javascript compilers
  - ghcjs, Fay, haste
- ghc-ios
  - create universal IOS binaries for Xcode

Haskell Platform

- "Batteries Included"
- Most of the tools you want
  - Debugger
  - Code coverage
  - Cabal (packaging)
  - Haddock (docs)
  - GHCi (REPL/interactive console)
- 2-3 releases per year
- [(link)](link)

Linux / *BSD

- Debian
  - `apt-get install haskell-platform`
- Fedora
- Gentoo
- Arch
- Free / OpenBSD
- easy to compile from source

Hackage

- http://hackage.haskell.org/
- Repository of Haskell packages
- Growing fast! 5,000+
- Recently upgraded to 2nd major version
- Packages
  - Image processing
  - Web
  - Testing
  - Parsing
  - Networking
  - Crypto
  - Etc...

hdiff.luite.com

- mirror of Hackage
- a `git` repo for each package
- `cgit` repo collection web ui
- bookmarklet to jump from Hackage to `cgit`

Cabal (package / build system)

- Common Architecture for Building Applications and Libraries
- Handles:
  - building
  - testing
  - installation
  - benchmarking
  - solving dependency constraints
  - ...
- Often just:
  - `cabal install awesome-lib`

Example Cabal files

- zeromq-haskell: file:///talk/cabal-example.txt
- accelerate-cuda: file:///talk/cabal-example2.txt

Cabal Sandboxing

- cabal-dev
- cabal … --sandbox
- hsenv
  - manage virtual Haskell build environments

GHCi

- interpreter / REPL based on GHC
- can load compiled code
- [winghci](#) - Windows app
- very configurable
  - customize output
  - define top-level definitions
  - custom commands

```
:set prompt "λ"

:def hoogle \x -> return $ ":!hoogle \"" ++ x ++ "\""
```

Scripting

```
#!/usr/bin/env runhaskell
main = interact (unwords . reverse . words)
```

- runhaskell - run a Haskell script

Literate Haskell

This is how you write Hello World in Haskell:

> main = putStrLn "Hello, world!"

You can load this file directly into ghci.

- `.lhs` suffix denotes Literate Haskell syntax
- only > lines are recognized
- works well with LaTeX, markdown, …
    - lhs2TeX, pandoc

Documentation search

- [Hoogle](#) and [Hayoo!](#)
- AMAZING!!!
- Search by types
  - Search: `[a] -> [a]`
  - Find: **sort, nub,** ...
  - Search: `Char -> Bool`
  - Find: **isSpace, isAlpha, isDigit** …
- Can run hoogle locally
- Local haddock docs

Editors and IDEs

- emacs
  - haskell-mode.el
- vim
  - haskell-mode, hdevtools-vim, syntastic, ariadne, ...
- SublimeText2
  - SublimeHaskell
- Eclipse (EclipseFP)

Coding Demo

hpc - Haskell Program Coverage

- toolkit to record and display code coverage
- [(example)](#)

hlint

- Suggest improvements to Haskell code
- analyze a directory:

  ```
  hlint . --report

  open report.html
  ```

- integrated into many editors
- good way to learn Haskell style conventions

ThreadScope

- profiler for parallel programs
- GUI for inspecting profiling logs
- available for Windows, OSX, Linux
- [(example)](#)

Heroku

- You can deploy Yesod apps on Heroku
  - http://blog.begriffs.com/2013/08/deploying-yesod-to-heroku-with-postgres.html
  - Demo

HaLVM

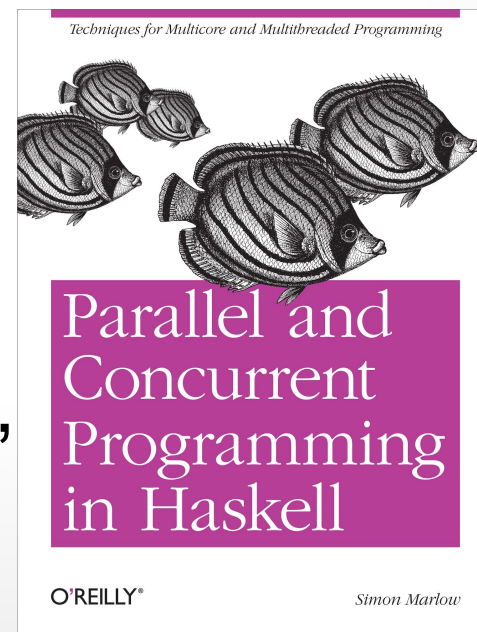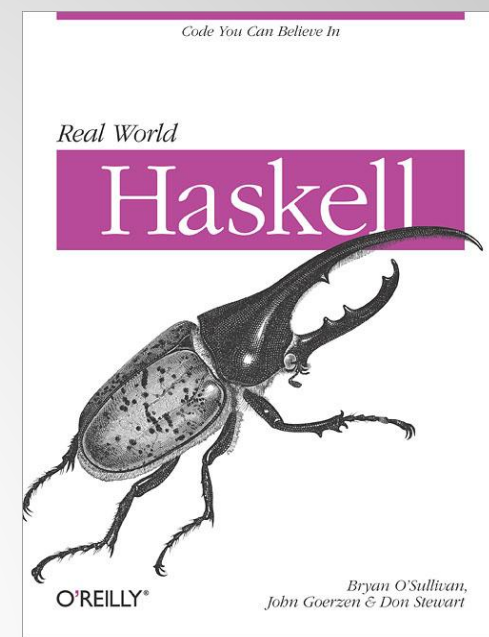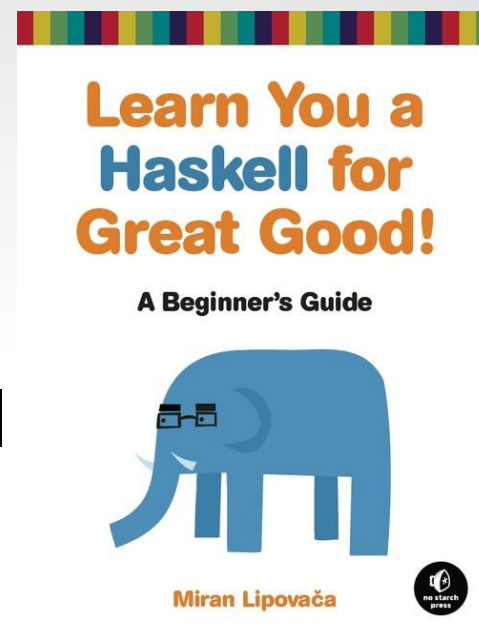"Haskell Lightweight Virtual Machine"

- Run Haskell on "Bare metal" (no OS)
- GHC ported to the Xen hypervisor
- Boots in < 1sec., runs in 1-2MB disk image
- write device drivers in Haskell

JHC / AJHC

- compile to standard C
- very small runtime
- no garbage collector - region inference
- suitable for embedded systems
  - Cortex-M3
  - Android
- AJHC author's goal: rewrite the NetBSD kernel in Haskell
- Metasepi project

Learning Haskell

- Learn You a Haskell for Great Good!
- Real World Haskell
- Parallel and Concurrent Programming in Haskell
- many blogs, articles, and papers…
- exercism.io

Other Resources

- [/r/haskell](#) (reddit)
- IRC Freenode #haskell (very helpful)
- Haskell Wiki
- Haskell Cafe (mailing list)
- [StackOverflow](#) (Q&A)
- [haskellers.com](#) (social network)
- [haskellnews.org](#)
  - reddit, github, twitter, vimeo, youtube, hackage, haskell-cafe, stackoverflow, google+, blogs, ...

FP Complete

- Started in 2012 by Aaron Contorer
  - former MS exec - technical advisor to Bill Gates
- Offers commercial support, training
- *School of Haskell*
- *Haskell Center*
- Monthly contest - cash prizes for best Haskell app

"Local" User Groups

- Wisconsin: meetup.com:Milwaukee-Functional-Programming-User-Group/
- Twin Cities: haskellmn@googlegroups.com
- Chicago: meetup.com/Northshore-Fringe-Coders/

Thanks!

Presenters

Erik Rantapaa

erantapaa@gmail.com

Chris Wilson

@twopoint718

chris@bendyworks.com