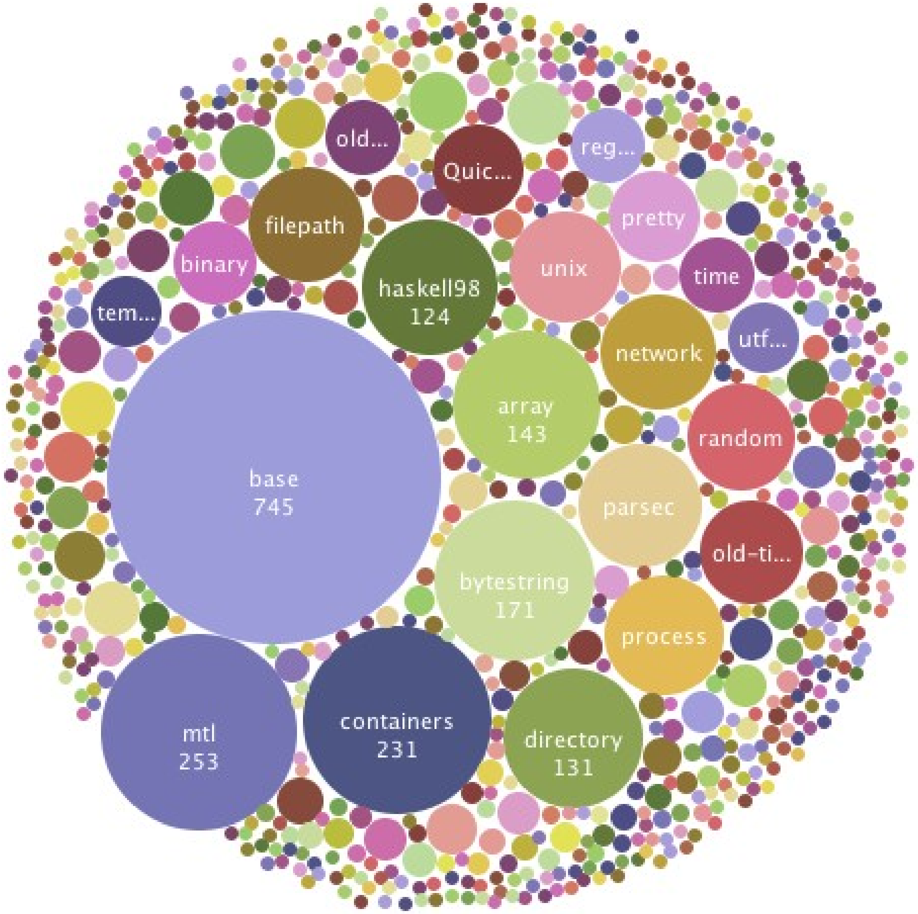
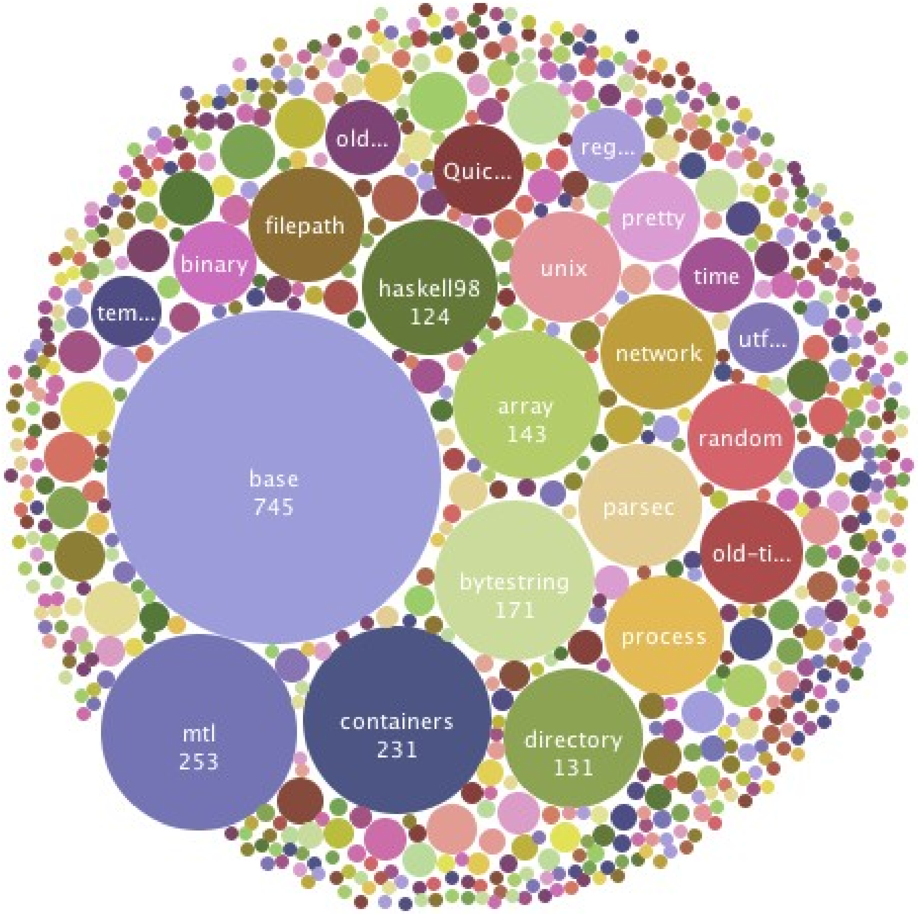
The Haskell Platform



Duncan Coutts

Well-Typed

The Haskell Platform



Data visualisation by (,) tupil

Libraries, Libraries, Libraries!

- A great language is not enough
- Languages succeed or fail on the strength of their libraries
- Fortunately a great language lets us
  - Make more libraries quicker
  - Compose libraries more easily

Development Platforms

- A development platform combines
  - Language
  - Compiler / interpreter / RTS / JIT / etc
  - Standard set of libraries
  - Standard development tools
    - api doc, profiler, debugger, code analysis, etc
  - Packaging format (sometimes)

Development Platforms

- Everyone else has one!
  - .NET
  - Java
  - Python
  - Ruby
- Well, almost everyone...
  - C
  - C++

Development Platforms

- Require a lot of effort!
  - .NET – corporate backing
  - Java – corporate backing
  - Python – huge open source community
  - Ruby – big open source community
- Good infrastructure can reduce the effort
  - Releases, testing, maintenance

1990-2003: The dark ages

- Every Haskell app had its own build system
  - Endless twisty Makefiles
  - Nothing worked on Windows
- 3 Haskell libraries in all the world
- Everything in the '`base`' package
- Applications bundled their own dependencies
- “Cathedral” model

2004-2008: The enlightenment

- Cabal: declarative package specifications
  - Includes a build system for simple packages
  - Many packages now build on Windows
- Hundreds of packages published on Hackage
  - `http://hackage.haskell.org/`
  - *“If it's not on Hackage, it doesn't exist!”*
- cabal-install & Cabal→native package tools
  - automated dependency chasing
- We begin to move from “Cathedral” to “Bazaar”

Community: our greatest asset

- We don't have corporate backing
- But we do have a large, passionate, active community
- Huge development power
  - But inherently distributed and parallel
  - Resists formal organisation
- Use an open source “bazaar” model

AaronTomb AbramClark AdamLangley AdamSmyczek AdrianHey AlbertoRuiz AlesBizjak AlexDrummond AlfonsoAcos
AlistairBayley AllanClark AndrePang AndreaRossato AndreaVezzosi AndresLoeh AndrewPimlott AndrewRobbins
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AshleyYakeley AsumuTakikawa AudreyTang AustinSeipp BalazsKomuves BartonMassey BenLippmeier BenSinclair
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BrentYorgey BrianHulley BrianSmith BryanOSullivan CaioMarcelo CaleGibbard CalvinSmith ChadScherrer ChrisDon
ChrisEidhof ChrisKuklewicz ChristophBauer ChristopherLaneHinson ClemensFruhwirth CliffordBeshers ColinRuncima
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DmitryAstapov DmitryGolubovsky DoaitseSwierstra DominicSteinitz DonaldStewart DuncanCoutts DustinDeWeese
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GeorgBrandl GeorgeGiorgidze GlebAlexeyev GordonStewart GracjanPolak GregHeartsfield GregoryWright GwernB
HansVanThiel HenningGuenther HenningThielemann HiteshJasani HoldenKarau HristoAsenov IanLynagh IavorDiatch
IgorBohm IsaacJones IvanTomac JaapWeel JanChristiansen JanisVoigtlaender JasonDagit JasonDusek JasonOrendorff
JeanPhilippeBernardy JedBrown JeffersonHeard JensPetersen JeremyApthorp JeremyShaw JimSnow JinjingWang
JochemBerndsen JoelReymont JohanTibell JohannesAhlmann JohannesWaldmann JohnGoerzen JohnLato JohnMacFar
JohnMcCall JohnMeacham JohnVanEnk JonFairbairn JosefSvenningsson JostBerthold JudahJacobson JuergenNicklischFr
JustinBailey KetilMalde KevinEllis KidoTakahiro KrasimirAngelov KyleConsalus LajosNagy LennartAugustsson
LennartKolmodin LeonidasFegaras LuisAraujo LukasMai LukePalmer LutzDonnerhacke MadsLindstroem MagnusJonsso
MagnusTherning MalcolmWallace ManuelChakravarty MarcWeber MarcoSilva MarioBlazevic MarkWassell MarkoLaur
MarshallBeddoe MartijnVanSteenbergen MartinGrabmueller MartinLuetke MartinSulzmann MasatakeDaimon
MattMorrow MatthewDanish MatthewMorrow MatthewNaylor MatthewSackman MattiNiemenmaa MaxBolingbroke
MaxRabkin MichalKonecny MiguelVilaca MilanStraka MiloslavRaus NatarajanRajagopal NeilBrown NeilMitchell
NicholasBurlett NicolasPouillard NiklasBroberg NilsAndersDanielsson NorbertWojtowicz OlivierBoudry OlivierThauvi
OrenBenKiki OtakarSmrz PaoloVeronelli PatrickPerry PatrikJansson PaulJohnson PaulLiu PauloSilva PauloTanimoto
PawelMurias PepeIborra PeterGammie PeterGavin PeterJonsson PeterSimons PeterTanski PiyushKurur RalfHinze
ReinierLamers RickKaudewitz RobertDockins RobinGreen RohanDrape RomanLeshchinskiy RossPaterson
RussellOConnor RyanIngram SamuelBronson ScottDillard SeanLeather ShaeErisson SigbjornFinne SimonMarlow
SimonPeytonJones SpencerJanssen StefanKersten StefanORear StephanFriedrichs StephenBlackheath StephenCook
StephenLihn SterlingClover StuartCook SveinOveAas SvenMoritzHallberg SvenPanne TaruKarttunen ThomasDavie
ThomasDuBuisson ThomasHartman ThomasVanNoort ThorkilNaur TimChevalier TimDocker TimNewsham
TomBevan TomMoertel TrevorElliott TristanAllwood TwanVanLaarhoven UweSchmidt VasiliGalchin VincentKraeutler
VivianMcPhail WaltBaety WillThompson WolfgangJeltsch WolfgangThaller WouterSwierstra WrenThornton YangZha
YannGolanski YoshikuniJujo alpheccar

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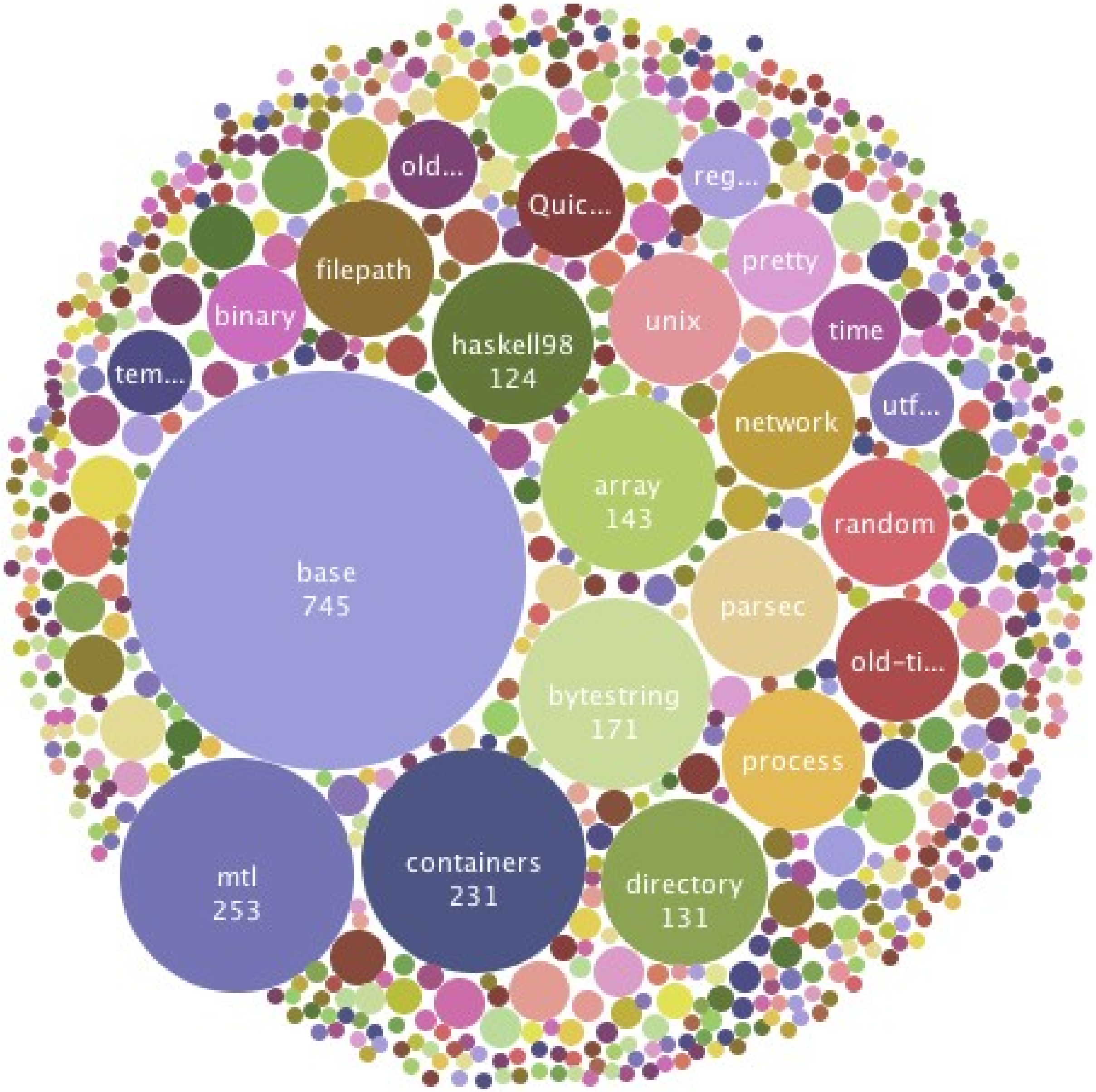

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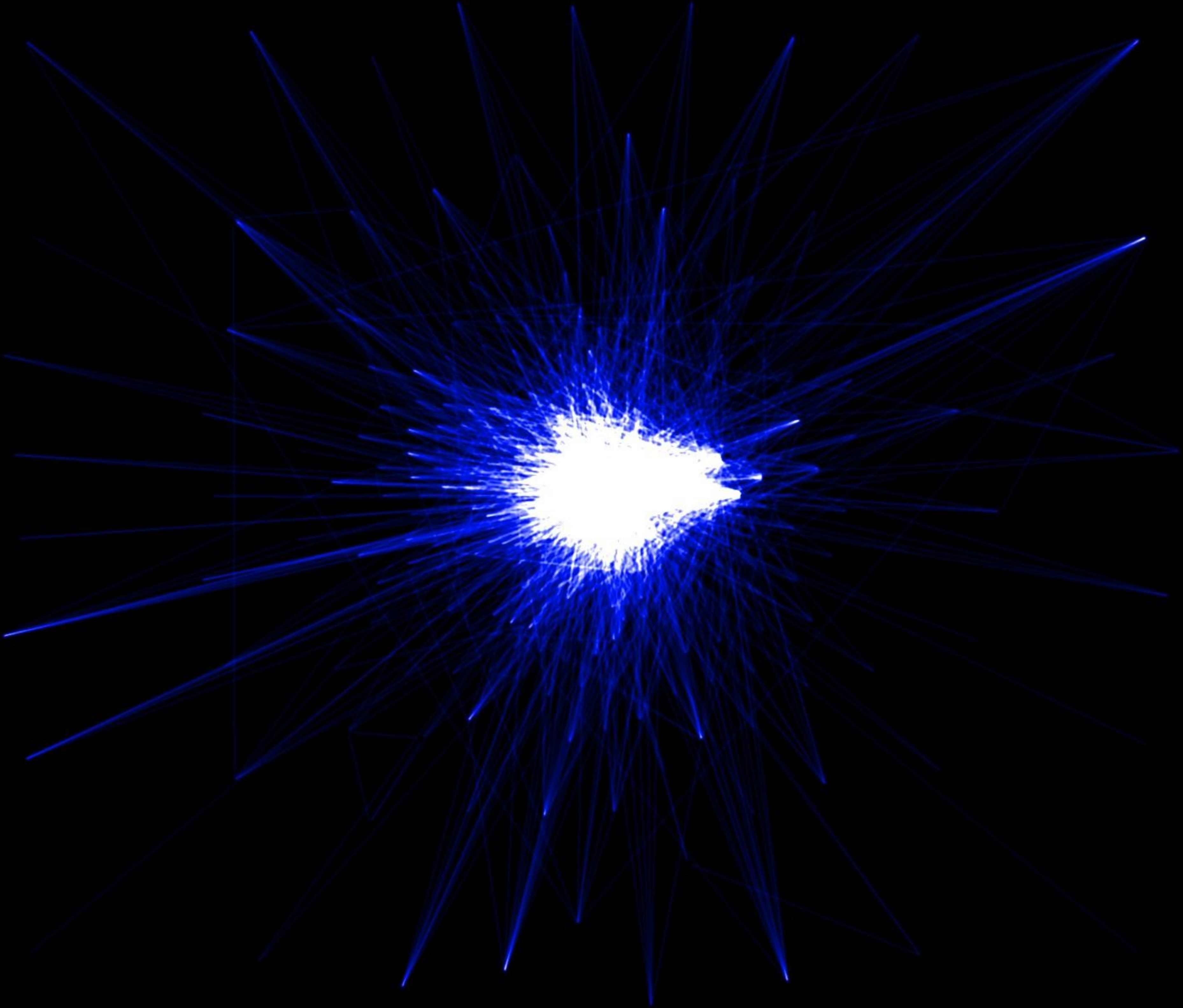


How to build a platform?

- How do we focus the development power of the community to build a platform?
- Do what Linux distributions do!
- Do what GNOME does!
- Select a bunch of libraries and tools
  - High quality
  - Consistent, work together
- Test it, package it and call it a platform release

The Haskell Platform

- Selection of packages from Hackage
- Consistent set of package versions
  - Tested together on all popular platforms
- Easy to install on all popular platforms
  - Binary installers
  - Supported by the distros
- Community process for new packages

This structure works

Haskell Platform	GNU/Linux distro
GHC	Linux kernel
Hackage	SourceForge
Cabal	`.rpm` / `.deb`
cabal-install	`yum` / `apt-get`

What's in the platform for me?

- New Haskell users and systems administrators
  - “How do I get Haskell?”
  - Tells them exactly what they need
  - Packaged natively for their platform

What's in the platform for me?

- Application authors
  - One true Haskell release to build upon
  - Set of libraries and tools known to work together on your platform
  - Less worry about non-standard dependencies

What's in the platform for me?

- Platform library maintainers
  - Wide distribution and publication for their work
  - Requires some commitment to keep the package working and make releases

What's in the platform for me?

- Distribution maintainers
  - Tells them what they need for their distribution to support Haskell
  - Less need for per-distro testing and QA
  - Regular schedule
  - Standard package format

What's in the platform for me?

- Compiler authors
  - Get back to writing compilers
  - No need to synchronise compiler release with dozens of other packages and people
  - Simpler, less stressful compiler release process

Other benefits

- Synchronise cross-package changes
  - Fewer chaotic or partial transitions
  - Examples
    - base 3 → base 4, new exceptions api
    - switching old-time → time package
    - HaXml-1.13.x → HaXml-1.20.x
    - QuickCheck-1 → QuickCheck-2
- Community agree the changes
  - Tell package maintainers what to do

Platform releases

- Time-based releases
  - Not feature based
  - Every 6 months
  - Like GNOME and Linux distributions
- A published timetable
  - Reduces the effort of synchronising dozens of package maintainers

Platform releases

- Major releases every 6 months
- Minor releases in between
  - Bug fixes only
  - No API additions or changes
- 6 months is a balance
  - Pressure for improvement
  - Pressure for stability

Release numbers

- Major 6-month releases
  - haskell-platform-2009.1.0
  - haskell-platform-2009.2.0
  - haskell-platform-2010.1.0
- Intermediate bug-fix updates
  - haskell-platform-2009.1.1
  - haskell-platform-2009.1.2

The first release

- Consists of
  - GHC + “core libs”
  - The “extra libs”
  - cabal-install + dependencies
- Very conservative
  - No controversial decisions
  - Need community backing to establish processes

The next release

- Up to the community
  - But perhaps aim for ~5 new packages
- Need to agree:
  - A process for adding packages
  - Details of release timetables
  - Responsibilities of maintainers
- When in doubt, do what GNOME does
  - Their release process has become so successful it's positively boring! (Which is a “Good Thing”™)

What goes in?

- Excellent opportunity to ask for quality
- Strike a balance between quality and quantity
- Requirements should be clear
  - Mostly objective
  - Some can be automated (via Hackage)
  - Some inherently manual (e.g. API review)

What quality level to ask for

- To be decided by the community
- Can increase as time goes on
- Probably should cover
  - API conventions
  - Consistency with other packages
  - Documentation
  - Testing
  - Complement other platform packages

Suggested requirements

- Use Cabal package format
- Distribute via Hackage
- Follow package versioning policy
- API documentation with x% coverage
- Test suite with x% code coverage
- Use hierarchical module namespace
- Use standard types and API conventions
  - This needs a lot more detail

Package versioning policy

- Four digit version number
  - foo-1.0.0.0
- First two for incompatible API changes
  - foo-1.1.0.0
- Third for compatible API changes e.g. additions
  - foo-1.0.1.0
- Fourth for bug fixes with no API change
  - foo-1.0.0.1

Package versioning policy

- Allows more accurate and future-proof dependencies
- New syntax to make it easier
  - build-depends: foo == 1.0.*
    - For major API series
  - build-depends: foo == 1.0.* && >= 1.0.1
    - Require later API addition
  - build-depends: foo == 1.0.* && >= 1.0.0.1
    - Require particular bug fix

Infrastructure

- Decent infrastructure to automate processes
  - Distribute maintenance work
  - Vital or release managers go insane
- Hackage should be our infrastructure
  - Will require many improvements
  - All packages benefit, not just platform packages

Hackage improvements

- Need build reporting
  - Like BuildBot but distributed
  - cabal-install to do anonymous build reporting
  - Dedicated clients for detailed build reporting
- Metrics
  - Downloads
  - Reverse dependencies
  - Code metrics

Hackage improvements

- Define subsets of Hackage via tagging
  - Rather than separate “testing”, “stable” sets
- Tags for quality metrics, e.g.
  - Builds on windows
  - Has x% documentation
  - Has opted into the package version policy
- Platform packages should be within inner-most quality subset

A new Hackage server

```
darcs get http://code.haskell.org/hackage-server/
```

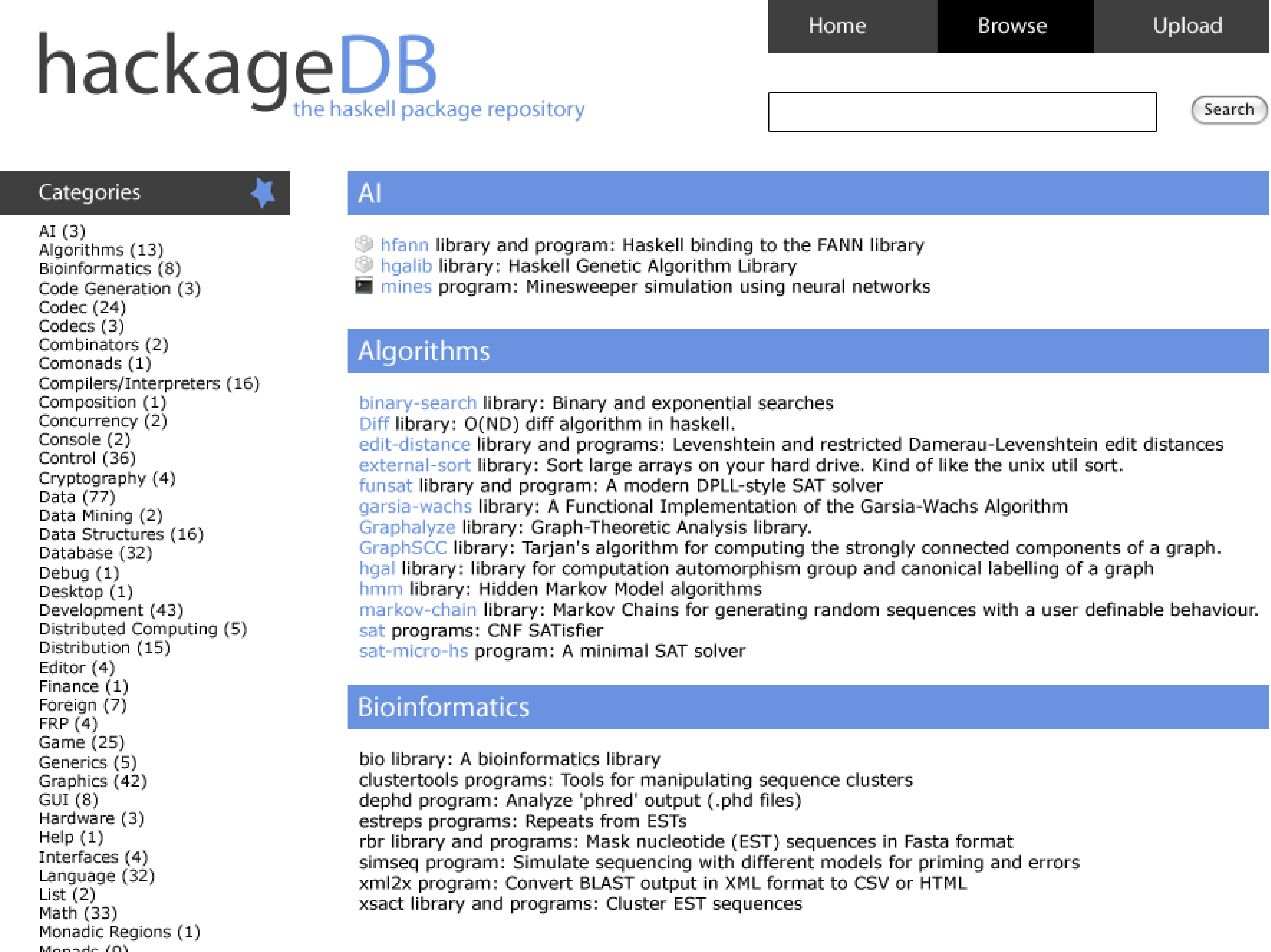
- Based on HAppS
  - Rather than Apache + CGI + file based data store
- Easier to extend
  - All data as Haskell types, less file IO
- Easier to deploy
  - `cabal install hackage-server && hackage-server`
- Switch over when feature-complete

A new Hackage server

- Slightly different architecture
  - Dumb server, many smart clients
- Server just manages and presents data
  - Upload and download in various formats
- Smart clients to download, process and upload:
  - Build reports
  - Documentation
  - Metrics
  - Statistics

A new Hackage website

- Full package search based on Hoogle 4
- New visual look by [,] tupil



Categories

AI (3)
Algorithms (13)
Bioinformatics (8)
Code Generation (3)
Codec (24)
Codecs (3)
Combinators (2)
Comonads (1)
Compilers/Interpreters (16)
Composition (1)
Concurrency (2)
Console (2)
Control (36)
Cryptography (4)
Data (77)
Data Mining (2)
Data Structures (16)
Database (32)
Debug (1)
Desktop (1)
Development (43)
Distributed Computing (5)
Distribution (15)
Editor (4)
Finance (1)
Foreign (7)
FRP (4)
Game (25)
Generics (5)
Graphics (42)
GUI (8)
Hardware (3)
Help (1)
Interfaces (4)
Language (32)
List (2)
Math (33)
Monadic Regions (1)
Monads (9)

AI

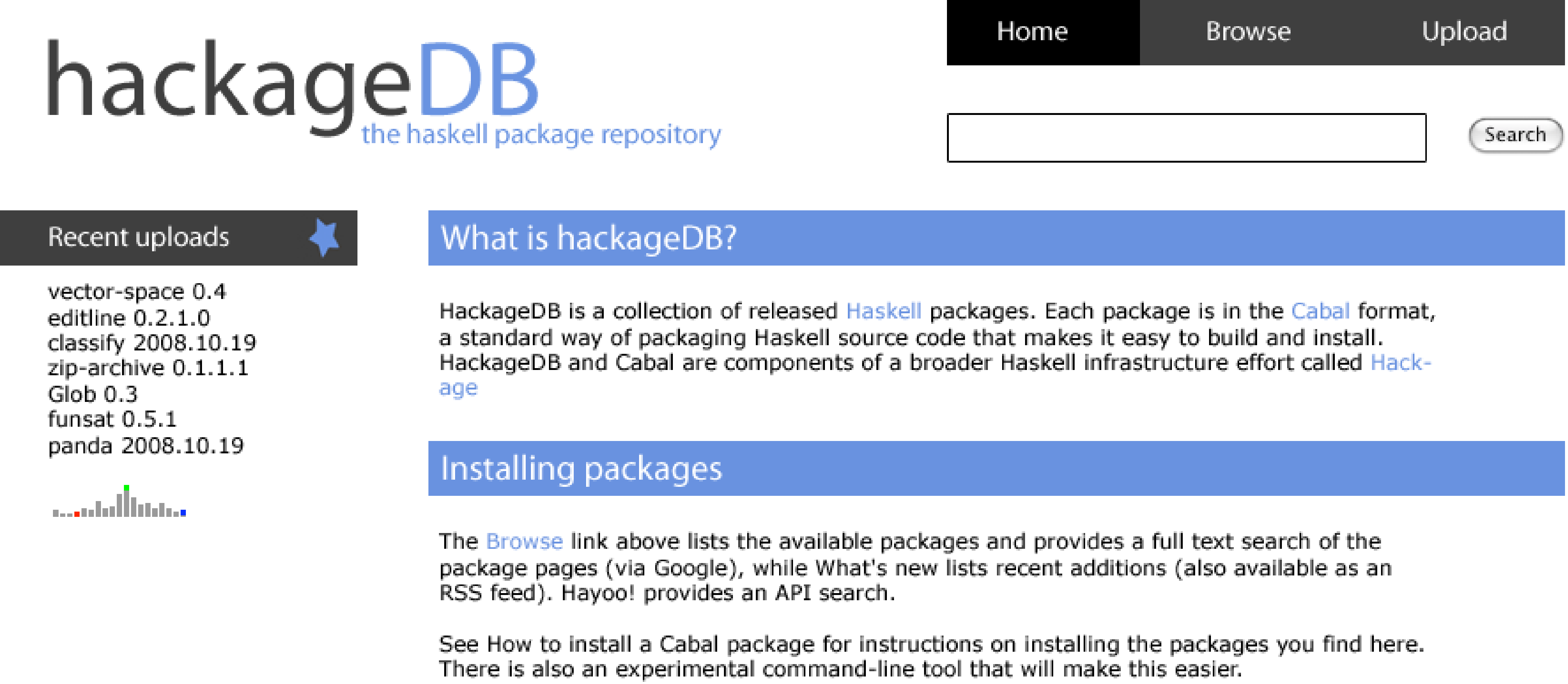
hfann library and program: Haskell binding to the FANN library
hgalib library: Haskell Genetic Algorithm Library
mines program: Minesweeper simulation using neural networks

Algorithms

binary-search library: Binary and exponential searches
Diff library: O(ND) diff algorithm in haskell.
edit-distance library and programs: Levenshtein and restricted Damerau-Levenshtein edit distances
external-sort library: Sort large arrays on your hard drive. Kind of like the unix util sort.
funsat library and program: A modern DPLL-style SAT solver
garsia-wachs library: A Functional Implementation of the Garsia-Wachs Algorithm
Graphalyze library: Graph-Theoretic Analysis library.
GraphSCC library: Tarjan's algorithm for computing the strongly connected components of a graph.
hgal library: library for computation automorphism group and canonical labelling of a graph
hmm library: Hidden Markov Model algorithms
markov-chain library: Markov Chains for generating random sequences with a user definable behaviour.
sat programs: CNF SATisfier
sat-micro-hs program: A minimal SAT solver

Bioinformatics

bio library: A bioinformatics library
clustertools programs: Tools for manipulating sequence clusters
dephd program: Analyze 'phred' output (.phd files)
estreps programs: Repeats from ESTs
rbr library and programs: Mask nucleotide (EST) sequences in Fasta format
simseq program: Simulate sequencing with different models for priming and errors
xml2x program: Convert BLAST output in XML format to CSV or HTML
xsact library and programs: Cluster EST sequences



hackageDB

the haskell package repository

Recent uploads

vector-space 0.4
editline 0.2.1.0
classify 2008.10.19
zip-archive 0.1.1.1
Glob 0.3
funsat 0.5.1
panda 2008.10.19

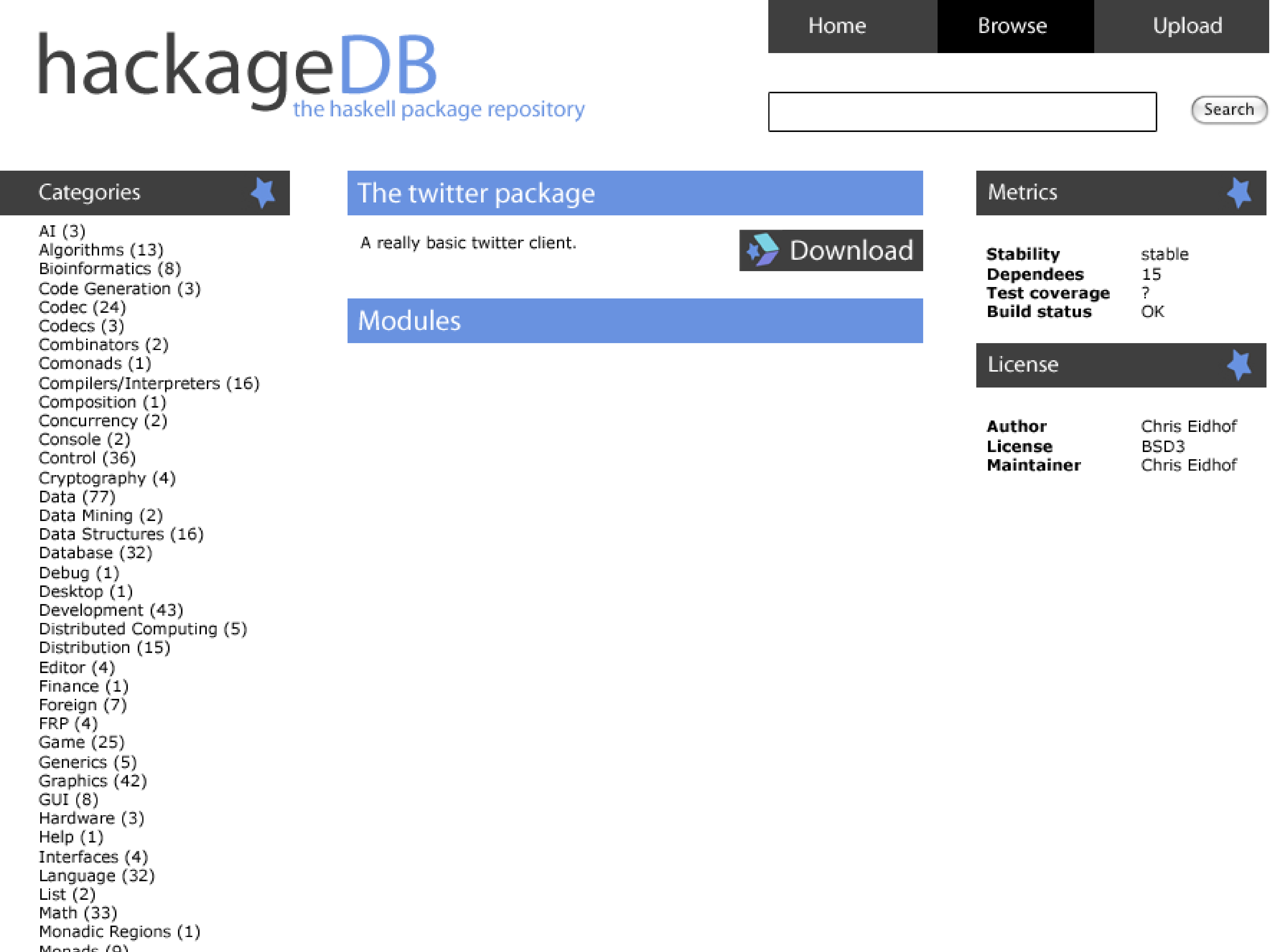
What is hackageDB?

HackageDB is a collection of released Haskell packages. Each package is in the Cabal format, a standard way of packaging Haskell source code that makes it easy to build and install. HackageDB and Cabal are components of a broader Haskell infrastructure effort called Hackage

Installing packages

The Browse link above lists the available packages and provides a full text search of the package pages (via Google), while What's new lists recent additions (also available as an RSS feed). Hayoo! provides an API search.

See How to install a Cabal package for instructions on installing the packages you find here. There is also an experimental command-line tool that will make this easier.



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Monads (9)

The twitter package

A really basic twitter client.

Modules

Metrics

Stability	stable
Dependees	15
Test coverage	?
Build status	OK

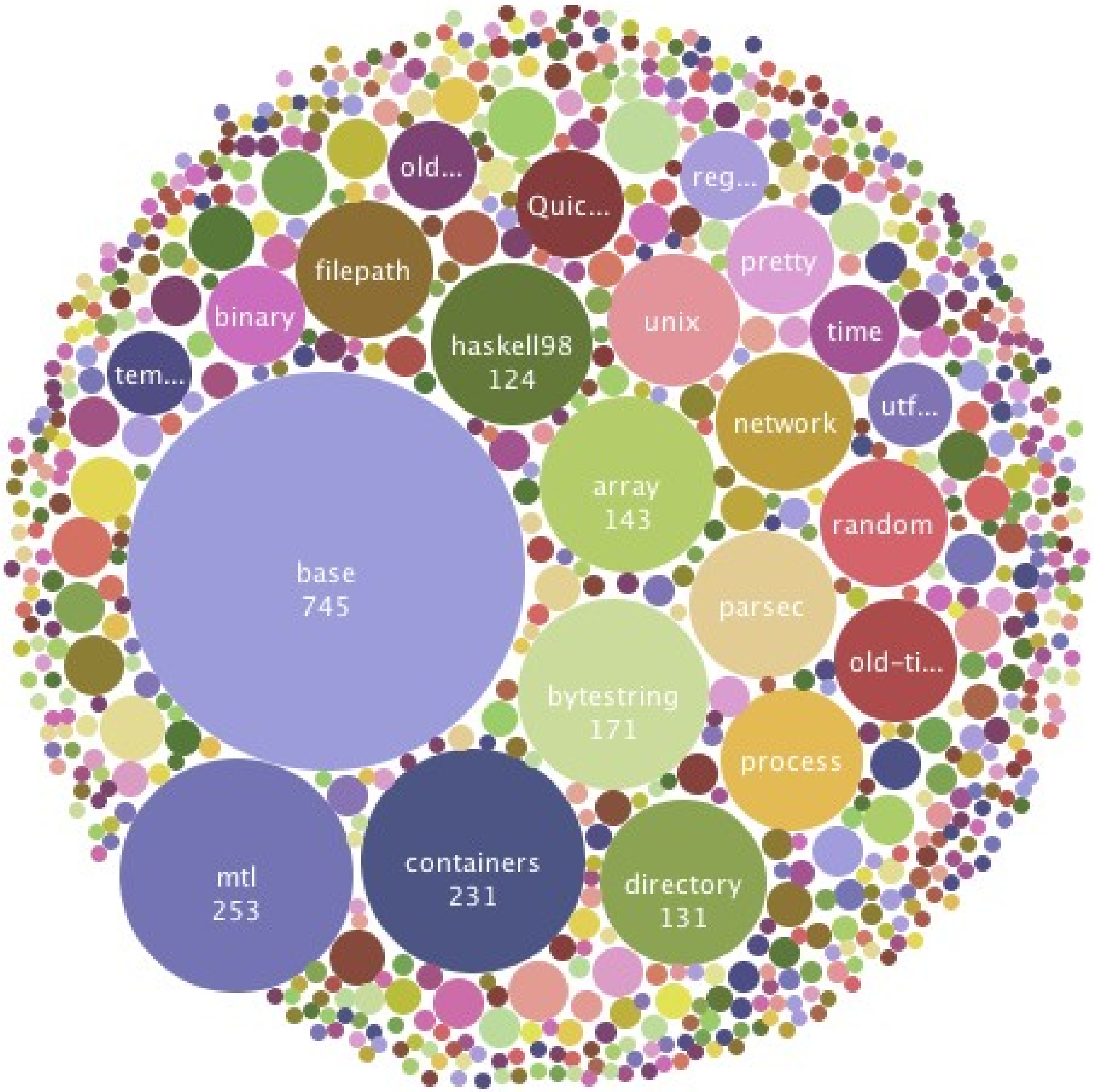
License

Author	Chris Eidhof
License	BSD3
Maintainer	Chris Eidhof

What's next

- Make the first platform release
- Agree the procedures for new packages
  - Discussion to take place on the libraries@haskell.org mailing list
- Build the infrastructure
  - We need your help!

Questions?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