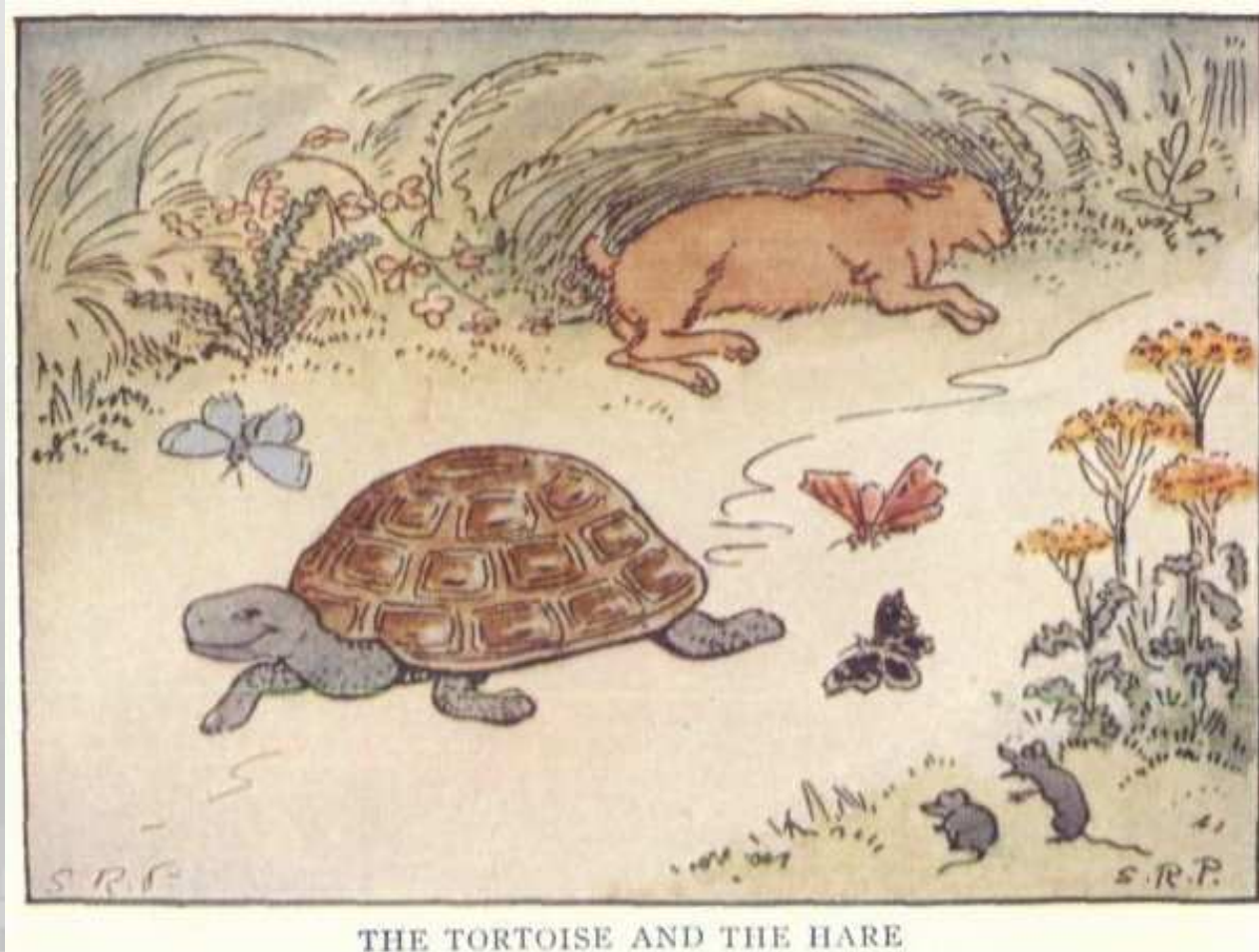


# A Fable



THE TORTOISE AND THE HARE

## The Idea of Fable

- Build a professional graphical workbench for analysing scientific data produced at synchrotrons
- Combine two types of experts to produce one integrated software product :
  - Scientist Programmers for Data Analysis
  - Software Engineers for the User Interface
- TotalCryst decided to risk trying this approach

New and emerging science and technology (NEST)

## What is Fable ?

- *TotalCryst* produced many individual programs :
  - ImageD11
  - QNFS
  - PolyXSim
  - GrainSpotter
  - GrainSweeper
  - FitAllB
  - Fable (the GUI)
  - ...
- Strictly speaking *Fable* is the Graphical User Interface
- *Fable* is sometimes used to refer to the whole suite ...

# Fable Goals

- Aim of Fable
  - Build a scientific workbench for analysing polycrystalline diffraction data for TotalCryst which can be extended to other scientific domains
- Technical goals
  - **Separate User Interface from Algorithms**
  - Support Algorithms written in multiple languages
  - Build on top of an open source commercial quality framework
  - Open Source with public access to code
- Technology chosen
  - Eclipse/RCP for graphical framework and Java for user interface
  - Python and C for algorithms, Project repository on Sourceforge

# The Fable Workbench Challenge

- *Andy*
- *Scientists*
- *Python*
- *Tk*



- *Gaelle*
- *Engineers*
- *Java*
- *Eclipse*

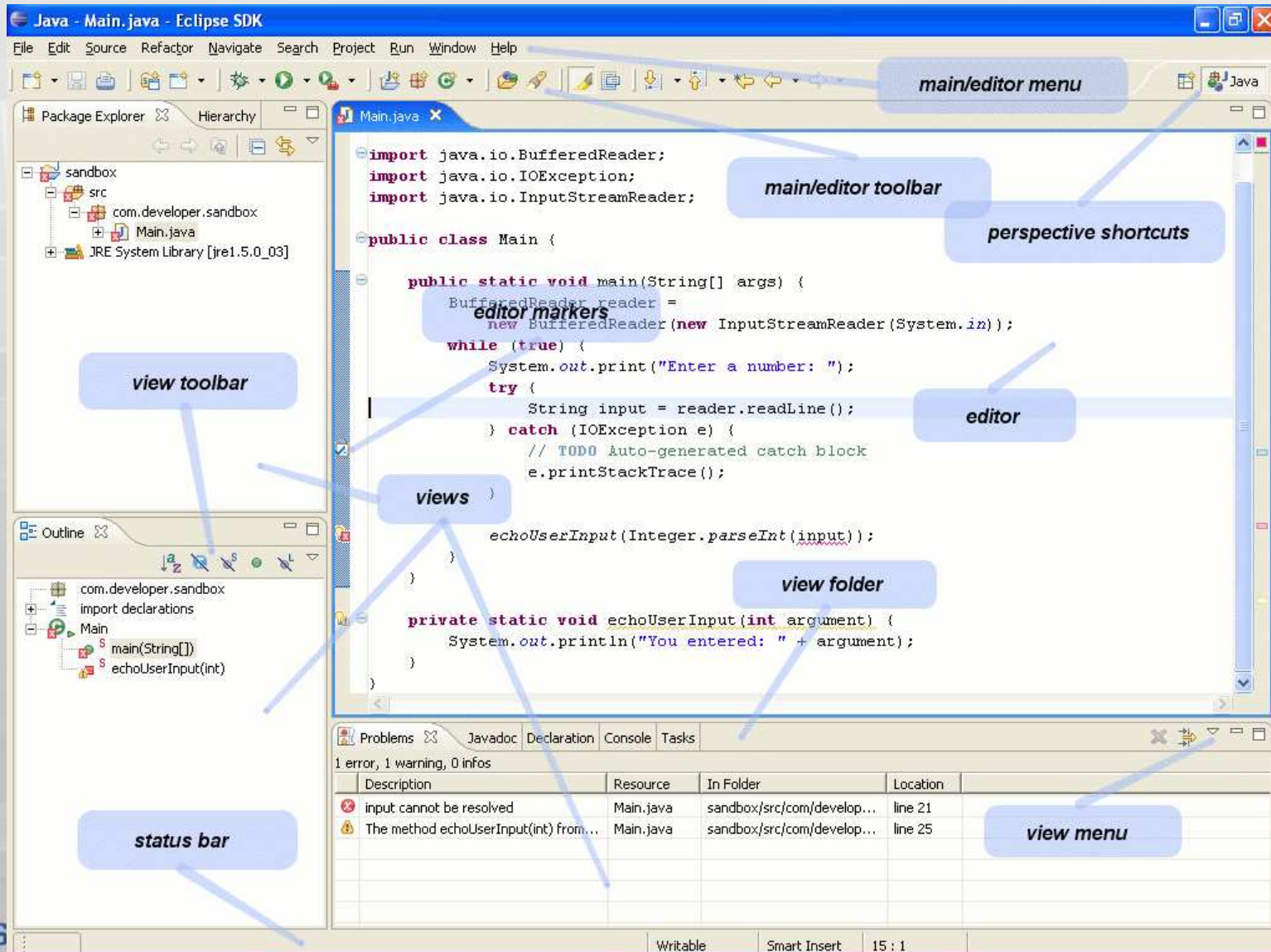
# The Workbench Concept



# The Ultimate Workbench ?



# The Eclipse Workbench



The screenshot shows the Eclipse IDE interface with the following components labeled:

- main/editor menu**: Located at the top right of the editor window.
- main/editor toolbar**: Located below the menu bar, containing icons for file operations and editing.
- perspective shortcuts**: Located on the right side of the editor window, showing icons for switching between different workbench perspectives.
- editor**: The central area where the Java code is being edited.
- editor markers**: Small icons on the left side of the editor window, used for marking specific lines of code.
- view toolbar**: Located on the left side of the editor window, containing icons for navigating between different views.
- views**: The area on the left side of the editor window, containing the Package Explorer, Outline, and other views.
- view folder**: A folder icon in the Package Explorer, used for organizing code files.
- status bar**: Located at the bottom of the IDE, displaying information about the current file and editor state.
- view menu**: Located at the bottom right of the IDE, used for navigating between different views.

The code in the editor is as follows:

```

import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;

public class Main {

    public static void main(String[] args) {
        BufferedReader reader =
            new BufferedReader(new InputStreamReader(System.in));
        while (true) {
            System.out.print("Enter a number: ");
            try {
                String input = reader.readLine();
            } catch (IOException e) {
                // TODO Auto-generated catch block
                e.printStackTrace();
            }
            echoUserInput(Integer.parseInt(input));
        }
    }

    private static void echoUserInput(int argument) {
        System.out.println("You entered: " + argument);
    }
}

```

The Problems view at the bottom shows the following error and warning:

Description	Resource	In Folder	Location
input cannot be resolved	Main.java	sandbox/src/com/develop...	line 21
The method echoUserInput(int) from...	Main.java	sandbox/src/com/develop...	line 25



## Why Java ?

- A good language with good tools
- Almost as fast as compiled C
- Large number of developers, wide range of libraries for certain domains e.g. user interfaces, web
- Easy to deploy – Java Virtual Machine hides differences between operating systems
- Disadvantage – not widely adopted in science

## Why Python ?

- Is easy to learn and compact to write
- Python is widely accepted by scientists
- It has a powerful array manipulation package (numpy)
- TotalCryst had Python Programmers
- *Zen of Python : there should be one-- and preferably only one --obvious way to do it*
- *Zen of TotalCryst : use Java AND Python*



# Fable Multi-language support

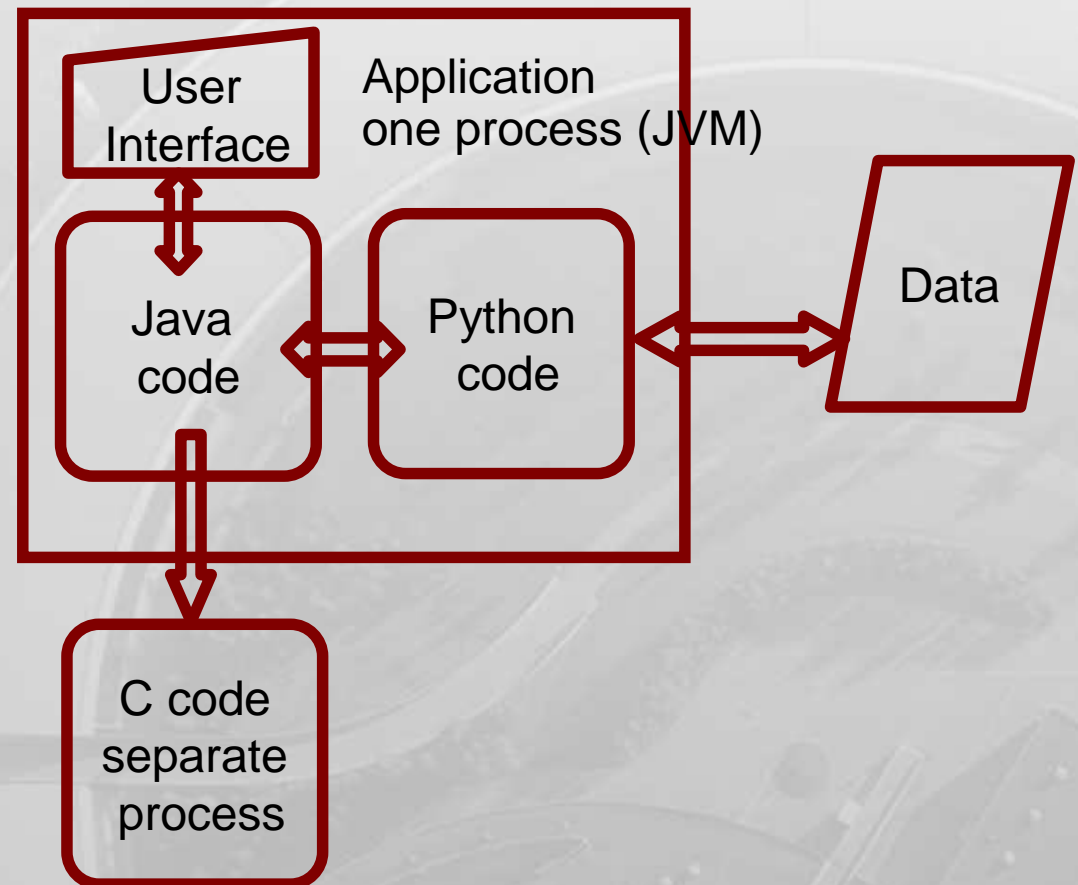
- Currently supported :

- Java
- Python
- C

- What about :

- Matlab/Octave
- Fortran
- IDL
- ...

- Not for now



# ***“Why is Lego the most ingenious toy in the world?” - Sophie's World (J.Gaarder)***



## What is a Plugin ?

- stykke software (Dansk)
- „Erweiterungsmodul“ (Deutsch)
- ***a plug-in or extension consists of a computer program that interacts with a host application (a web browser or an email client, for example) to provide a certain function "on demand"***

# Firefox plugins



**Modules complémentaires**

Catalogue Extensions Thèmes Plugins Mises à jour

**Cooliris** 1.8.2.4690  
Cooliris (formerly PicLens) transforms your browser into a full-screen 3D Wall for searching, viewing and sharing the Web.  
Options Désactiver Déginstaller

**Download Statusbar** 0.9.6.3  Supportez cette extension - [Donnez !](#)  
Voir et gérer les téléchargements à partir d'une barre d'état

**DownloadHelper** 3.2.2  
Télécharger des vidéos et des images depuis de nombreux sites

**Fast Dial** 2.9  
Visual Bookmarking

**Firebug** 1.2.1  
Web Development Evolved.

**FireFTP** 1.0.2  
FTP Client for Mozilla Firefox.

**Forecastbar Enhanced** 0.9.6  
Affichez la météo internationale et des images satellite dans n'importe quelles barres d'outils ou d'états...

**Gmail Notifier** 0.6.3.8  
Un notificateur pour comptes Gmail.

**Java Quick Starter** 1.0

**Refractor for Prism** 0.2.1  
Create Prism applications directly in Firefox.

**ScribeFire** 3.0.1  
Un éditeur de blog multifonction s'intégrant dans votre navigateur et vous permettant de publier facile...

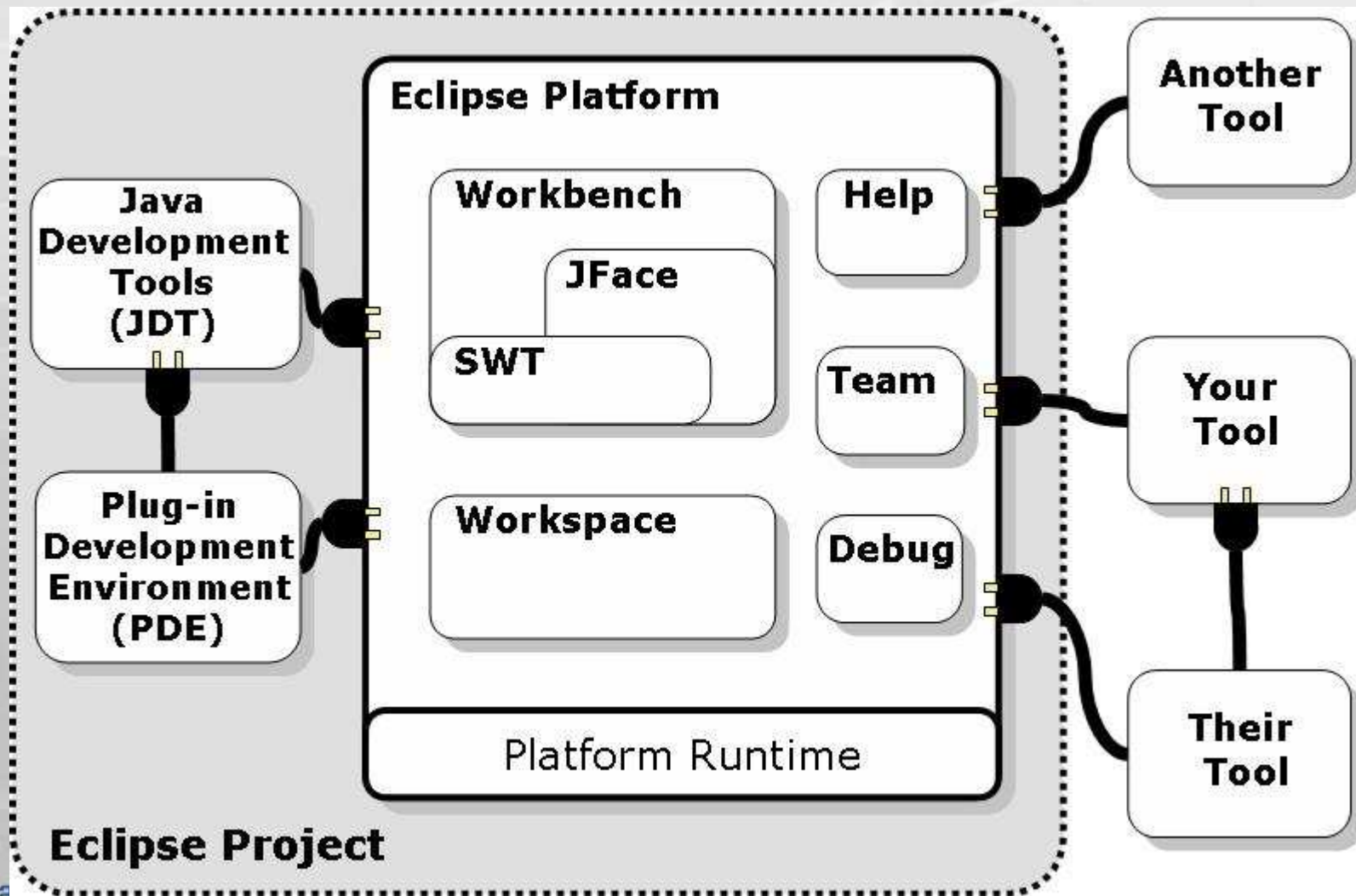
**Shazou** 2.1  
Shazou - we know WHERE... your server is!

**Stylish** 0.5.7  
Personnalisez l'apparence des sites Web et de l'interface utilisateur.

**Web Developer** 1.1.6  
Adds a menu and a toolbar with various web developer tools.

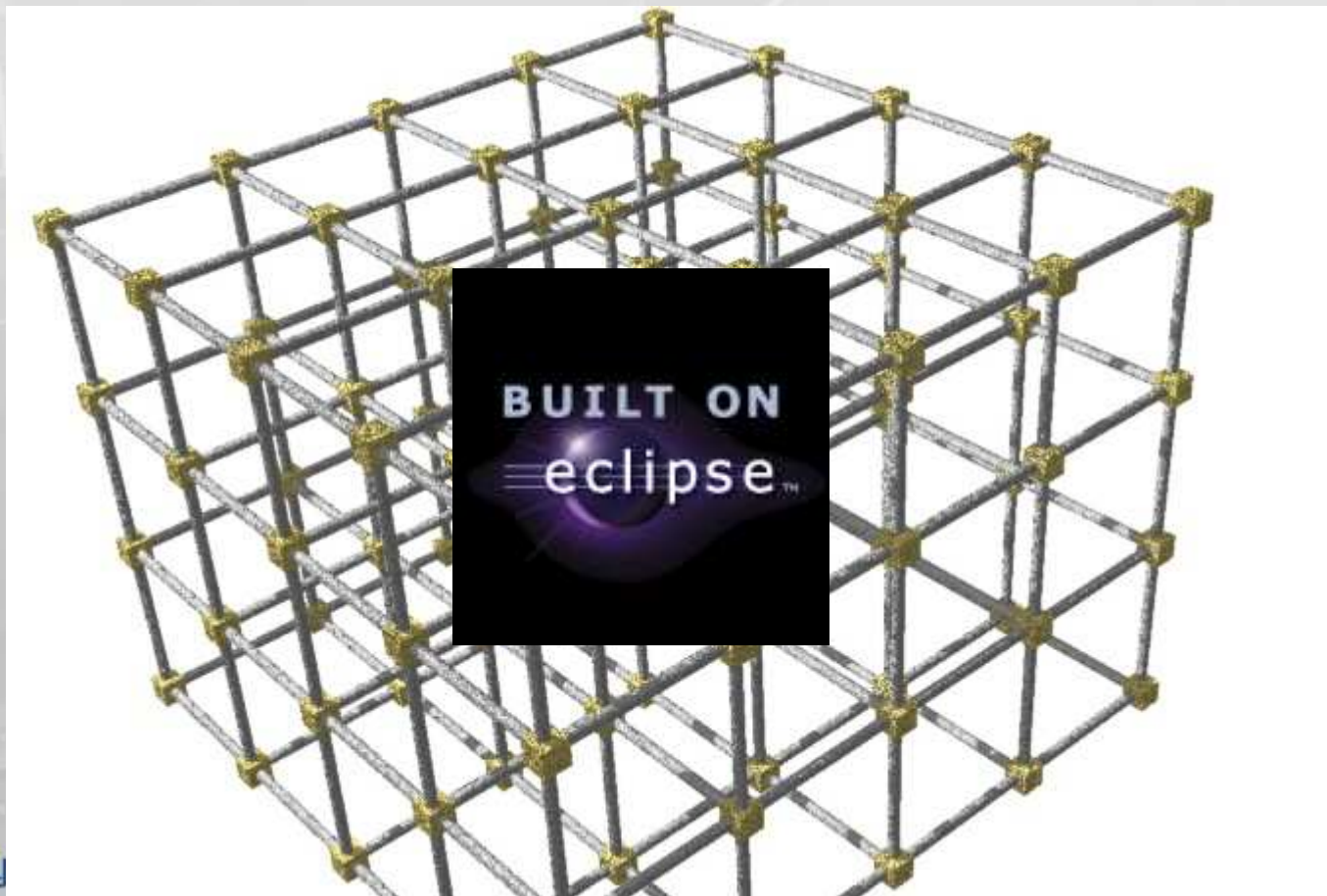
Rechercher des mises à jour

# Software Lego – Eclipse Plugins



# Fable Framework

- Eclipse/RCP is the Fable plugin framework

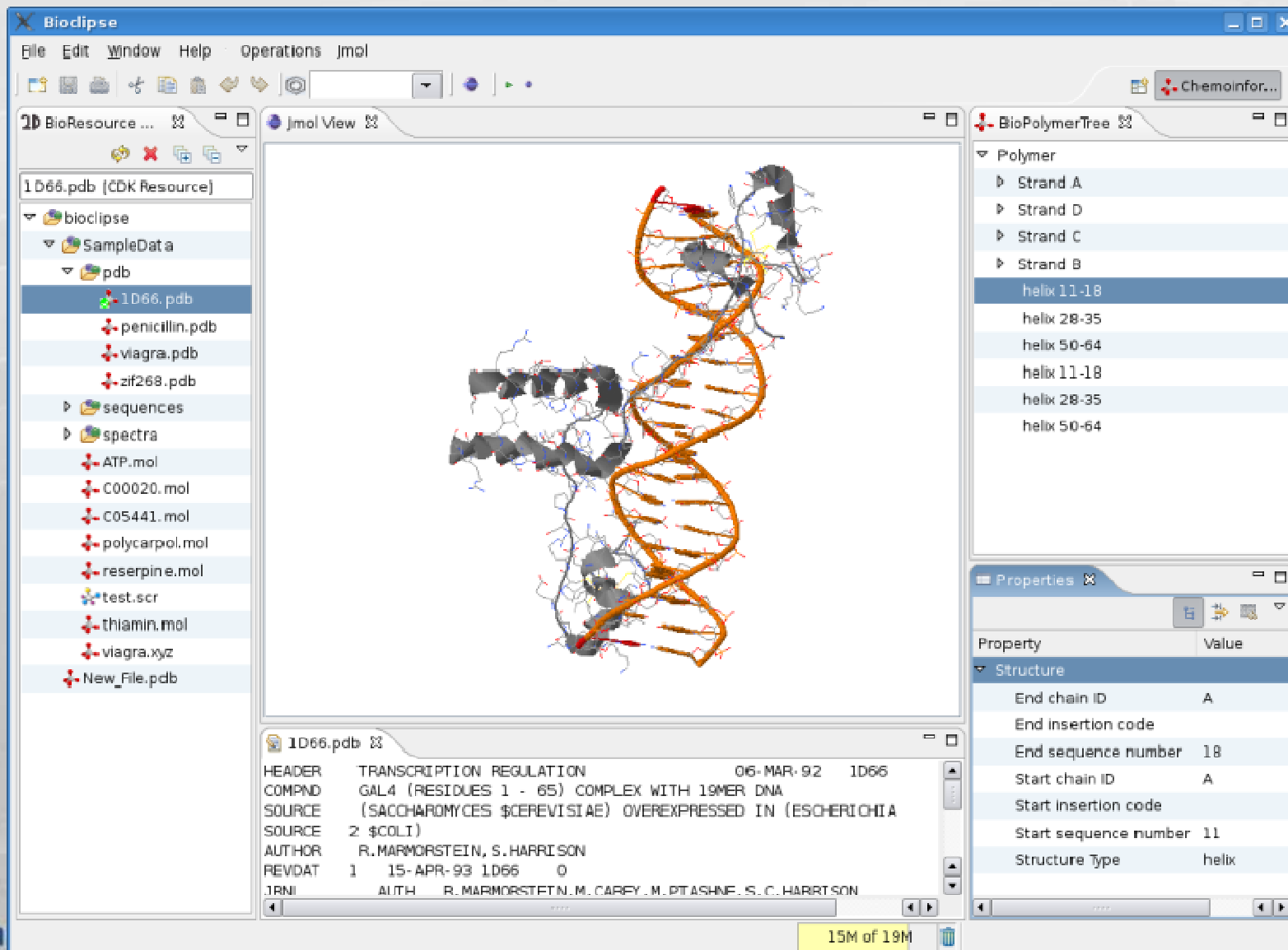




## Eclipse-based Scientific Applications

- *Gumtree* – ANSTO beamline control system UI
- *GDA* – Diamond beamline control system UI
- *CSS* – EPICS control system UI
- *Bioclipse* - visual platform for chemo- and bioinformatics
- *MAEviz* – Mid-America Earthquake Center
- *G-Eclipse* – graphical client for Grid

# Bioclipse



The screenshot displays the Bioclipse software interface with the following components:

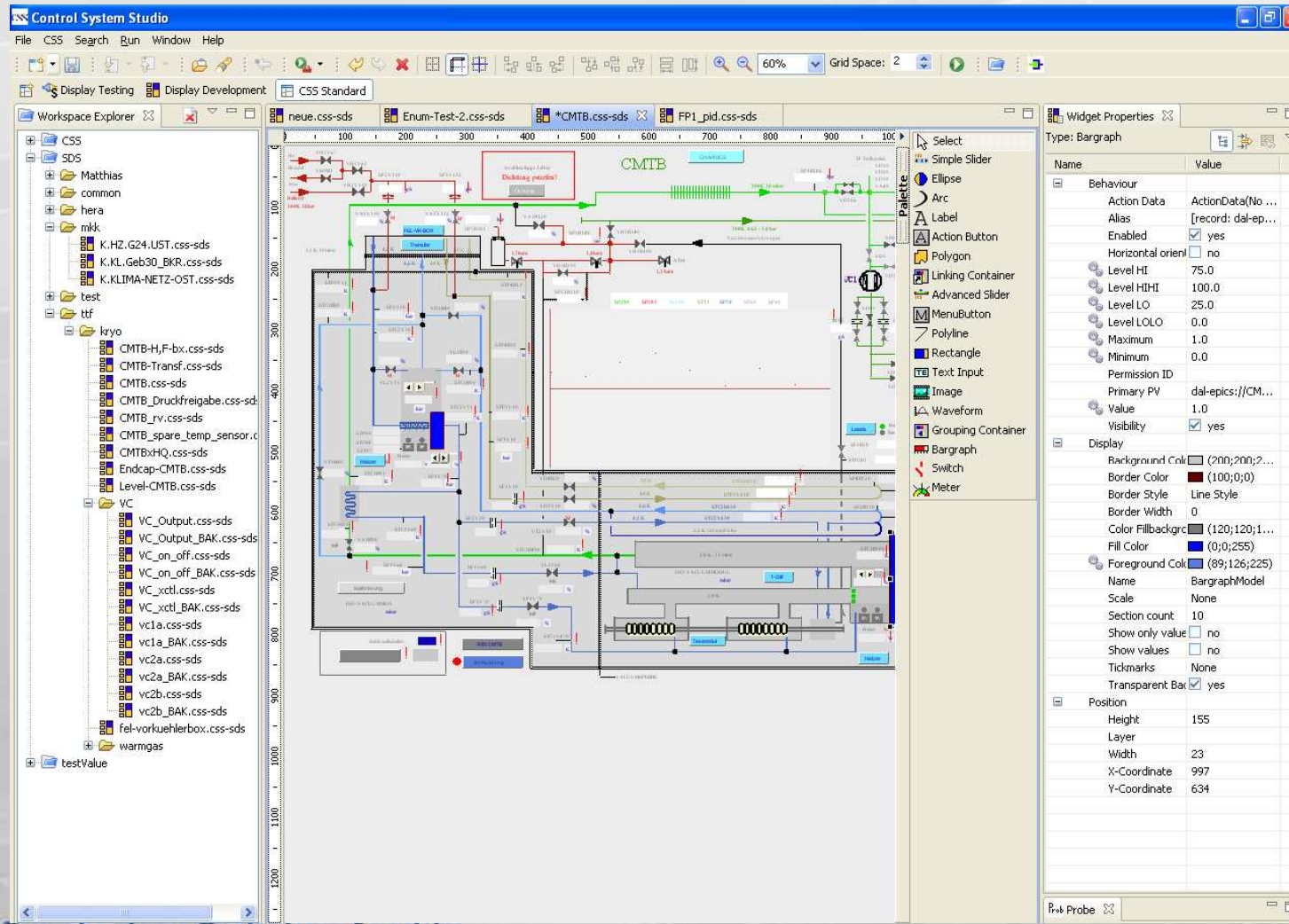
- File Browser (left):** Shows a tree view of files under '1D66.pdb (CDK Resource)'. The selected file is '1D66.pdb'. Other files include penicillin.pdb, viagra.pdb, zif268.pdb, sequences, spectra, ATP.mol, C00020.mol, C05441.mol, polycarpol.mol, reserpine.mol, test.scr, thiamin.mol, viagra.xyz, and New\_File.pdb.
- Jmol View (center):** Displays a 3D molecular model of a DNA-protein complex. The DNA is shown as an orange double helix, and the protein is shown as a grey and blue ribbon structure.
- BioPolymerTree (right):** Shows a tree view of the polymer structure. The selected item is 'helix 11-18'. Other items include Strand A, Strand D, Strand C, Strand B, helix 28-35, and helix 50-64.
- Properties (bottom right):** Shows a table of properties for the selected structure.
 

Property	Value
End chain ID	A
End insertion code	
End sequence number	18
Start chain ID	A
Start insertion code	
Start sequence number	11
Structure Type	helix
- 1D66.pdb (bottom):** Shows the PDB header information for the selected file.
 

```

      HEADER  TRANSCRIPTION REGULATION 06-MAR-92 1D66
      COMPND  GAL4 (RESIDUES 1 - 65) COMPLEX WITH 19MER DNA
      SOURCE  (SACCHAROMYCES $CEREVISIAE) OVEREXPRESSED IN (ESCHERICHIA
      SOURCE  2 $COLI)
      AUTHOR  R.MARMORSTEIN, S.HARRISON
      REVDAT  1 15-APR-93 1D66 0
      JRNL    AUTH  R.MARMORSTETN,M.CAREY,M.PTASHNE,S.C.HARRISON
      
```

# EPICS Control System Studio



The screenshot shows the EPICS Control System Studio interface. The main workspace contains a detailed control diagram with various components and connections. The left sidebar shows a project tree with folders like 'SDS', 'Matthias', 'common', 'herea', 'mkk', 'test', 'tff', 'kryo', and 'VC'. The right sidebar shows the 'Widget Properties' for a 'Bargraph' widget.

Name	Value
<b>Behaviour</b>	
Action Data	ActionData(No ...
Alias	[record: dal-ep...
Enabled	<input checked="" type="checkbox"/> yes
Horizontal orient	<input type="checkbox"/> no
Level HI	75.0
Level HIHI	100.0
Level LO	25.0
Level LOLO	0.0
Maximum	1.0
Minimum	0.0
Permission ID	
Primary PV	dal-epics://CM...
Value	1.0
Visibility	<input checked="" type="checkbox"/> yes
<b>Display</b>	
Background Col	(200;200;2...
Border Color	(100;0;0)
Border Style	Line Style
Border Width	0
Color Fillbackgr	(120;120;1...
Fill Color	(0;0;255)
Foreground Col	(89;126;225)
Name	BargraphModel
Scale	None
Section count	10
Show only value	<input type="checkbox"/> no
Show values	<input type="checkbox"/> no
Tickmarks	None
Transparent Bax	<input checked="" type="checkbox"/> yes
<b>Position</b>	
Height	155
Layer	
Width	23
X-Coordinate	997
Y-Coordinate	634

# Diamond's GDA

GDA AcquisitionGUI RCP Version 0.0.0 - logged in as xxx

File Edit Window Help Search

MX Perspective Default

MX ExperimentControlPanel MX JCamamanDisplayPanel MX FluorescenceScanPanel

QBPMs  
 Pre-HFM   $\mu\text{A}$  Pre-VFM   $\mu\text{A}$   
 Post-VFM   $\mu\text{A}$  Coll. Table   $\mu\text{A}$

Experiment Shutter  
 N/C

Ring & DCM  
 DCM Energy  eV DCM Wavelength  Angstrom  
 Ring Current  mA

Visit Directory  Folder  File Prefix

Data Collection Parameters

Row Sel.	Sample ID	Holder	Position	Phi Start (°)	Phi Step (°)	Phi Delta (°)	Number of Images	Time per image (s)	Max. Resolution (Å)	Distance (mm)	Transmission (%)	Run Number	First Image Number	Number of Passes	Comment
				0.00 °	1.00 °	0.00 °	1	1.0 s	1.0000 Å	250.0 mm	100.0000 %	1	1	1	

Status  
 Wavelength  Å Phi Angle  °  
 Detector Distance  mm  
 Beam Position X  mm Holder   
 Beam Position Y  mm Sample

Last Image  
 Filename

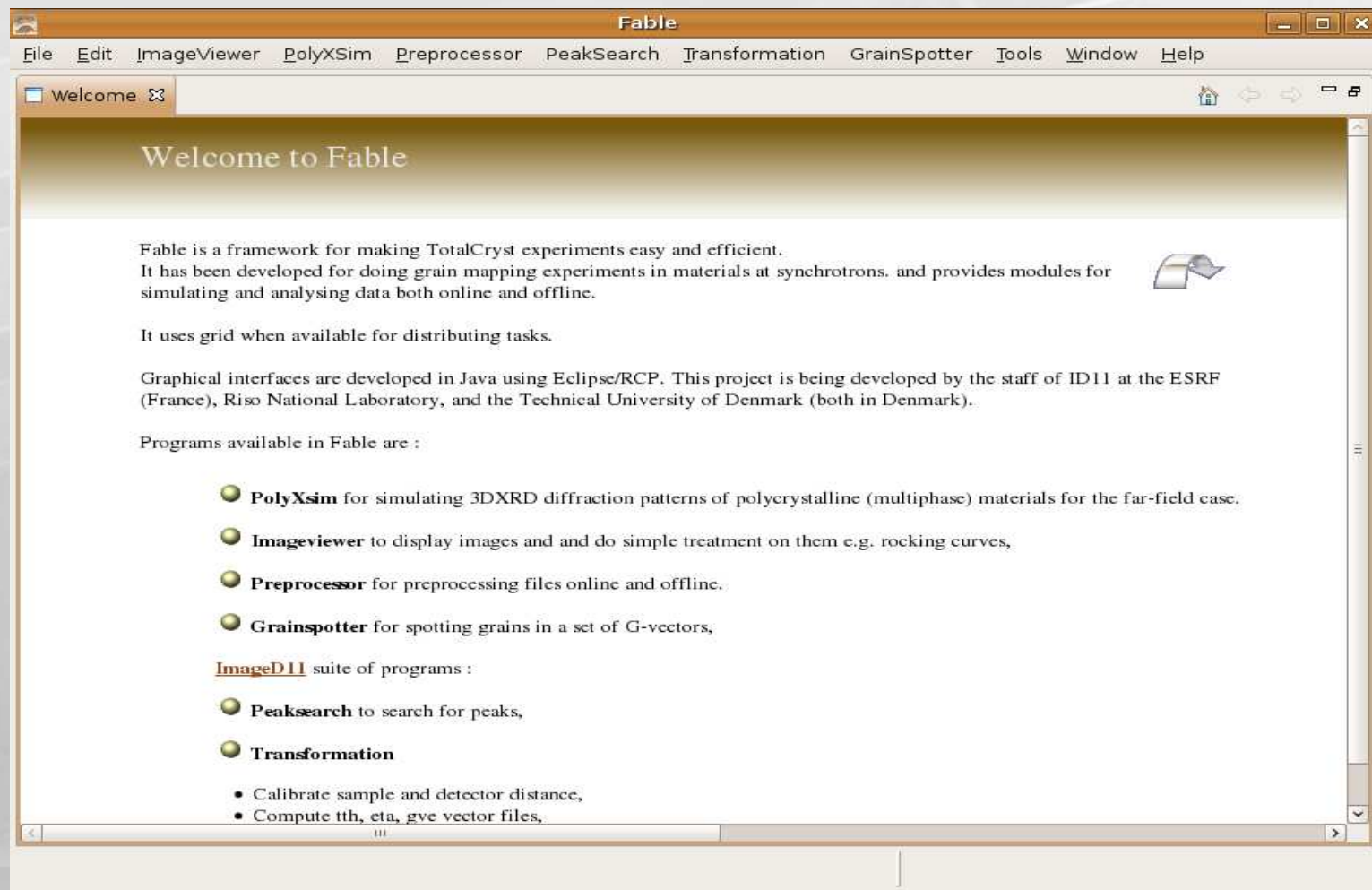
Data Collection Progress

Image Display Control  
 Display Live Images

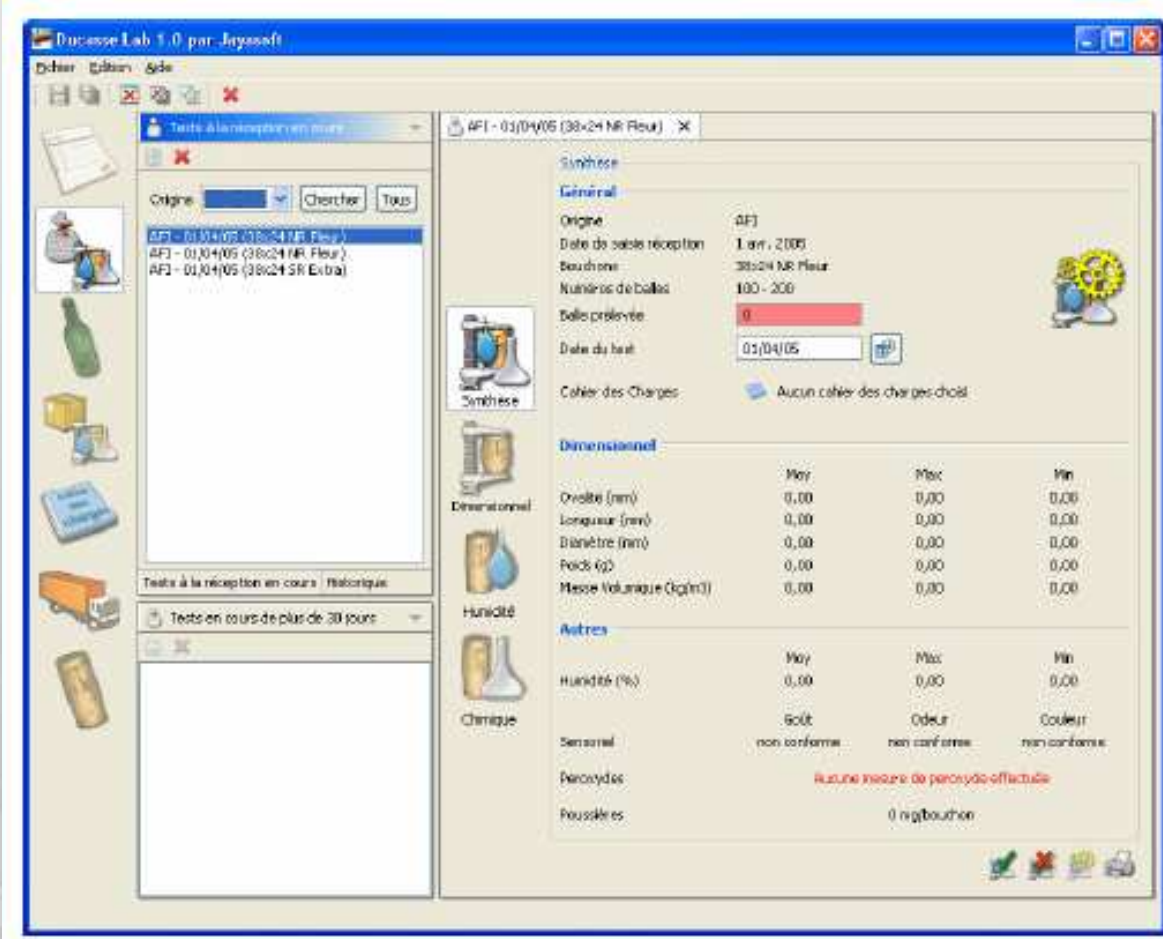
Still  
 Exposure  s

Image Display

# Fable - Welcome



# Eclipse + French Wine



The screenshot shows the 'Ducasse Lab 1.0' software interface. The main window displays a detailed report for a wine sample identified as 'AFI - 01/04/05 (38x24 NR Fleur)'. The report is organized into several sections:

- Synthese:**
  - Origine: AFI
  - Date de saisie reception: 1.04.2005
  - Beauvigne: 38x24 NR Fleur
  - Numéros de boîtes: 100 - 200
  - Balle prélevée: 0
  - Date du test: 01/04/05
  - Cahier des Charges: Aucun cahier des charges choisi
- Dimensionnel:**

	Moy	Max	Min
Oxalate (mm)	0,00	0,00	0,00
Longueur (mm)	0,00	0,00	0,00
Diamètre (mm)	0,00	0,00	0,00
Poids (g)	0,00	0,00	0,00
Masse Volumique (kg/m <sup>3</sup> )	0,00	0,00	0,00
- Autres:**

	Moy	Max	Min
Humidité (%)	0,00	0,00	0,00
Sensibil	non conforme	non conforme	non conforme
Peroxydes	Aucune mesure de peroxyde effectuée		
Faussetés	0 nigbouthon		

The interface also includes a sidebar with navigation icons for various analysis types (Synthese, Dimensionnel, Humidité, Chimique) and a list of tests on the left side of the window.

## What did we achieve ?

- An open source graphical workbench for running a subset of TotalCryst data analysis programs
- Another 2D image viewer
- An application which (we think) is useful
- Demonstrated technological choices were adapted



# What did Fable cost ?

## Ohloh Analysis

### Project Cost

This calculator estimates how much it would cost to hire a team to write this project from scratch. [More »](#)

Include	Markup: <input type="text" value="1.0"/>
Codebase	556,874
Effort (est.)	150 Person Years
Avg. Salary	\$ <input type="text" value="55000"/> year
<b>\$ 8,228,842</b>	

ohloh

ohloh:Root

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# fable

Updated 31 Mar 2009 12:53 UTC

### GENERAL

- [Summary](#)
- [Journal Entries](#)
- [Reviews](#)
- [Links](#)
- [News](#)
- [Managers](#)
- [Widgets](#)

### DEVELOPMENT

#### Code Analysis

- [Contributors](#)
- [Commits](#)
- [Enlistments](#)

### Licenses

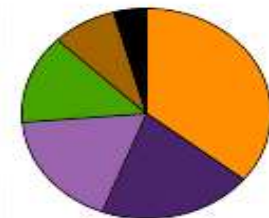
Ohloh searches the source code for individual license declarations. These licenses can differ from the project's official license.

<a href="#">GNU General Public License 2.0</a>	233 files
<a href="#">Common Public License 1.0</a>	6 files
<a href="#">GNU Lesser General Public License 2.1</a>	5 files
<a href="#">Eclipse Public License</a>	3 files

### Languages

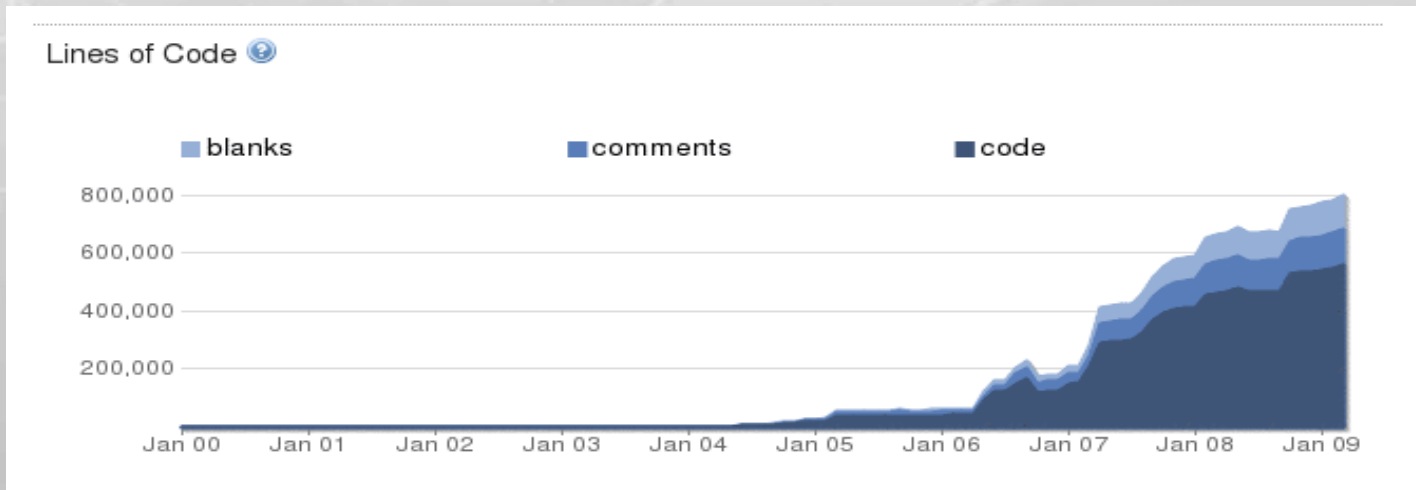
Ohloh analyzes the project source code and determines the language of each line of code, excluding comments and blanks.

<a href="#">C</a>	34%
<a href="#">Python</a>	19%
<a href="#">Java</a>	17%
<a href="#">HTML</a>	13%
<a href="#">Matlab</a>	8%
<a href="#">Other</a>	4%




















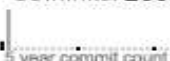






# Fable – Lines of Code



# Fable Top Contributors

Contributors Filter on:  Sort by: **Commits**  Update

[15 total]

	<b>gaelle_suchet</b>	<b>Kudo Rank</b> 	Primary Language: <b>Java</b>	Commits: <b>1110</b>  <small>5 year commit count</small>
	<b>andy_gotz</b>	<b>Kudo Rank</b> 	Primary Language: <b>Java</b>	Commits: <b>912</b>  <small>5 year commit count</small>
	<b>jpwright</b>	<b>Kudo Rank</b> 	Primary Language: <b>Python</b>	Commits: <b>672</b>  <small>5 year commit count</small>
	<b>h_osholm</b>	<b>Kudo Rank</b> 	Primary Language: <b>Python</b>	Commits: <b>594</b>  <small>5 year commit count</small>
	<b>erkn</b>	<b>Kudo Rank</b> 	Primary Language: <b>C</b>	Commits: <b>286</b>  <small>5 year commit count</small>
	<b>eknudsen</b>	<b>Kudo Rank</b> 	Primary Language: <b>C</b>	Commits: <b>270</b>  <small>5 year commit count</small>
	<b>KennethEvans</b>	<b>Kudo Rank</b> 	Primary Language: <b>Java</b>	Commits: <b>199</b>  <small>5 year commit count</small>

## *Fable Programmers*

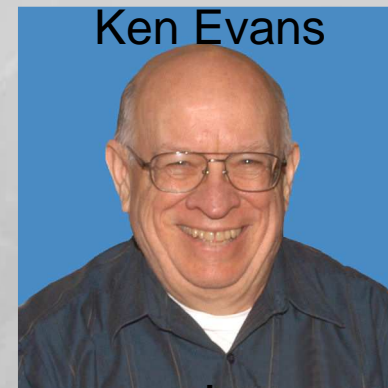
- ESRF
  - Jon Wright
  - Gaelle Suchet
  - Andy Gotz
- Risoe
  - Henning Osholm
  - Soeren Schmidt
  - Jette Odersheder
  - Erik Knudsen
- APS
  - Ken Evans

## • Testers

**THANK YOU to  
EVERYBODY !**

# Fable Tester Competition

- Winner of the Best Fable Tester bottle of wine - a 1988 Chateau Clarke :



## What we did not achieve

- A graphical application for running all of TotalCryst data analysis programs
- Missing programs are Fabric, Grain Mapping, ...
- A complete set of 1D, 2D, 3D visualisation tools
- A better data format e.g. HDF, database



## **Fable - Short Term Future**

- Handling Multiple-Image Binary Files
- Histogram of Image
- Export Slices of Images
- Add tools like :
  - Background maker
  - Fit2dcake
  - ...

## **Fable - Short to Medium Term Future**

- Project Navigator
- Integrate Experimental Parameters
- Plot Rodrigues Vectors, Q-Space, Debye-Scherrer rings, ...
- Make all Input File Views to Editors
- Double-click and Drag-n-Drop on Input Files
- Add support for HDF and Databases

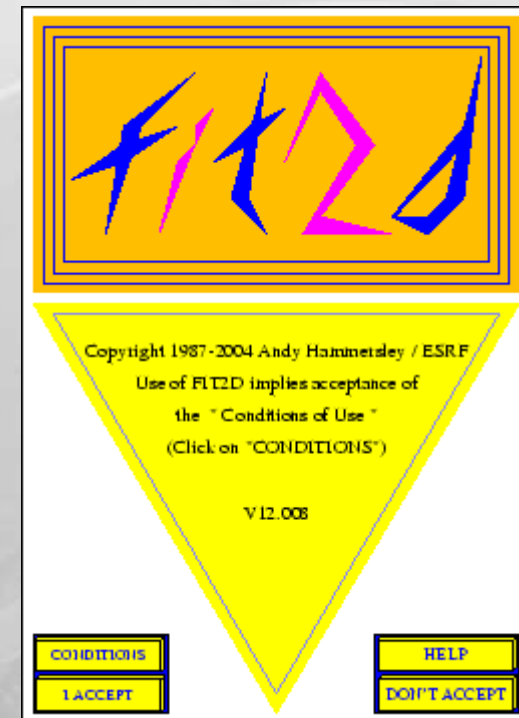
## *Fable - Long Term Future*

- 1D Peak Fitting
- Visualisation
  - 3D Reciprocal Space
  - Volume Rendering of Grains
  - Center of Mass Grain Maps
  - Pole Figures
- Online Data Analysis
  - User Interface to configure, run and monitor ODA
- Powder diffraction ...



## *Powder Diffraction Workbench*

- Develop yet another alternative for analysing Powder Diffraction *a la* Fit2d, XOP, ...
- Typical tasks to implement are :
  - Calibrate beam center, detector tilt, ...
  - Radial integration
  - Fit powder rings
  - 3D volume visualisation
  - Element and phase analysis
  - Online data analysis



## *Fable - Conclusion*

- Fable will continue to be developed and maintained for

**Total Cryst**

- Fable will be further developed to provide a richer 1D, 2D and 3D plotting tool
- Fable will be integrated into the ESRF Upgrade Program for the next 10 years to do e.g. :
  - Online Data Analysis,
  - Powder diffraction
- Fable will collaborate with APS, DLS and others

## Fable has a long term future ...

