FOSS

Free Open-Source Software

Context

- Need to integrate large legacy systems
- Systems' documentation may be:
  - Missing
  - Too large
  - Outdated
- Needs to understand a system from its code source
  - IDE: a minimum
  - IDE: not enough

Needs

- Instrumentation
  - Dynamic analysis
  - Byte code manipulation
- Modeling
  - Encapsulates code-level details
- Graphics
  - Visualization
- Regex-based searching & filtering
  - Show only objects of interest

Categories

- Eclipse Platform : the most popular Java IDE
- Eclipse Plug-ins : several of them are free and open
- External Java Libraries : bring features of interest into Eclipse

Eclipse Platform

- Extensions: everything is a plug-in (except the platform's core)
- Extension points:
  - Add a menu item into the menu
  - Add a preference page in the preferences
  - Add an editor for a kind of file
  - Add a permanent view
  - Add documentation in the help pages

Eclipse Plug-ins

- Bytecode manipulation
- Modeling
- Graphical Libraries
- Parsers
- Integrated Products
- Others

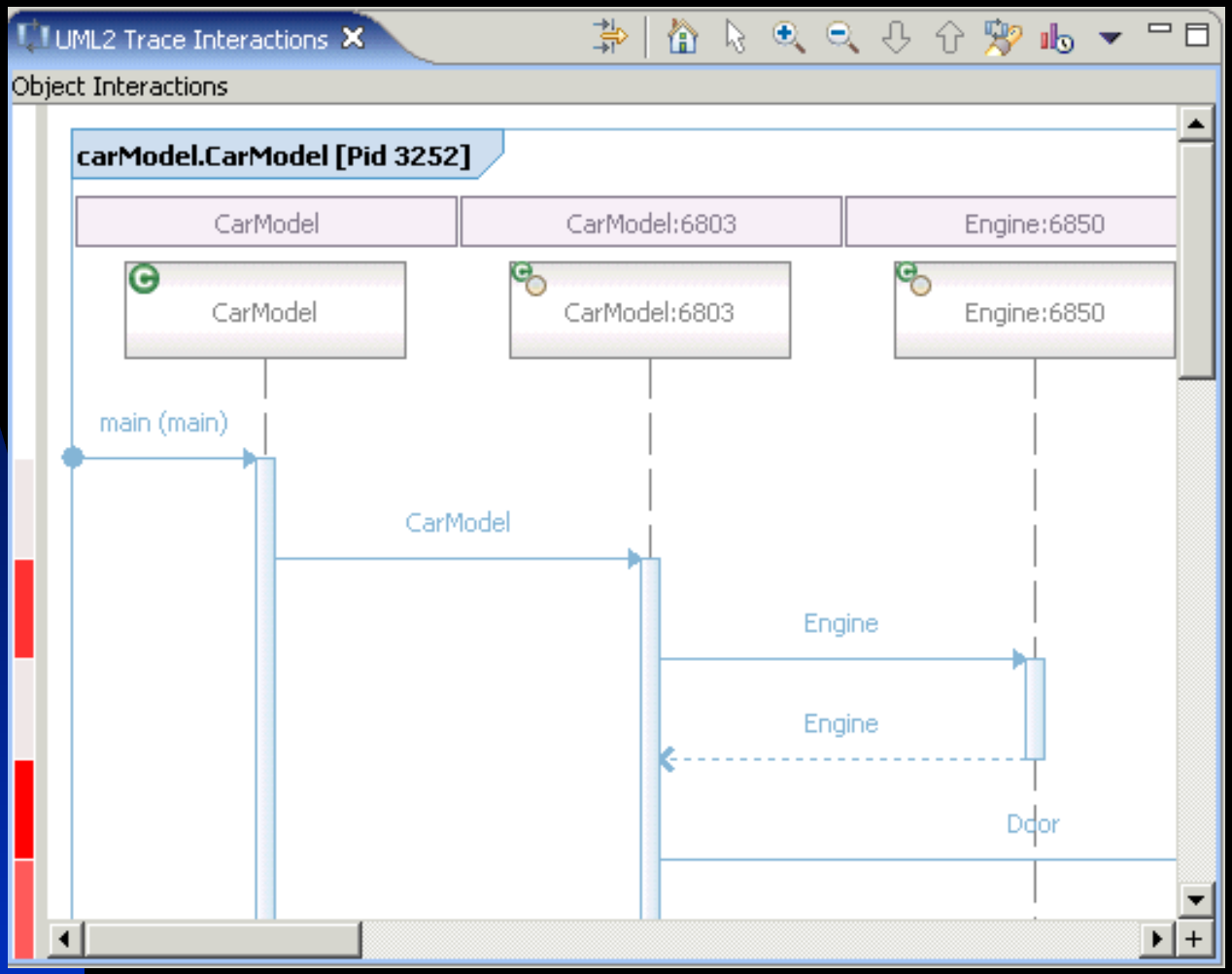
Eclipse Plug-ins

- Bytecode manipulation : TPTP
  - Test and Performance Tools Platform
  - Formerly named *Hyades*
  - Monitors, traces, profiles, instruments.
  - Divided in four independent sub-projects.
  - Monitoring and analyzing performance:
    - Profiling
    - Viewing interaction
    - Instrumentation
  - http://www.eclipse.org/tptp/

TPTP: Profiling

- An *agent controller* controls and monitors JVM activity during an execution
- Limitations:
  - Supported platforms: Windows, AIX, Linux, Solaris
  - JVM versions
  - Languages constructs, such as generics declarations

TPTP: Viewing interactions



TPTP: Viewing interactions

- We can:
  - Collapse/Expand lifelines (by selection, not by applying a package collapse)
  - Collapse/Expand messages
  - Drilling down into lifelines (interactions with a specific lifeline)
  - Highlight a call stack
  - Viewing time intervals
  - Searching/Filtering features (limited)
  - Zooming/Overview diagrams.

TPTP: Viewing interactions

- We cannot easily control the generation of the sequence diagram:
  - To change B/G and F/G colors
  - To filter out undesired items
  - To view package interactions
  - To add stereotypes and icons
  - To specify domain-related items (items of interest for an application domain).
- We didn't find how to generate sequence diagrams from external traces (such as JRAT traces)

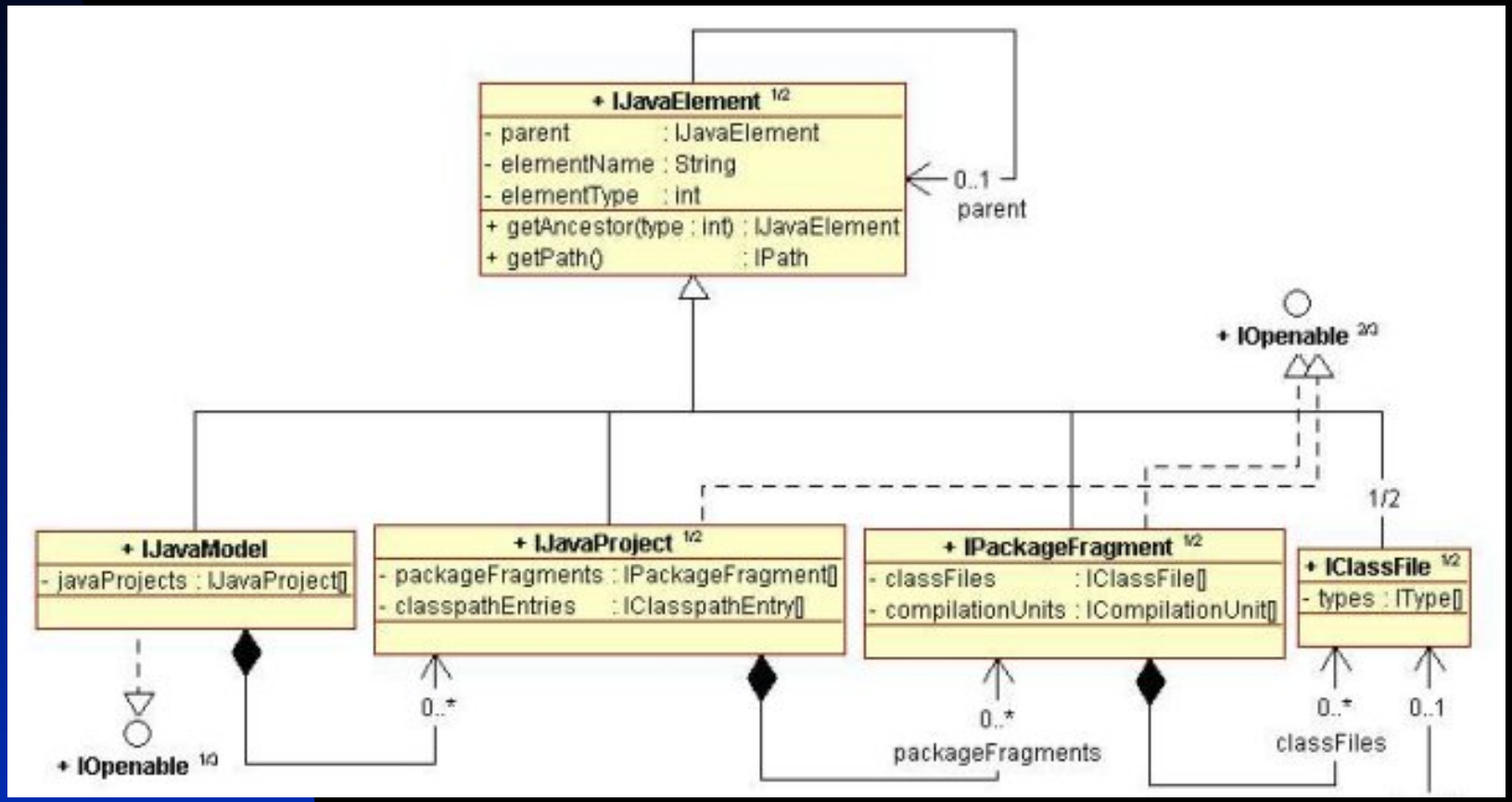
TPTP: Instrumentation

- Probekit:
  - A probe can be inserted into .class code
  - The probe calls user-defined code
  - Some info available from the probe:
    - Caller name, object instance, etc.
  - The probe may be inserted to:
    - Called methods : monitors instrumented application
    - After/before calls : monitors Java library and 3rd party
    - Both
  - We can make a probe generating XML-formatted traces.

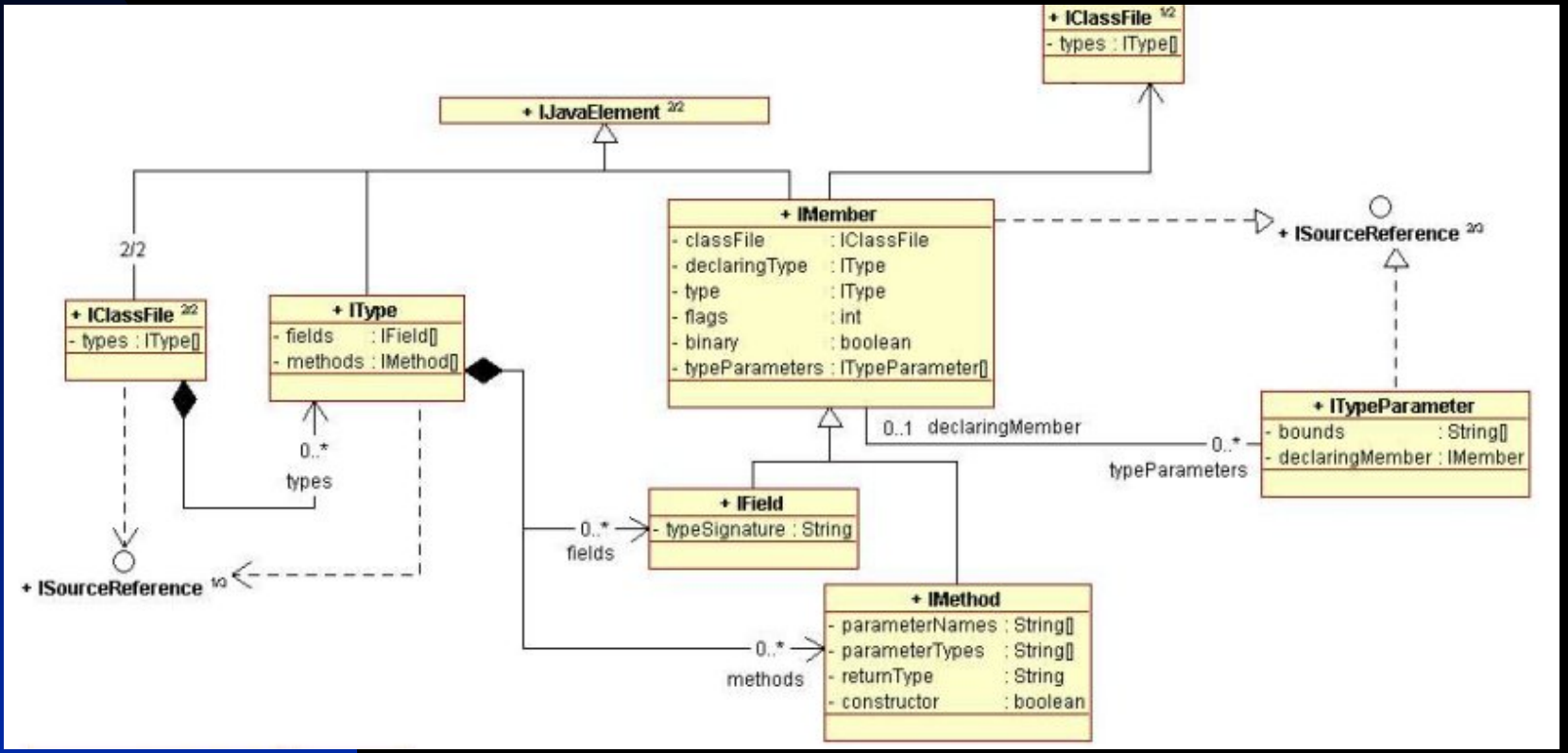
Eclipse Plug-ins

- Modeling
  - JDT (Java code level)
    - Includes a parser (org.eclipse.jdt.internal.compiler.parser)
    - Generates a model of Java objects
  - EMF (UML level)
    - Models UML objects instead of Java objects
  - Others (CDT, RDBMS)
    - Making Eclipse a language-neutral IDE

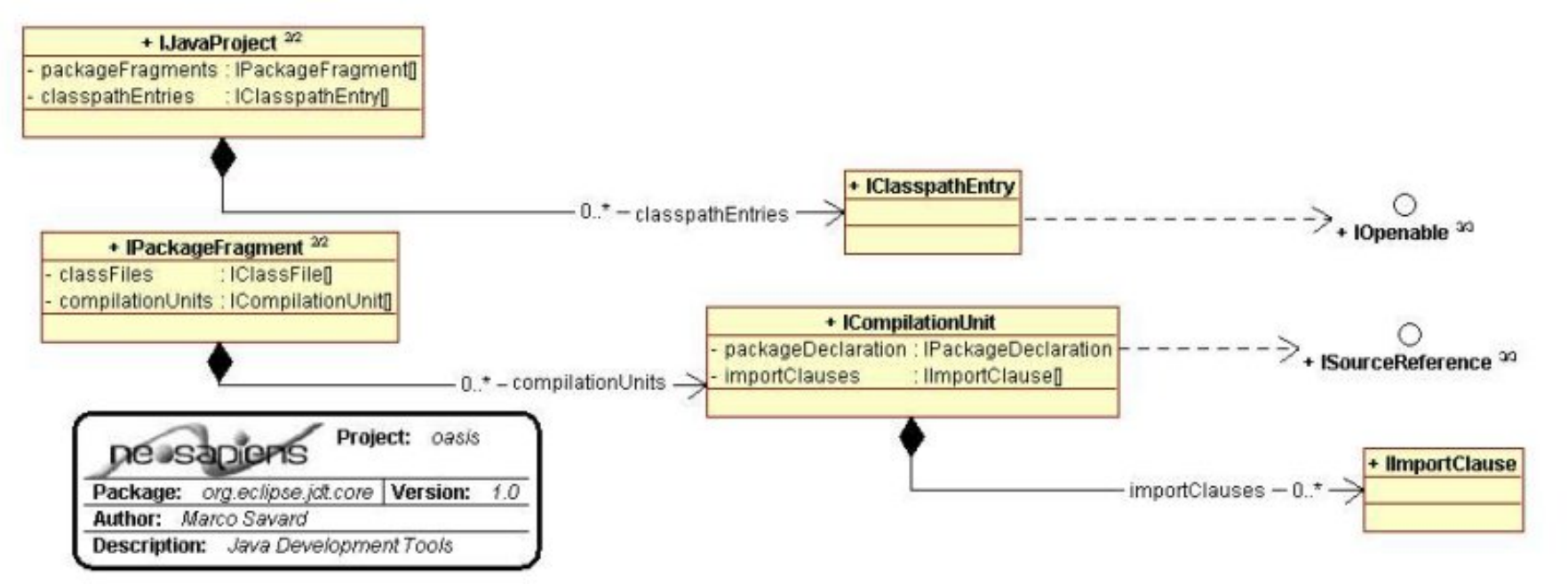
JDT : *openable* classes



JDT : source references



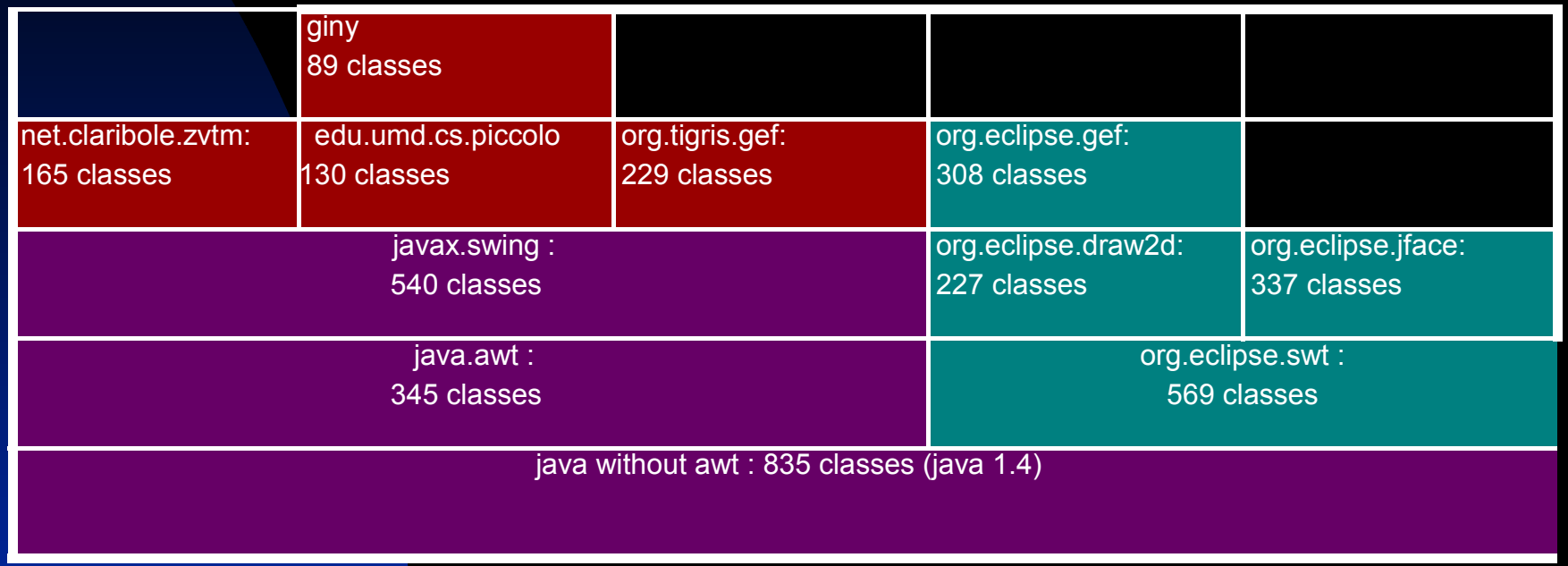
JDT : package and compilation units



Eclipse Plug-ins

- Graphic Libraries
  - SWT : A widget library
    - User has to create Tree, TreeItem
  - Jface : Integrating model and view
    - User creates a TreeViewer, TreeContentProvider from a data model, abstracting the widget level.
    - High-level widget: wizards.
  - Draw2D : a low-level drawing library
    - Equivalent to org.eclipse.swt.graphics
  - GEF : a diagramming framework

Graphical libraries: complexity and dependencies



- Standard libraries : magenta
- Eclipse plug-ins : green
- 3rd party libraries : red

Eclipse Plug-ins

- Parsers
  - ANTLR
    - generates a Java parser from a .g grammar file
  - JavaCC
    - generates a Java parser from a .jj grammar file
  - JDT built-in parser
    - parses only java files
  - XML parsers
    - Xerces.jar : org.w3c.dom
    - Since java 1.4 : javax.xml
  - XSD (required by TPTP)
    - www.eclipse.org/xsd

Eclipse Plug-ins

- Integrated Products
  - Spider
  - Junit
  - Metrics
  - UML Modeler
    - Omondo (free version)
    - Slime UML (not free)
    - Modelistic (not free)

Eclipse Plug-ins

- Others
  - Ant : to run build.xml Ant scripts)
  - Log4J : required by SEQUENCE)
  - OSGi : required by PDE
    - (Plug-in Development Environment)
  - TextEditor :
    - org.eclipse.ui.editors.text.TextEditor
  - XMLEditor :
    - Not found in the Eclipse framework
    - More convenient to edit XRAT files

External Libraries

- JRAT : BCEL-based class instrumentor
  - Simpler, more reliable than TPTP's probekit
  - Limitations: ignore client calls, constructors
- BCEL : low-level byte code manipulation
- JavaHelp : required by SEQUENCE
- Regular expression :

  Gnu's version : org.gnu.regex

  Java.util.regex : since JDK 1.4

BCEL usages

- To pass byte code object to JRAT

```
JavaClass source, target; //BCEL objects
InjectionCriteria criteria; //JRAT objects

target = ClassInjector.injectClass(source, criteria);
```

- To convert method signatures found in .xrat

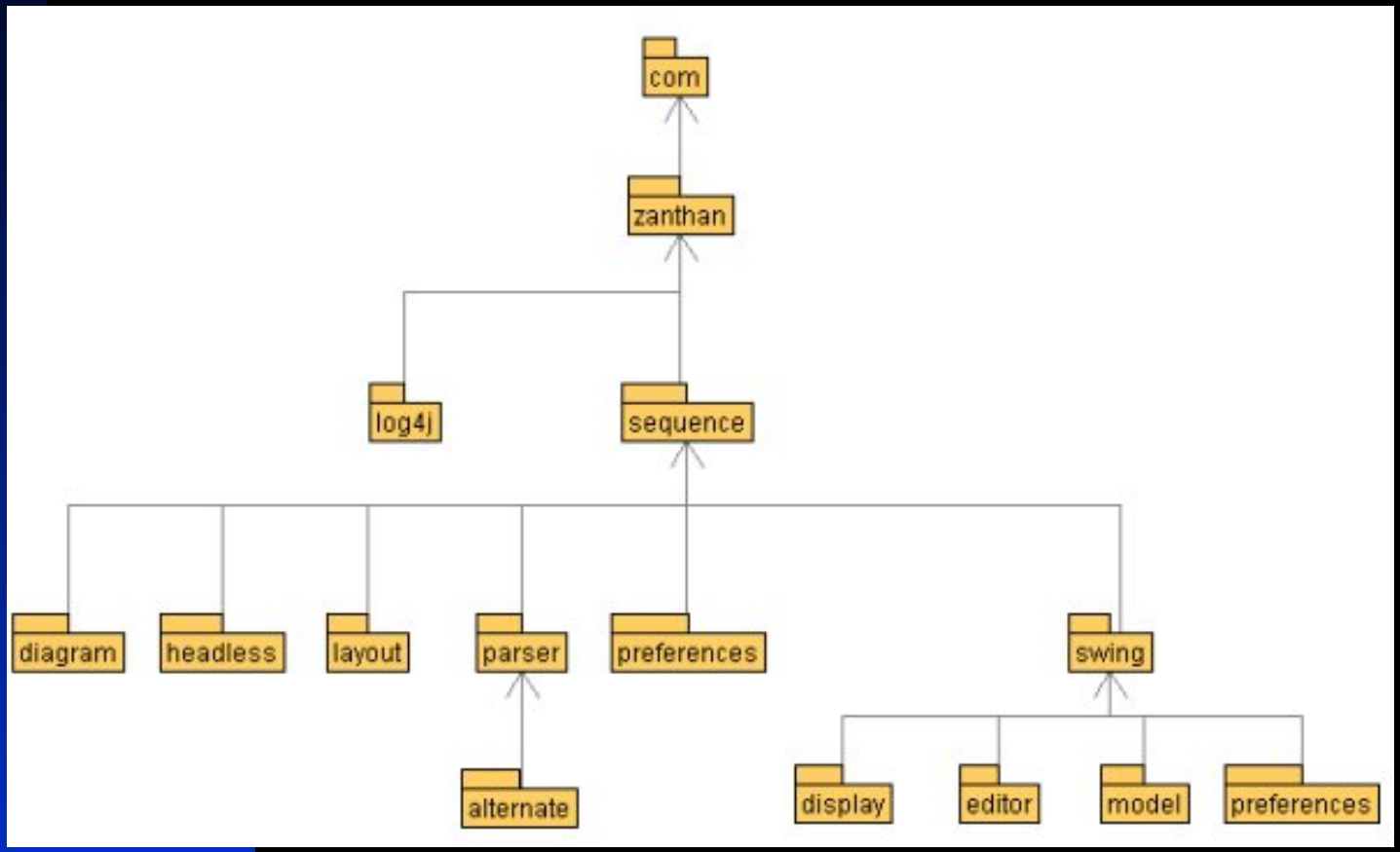
```
String signature = "Ljava/lang/String;Z";
org.apache.bcel.generic.Type[] types;
types = Type.getArgumentTypes(signature);
//types[0].toString() equals "java.lang.String"
//types[1].toString() equals "boolean"
```

External Libraries : SEQUENCE

- A simple Swing-based program
- A conversion to SWT is required to run it within Eclipse
- Future enhancement: convert to a diagramming framework (gef, piccolo).
  - Zooming/Scrolling support
  - Direct manipulation of graphical elements (move, resize, in-line editing)

SEQUENCE : architecture

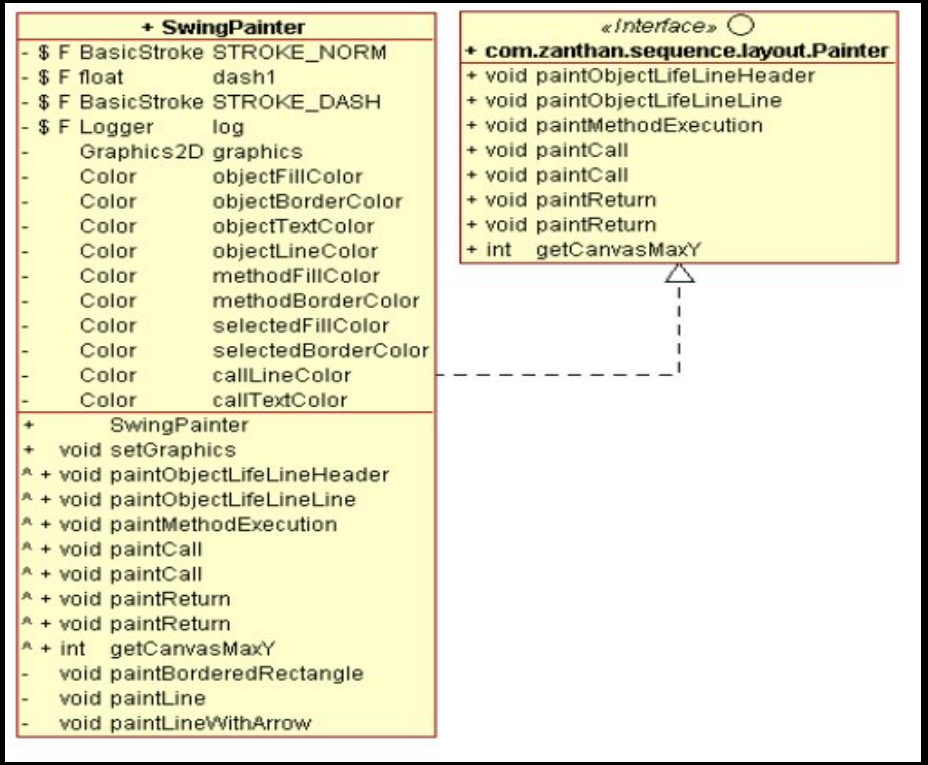
- 15 packages
- 70 classes



SEQUENCE : Painter

No code in the Painter interface

A concrete SWTPainter could be implemented



The OASIS plug-in

- Instrumentation based on JRAT and Prokebit
- Uses SEQUENCE to show class interactions

SEQUENCE

- Changes to the original tool
- Swing to SWT conversion