The Eclipse Rich Client Platform

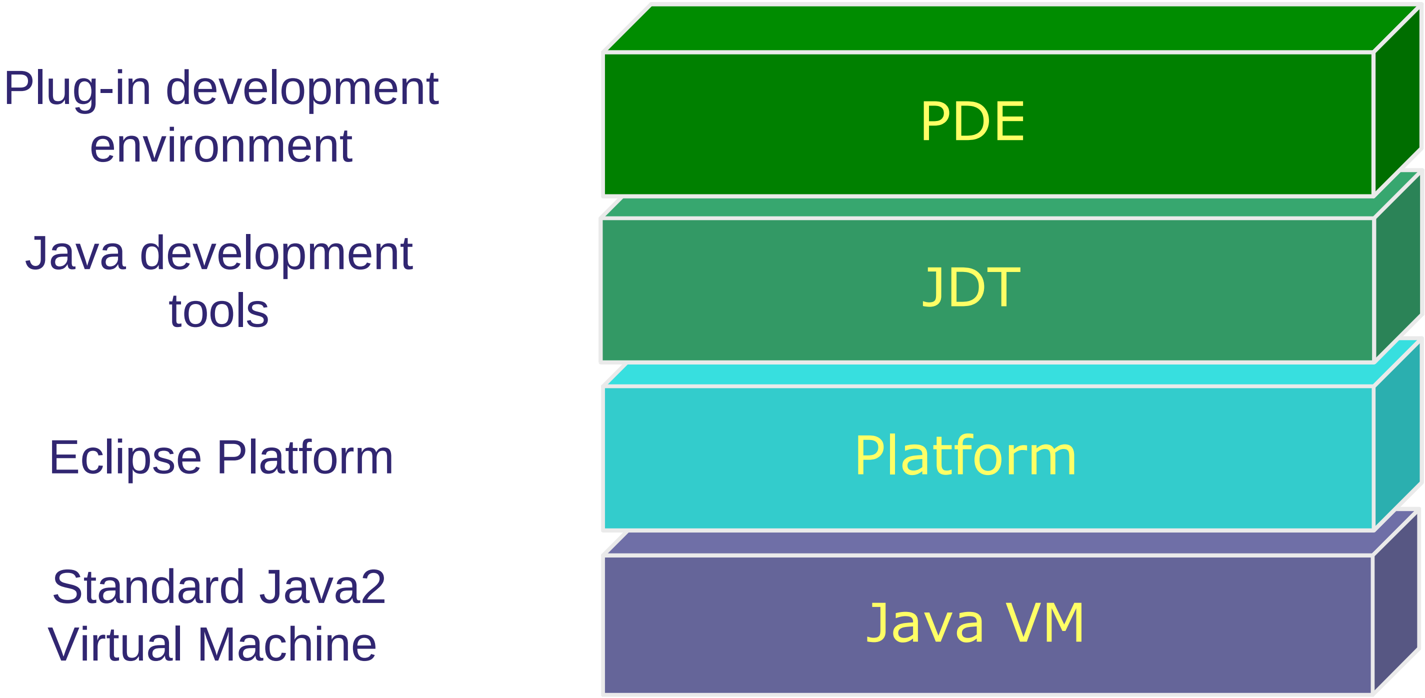
Slides by various members of the Eclipse JDT and Platform teams

Outline

- Rich Client Application ?
- The Eclipse Plug-in Architecture
- Eclipse Plug-ins in action
- The Eclipse Rich Client standard components
- How to deploy Plug-ins
- How to develop Eclipse Plug-ins

How Eclipse started

- Eclipse is a universal platform for integrating development tools
- Open, extensible architecture based on plug-ins



Plug-in development environment

Java development tools

Eclipse Platform

Standard Java2 Virtual Machine

PDE

JDT

Platform

Java VM

Eclipse for Non IDE Applications

"could I dump all the plug-ins that come with eclipse and use the platform to host only business specific plug-ins that have been built?" – news.eclipse.org

But when using Eclipse 2.1 as an ordinary application platform you get either:

- **too much**
  - all the IDE specific components
  - user interface is polluted with IDE specific actions
- **too little**
  - only SWT and JFace
  - low level programming model
  - No extensibility

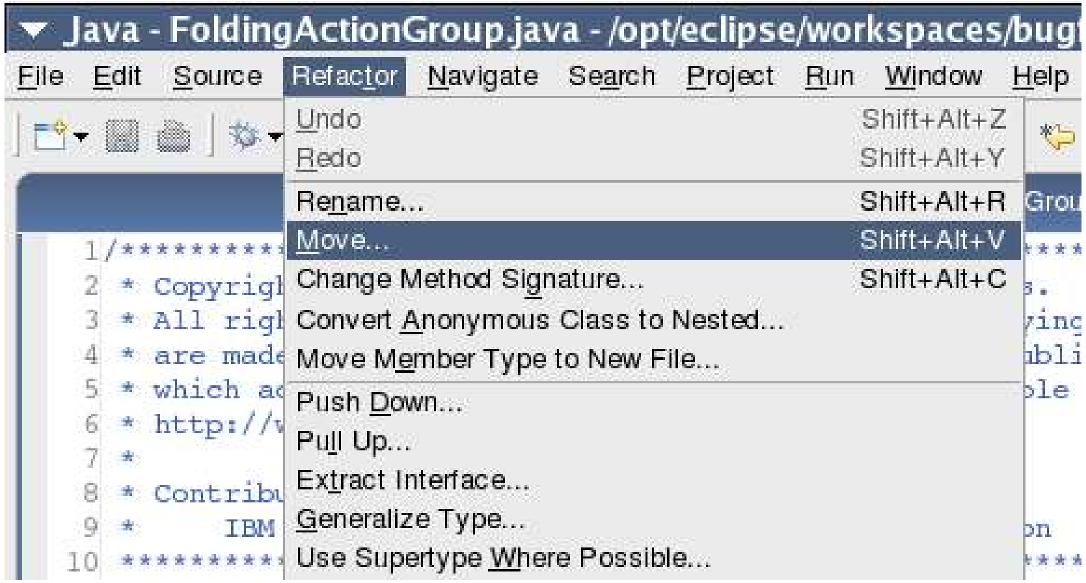
Towards a Rich Client Platform

- **Many workbench components are not IDE specific. Advanced desktop applications have similar needs**
  - open architecture
  - efficient, configurable, portable user interface
  - supports product branding, install/update support
  - integrated help, user configuration/preferences

- **Enable workbench to be used for non IDE applications**
  - remove IDE personality from workbench
    - no built-in editors, views, perspectives
  - remove assumption that workspace is the data model
  - make most other components optional
    - rich function, low footprint

What is a Rich Client Application?

- An application that use the windowing and GUI features of the operation system they run on. This means:
  - Native widgets, menu and tool bars
  - Drag & Drop
  - Integrates with platform component model
  - …



Java - FoldingActionGroup.java - /opt/eclipse/workspaces/bug
File Edit Source Refactor Navigate Search Project Run Window Help
Undo Shift+Alt+Z
Redo Shift+Alt+Y
Rename... Shift+Alt+R
Move... Shift+Alt+V
Change Method Signature... Shift+Alt+C
Convert Anonymous Class to Nested...
Move Member Type to New File...
Push Down...
Pull Up...
Extract Interface...
Generalize Type...
Use Supertype Where Possible...

Consequences…

- ✓ More responsive user experience
- ✓ Better integration with existing Desktop tools
- ✓ Lower server loads
- ✓ Offline execution
- ✓ Local data access
- – Client/Server architecture
- ✓? Memory footprint
- ✓? Management & Deployment

Eclipse Rich Client Platform

A Rich Client Platform needs a strong component model with the following major characteristics:

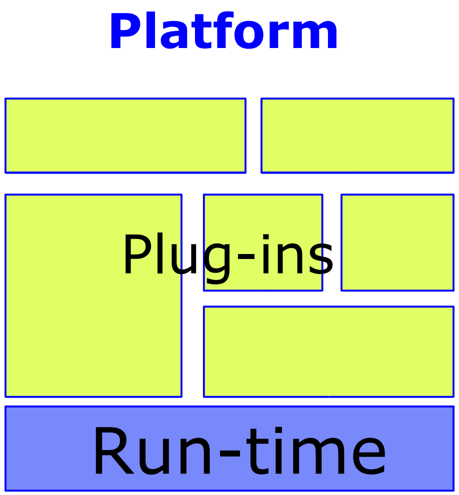
- ✓ Specified interfaces: a component must declare its public API and how it can be extended
- ✓ Lazy loading: components are loaded on demand not on startup
- ✓ Versioning: prerequisite components are reference by name and version
- ✓ Dynamic detection: components are detected dynamically (no need to restart)

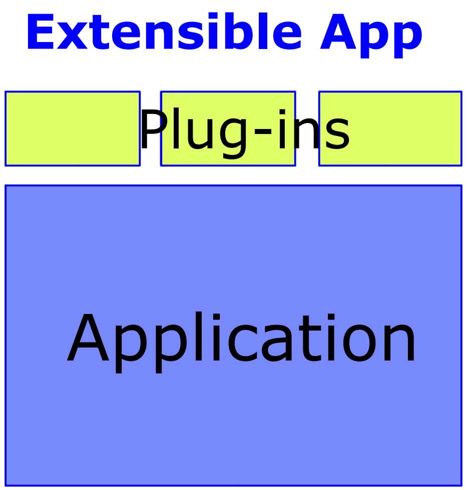
Additionally the following issues must be addressed:

- ✓ Managing: install, update, remove & discover components
- ✓ Development: IDE to develop components
- ✓ Security: based on Java 2 security

Platform vs. Extensible Application

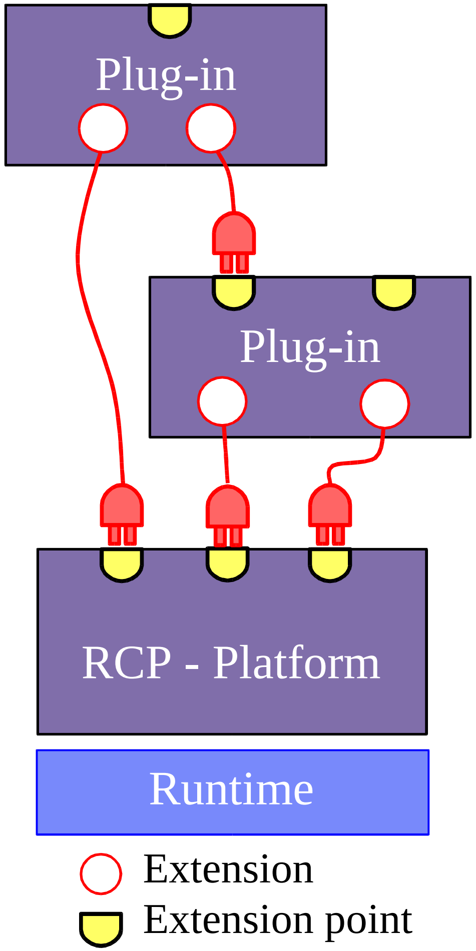
- Eclipse Rich Client Platform
  - It has an open, extensible architecture
  - Built out of layers of plug-ins





Eclipse Plug-in Architecture

- **Plug-in == Component**
  - Set of contributions
  - Smallest unit of Eclipse function
  - Details spelled out in plug-in manifest
  - Big example: mail client
  - Small example: action to calculate the number of lines of a mail
- **Extension point** – named entity for collecting contributions
  - Example: extension point to add additional spam filtering tools
- **Extension** – a contribution
  - Example: a specific spam filter tool
- **RCP - Platform** – set of standard plug-ins
- **Runtime** – controls and manages contributions



The Plug-in Manifest

```
<plugin
   id= “com.example.tool.mail"
   name= “Example Mail Plug-in“
   version= “1.0.0“
   class = "com.example.tool.MailPlugin">
  <requires>
    <import plugin= "org.eclipse.ui" version=“3.0.0”/>
  </requires>
  <runtime>
    <library name = “mail.jar“>
      <export name= “org.example.tool.mail“/>
    </library>
  </runtime>
  <extension point = "org.eclipse.ui.preferencepages">
     <page id = "com.example.tool.mail.preferences"
        title = “Mailing"
        class = "com.example.tool.mail.PreferencePage“/>
  </extension>
  <extension-point
   name= “spamFilters“
   id = "com.example.tool.mail.spamFilters"/>
</plugin>
```

Plug-in identification

Required Plug-ins

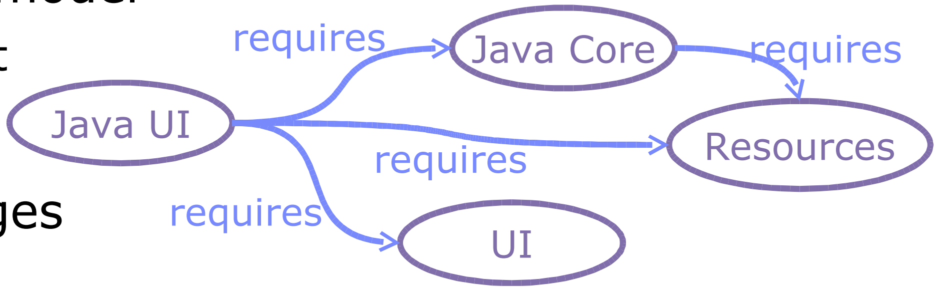
Plug-in code

Declare contribution this plug-in makes

Define new extension point open for contributions

The Eclipse Runtime

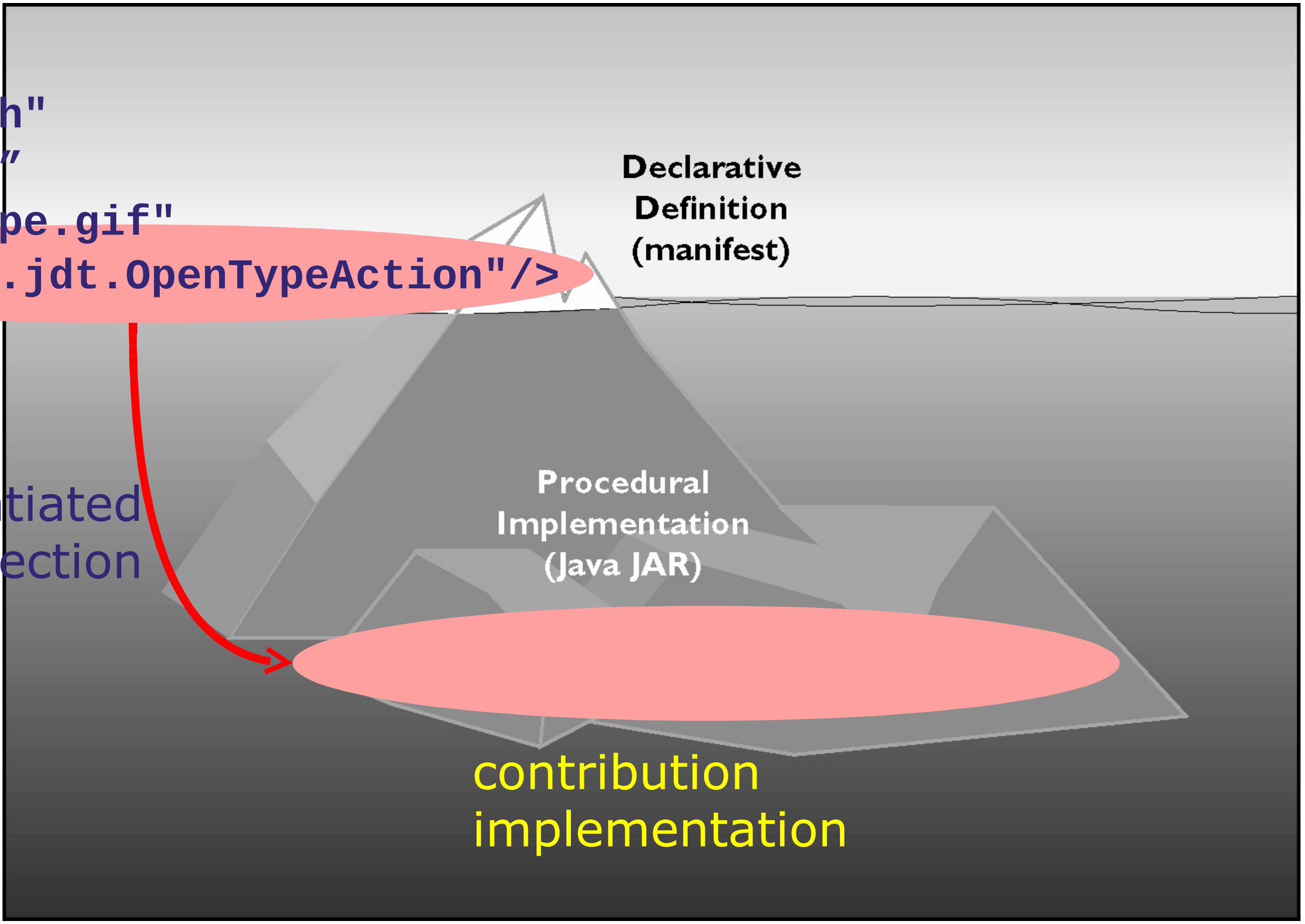
- Java component (*plug-in*) model
  - dependency management
  - activation management
- Extension registry - manages
  - extension points and
  - corresponding extensions
- OSGI based (Open Service Gateway Initiative):
  - Nokia, NTT, Motorola, Philips, Siemens, Oracle
  - dynamic install/uninstall/update of components
  - service architecture
  - security (based on Java 2)
  - remote configuration API



Lazy Loading

```
<action
   toolbarPath=“search"
   toolTip=“Open Type”
   icon="icons/opentype.gif"
   class="org.eclipse.jdt.OpenTypeAction"/>
```

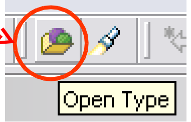
lazily instantiated
using reflection



Declarative
Definition
(manifest)

Procedural
Implementation
(Java JAR)

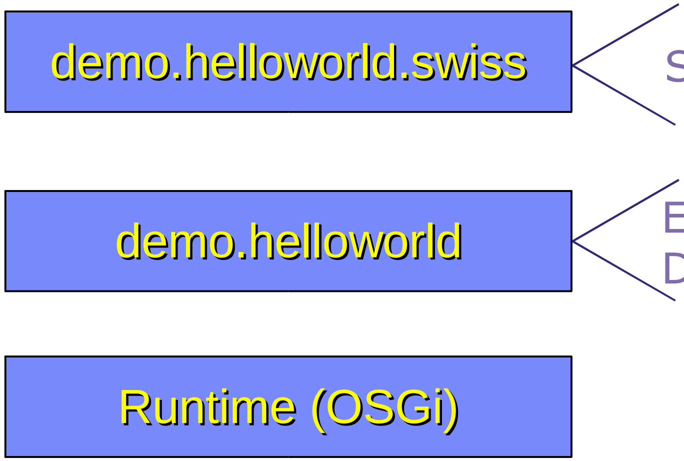
contribution
implementation



Hello World Example

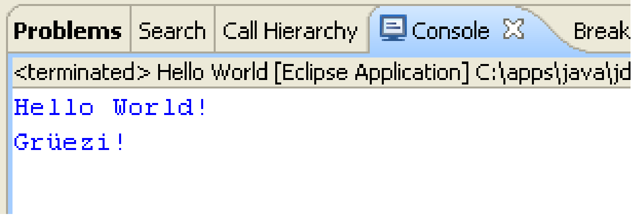
A component based Hello World application that allows contributing additional greeters:

- Uses OSGI as a runtime
- Provides extension points and extensions
- Demonstrates how Eclipse technology can be used to componentize existing applications



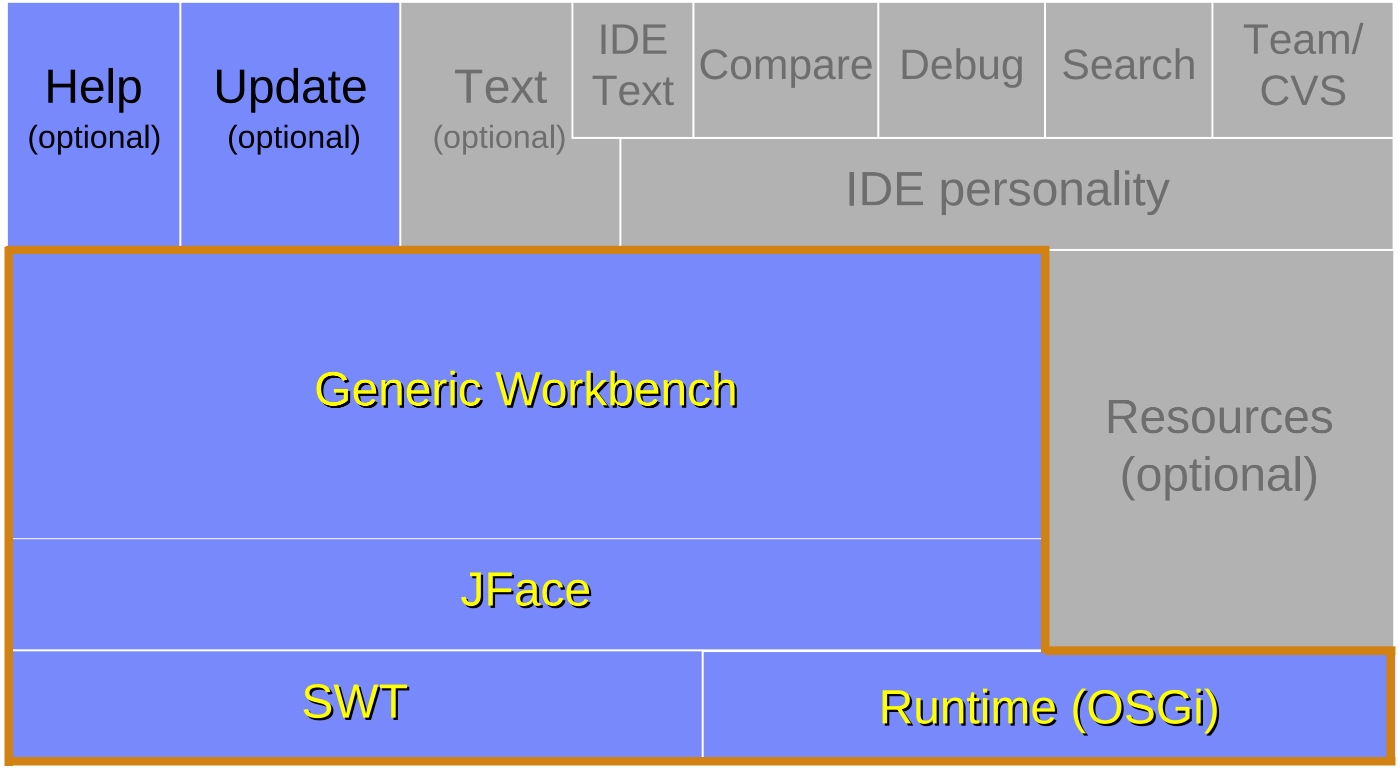
Swiss greeter

Extension point for greeter
Default greeter for Hello World

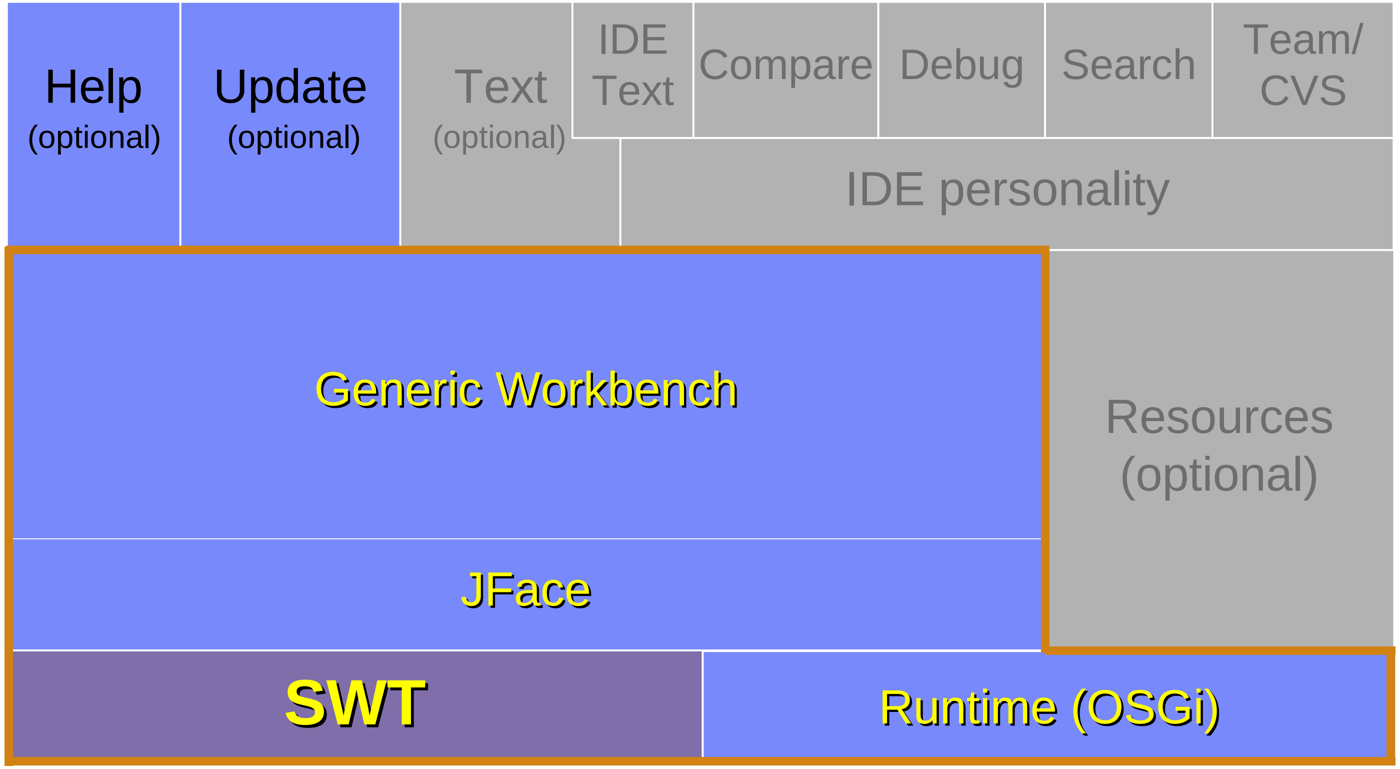


```
<terminated> Hello World [Eclipse Application] C:\apps\java\jd
Hello World!
Grüezi!
```

Eclipse Platform – Version 3.0



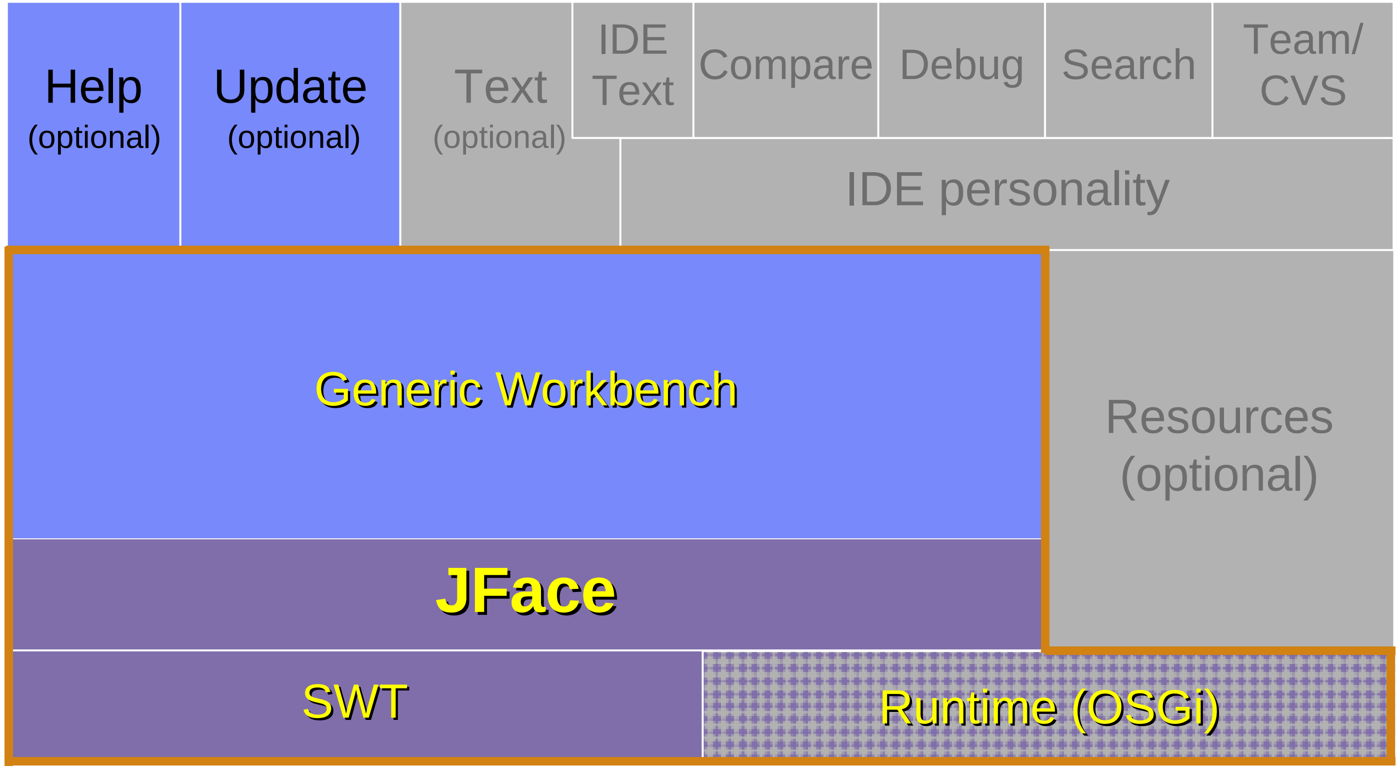
Standalone Applications



Standalone Applications

- Application model
  - Single not extensible application
- **S**tandard **W**idget **T**oolkit
  - Platform independent widget toolkit
    - Native widgets (button, tree, table, menu, …)
    - Win32, GTK, Motif and Mac
  - Integrates with other native application
  - Support for OS component model
    - OLE under Win32
- Programming model
  - OO widget library – no framework
  - API equivalent to native Win32 or GTK applications

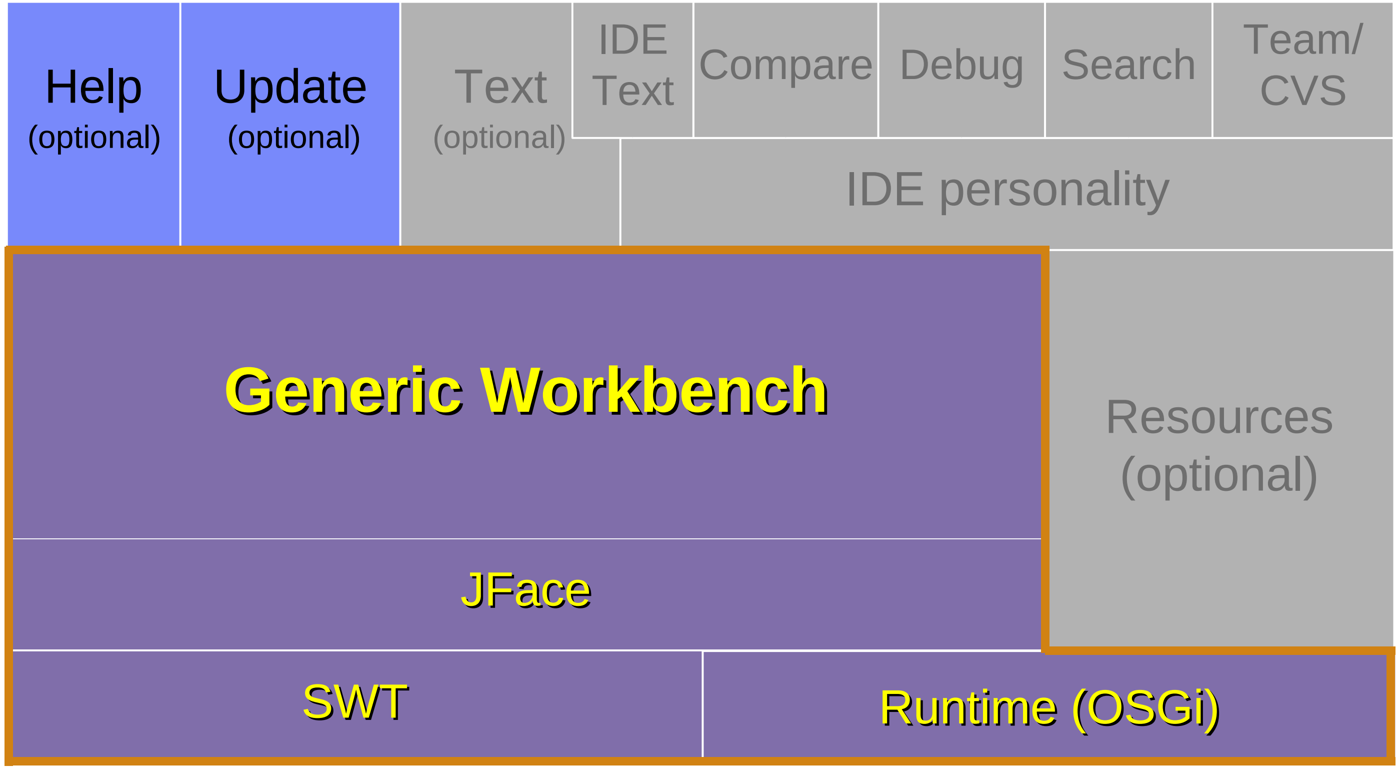
Extensible Applications



Extensible Applications

- Application model
  - Single application
- JFace – brings:
  - MVC concept: viewer & content provider
  - Application window: menu bar, tool bar, content area & status line
  - Action support: menu bar, toolbar, context menu
  - Preference and wizard framework
  - No extension points, API only
- Runtime – brings:
  - Change for extensiblilty
- Programming model
  - Formed by Model View Controller paradigm
  - „Frameworkish"

Application Platform

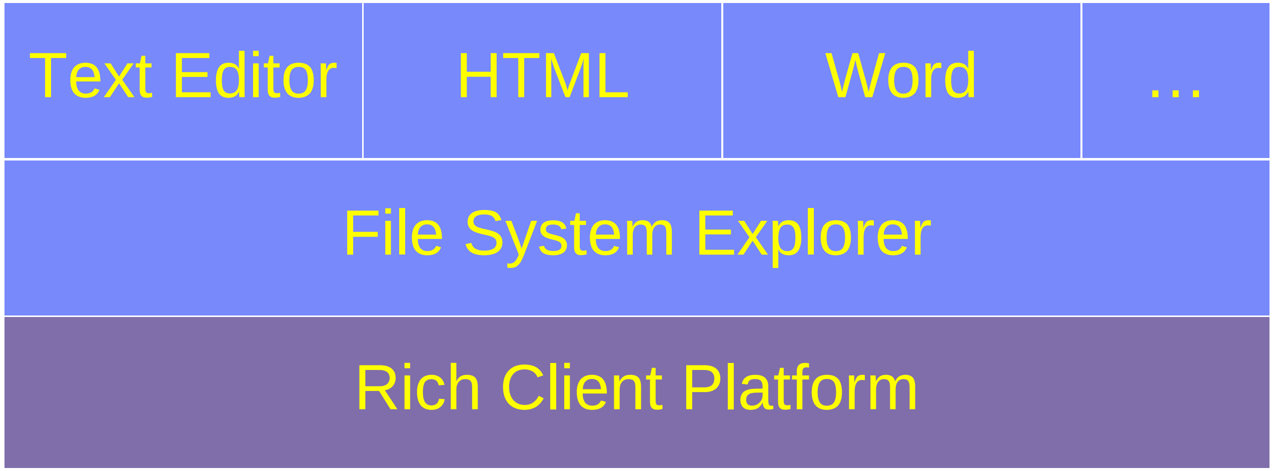


Application Platform

- Application model
  - Family of components (Mailing, Organizer, Address-Book, …)
  - Different sets of components form different applications
- Workbench – brings:
  - Perspectives: define arrangement of editors and views
  - Editors: edit or browse a document or input object
  - Views: navigate a hierarchy of information
  - Action contributions: add additional action to already existing elements
  - Manages shared resources like global menu, preference pages, …
- Programming model
  - Components contribute to workbench extension points
  - Components provide own extension points
  - Split between XML (plugin.xml) and Java code

The Demo

- File System Explorer providing a model of the file system, and views to browse the model
- No file viewers/editors are provided by the Explorer
- Several additional plug-ins to view/edit different kinds of files



Text Editor

HTML

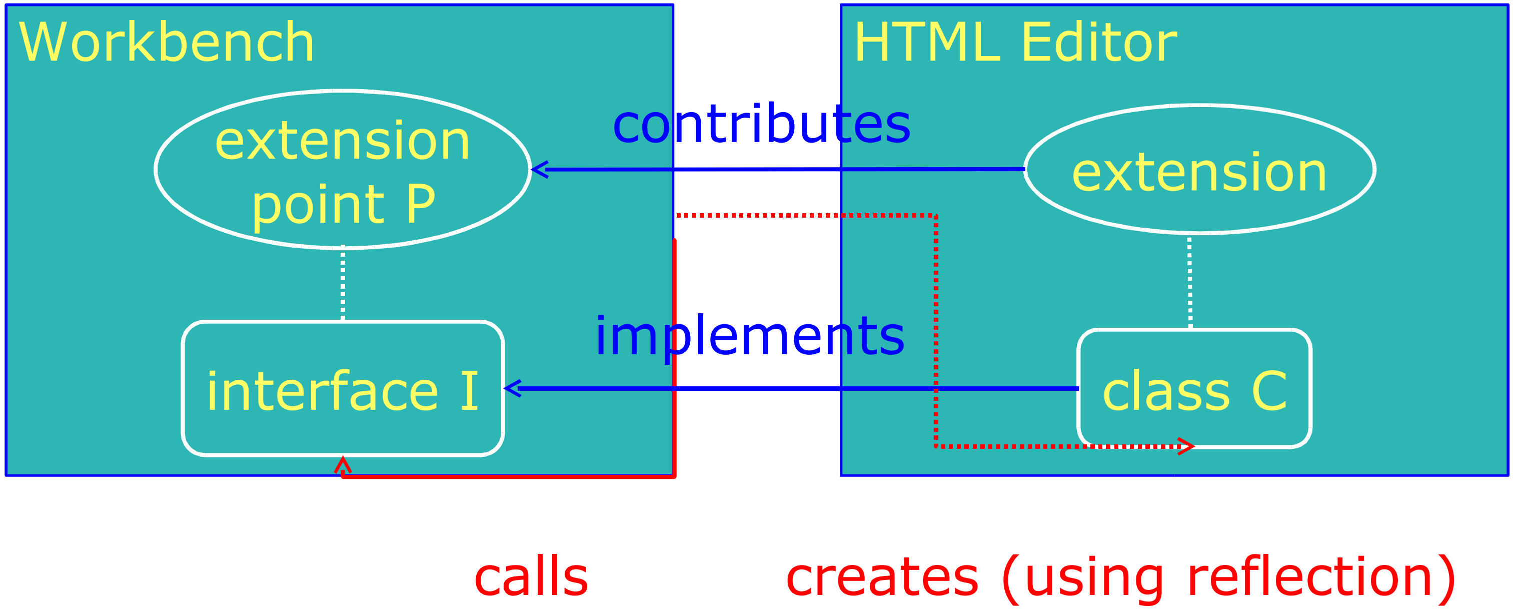
Word

…

File System Explorer

Rich Client Platform

Contributing an Extension



- Workbench
  - Declares extension point P (org.eclipse.ui.editors)
  - Declares interface I (IEditorPart) for P
- HTML-Editor
  - Implements interface I with its own class C (HTMLEditor)
  - Contributes class C to extension point P
- Workbench instantiates HTMLEditor and calls its methods via interface IEditorPart

Scalability

- The Workbench is highly scalable
- Leverages the extension point mechanism for progressive loading of code
- Supports dynamic plug-in addition
- Activities mechanism can be used for role-based “right-fitting” of UI
- Proven by successful products built on Eclipse:
  - WebSphere/Rational development tools
  - Lotus Workplace

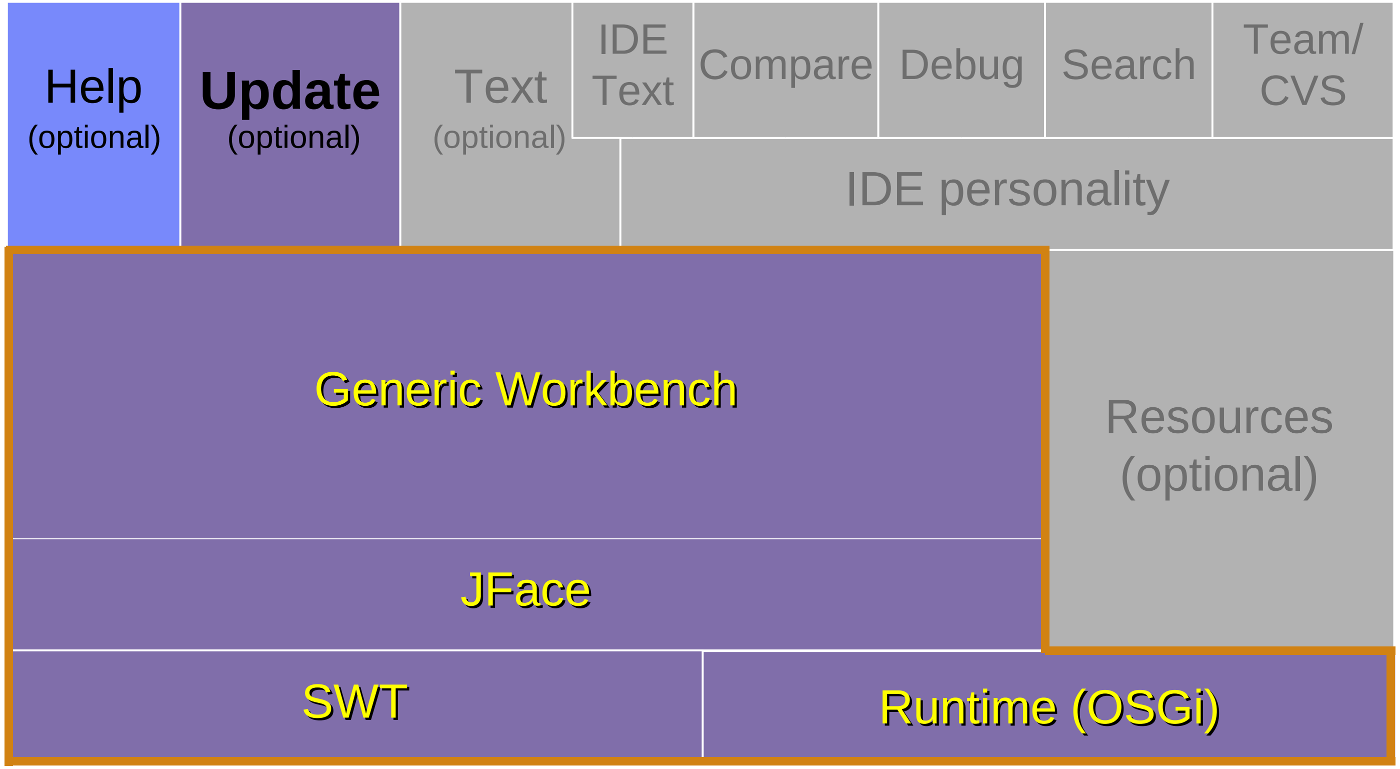
Optional RCP components

Component	Description
Help UI	Web-app-based Help UI
Update Manager	Discover and install new and updated versions of plugins
Text	Framework for high-function text editors
Forms	Forms-based control library
Welcome Page / Intro	Initial welcome experience and guided assistance
Cheat Sheets	Guides the user through a long-running, multi-step task such as a tutorial

Optional RCP components (cont'd)

Component	Description
Resources	Managed workspace with projects, folders, files, builders
Console, Outline, Properties views	Various extensible views
Graphical Editing Framework (GEF)	Includes Draw2D, a vector graphics framework
Eclipse Modeling Framework (EMF) and Service Data Objects (SDO)	EMF: Modeling framework and code generation facility based on a structured data model. SDO: Simplifies/unifies data application development in a service oriented architecture (SOA).

Managing Plug-ins: Install/Update



Help (optional)

Update (optional)

Text (optional)

IDE Text

Compare

Debug

Search

Team/ CVS

IDE personality

Generic Workbench

Resources (optional)

JFace

SWT

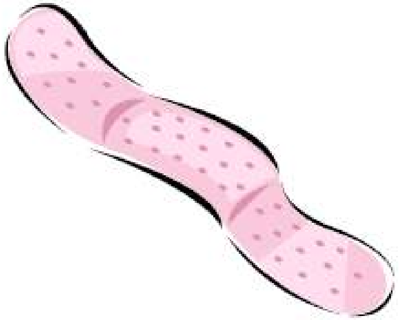
Runtime (OSGi)

Managing Plug-ins: Install/Update

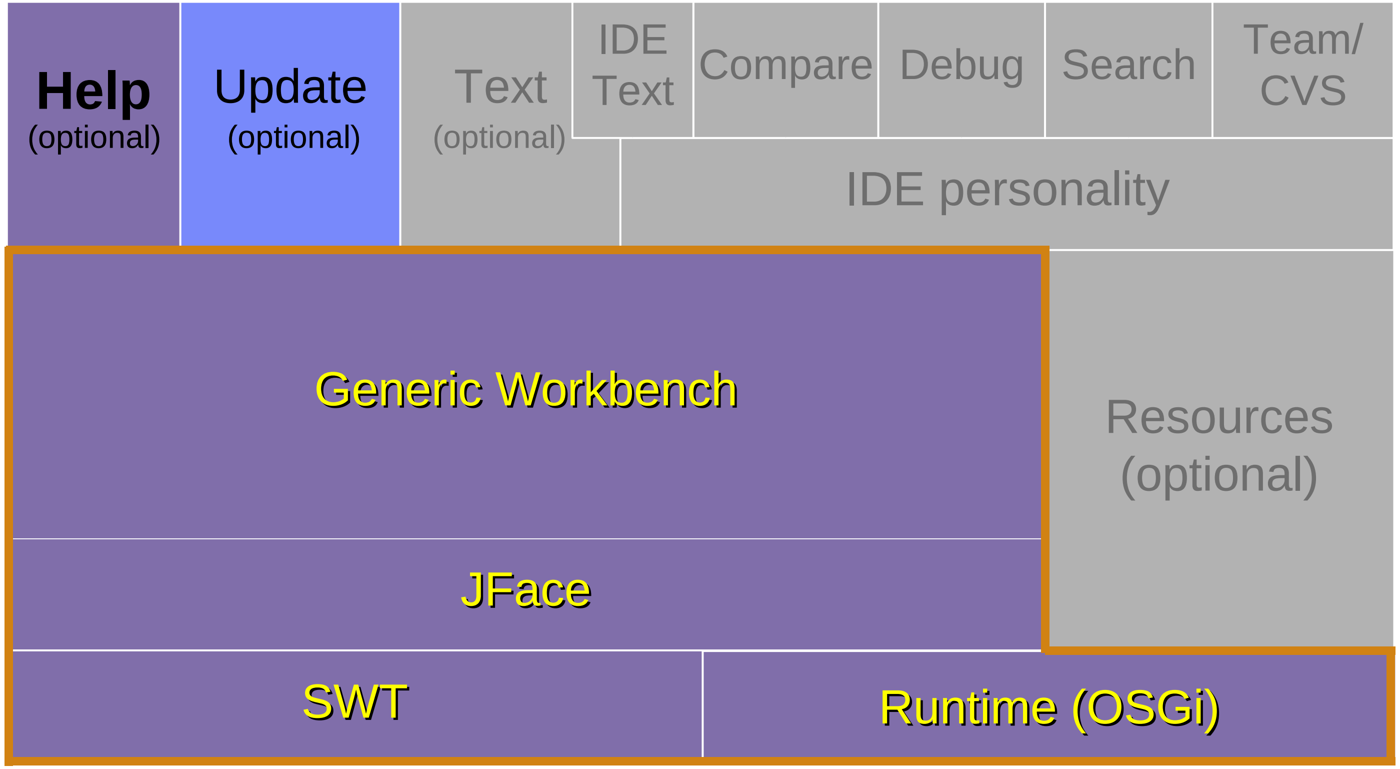
- **Features** group plug-ins into installable chunks
  - Feature manifest file
- Plug-ins and features bear version identifiers
  - major . minor . service
  - Multiple versions may co-exist on disk
- Features downloadable from URL addressable location
  - Using Eclipse Platform update manager
  - Obtain and install new plug-ins
  - Obtain and install patches & updates to existing plug-ins
- Support for update site mirroring & shared installations

Patches

- Updates require that features are replaced with those of the same ID but a higher version
- For large products, it is hard to ship ‘true’ updates every time an emergency fix is needed
- Patches live side-by-side features they patch – they just bring new versions of select plug-ins (3.0 behavior)
- Patches contain either whole plug-ins or only those files that have changed
- Eclipse run-time sorts things out – picks the newer (patched) plug-ins

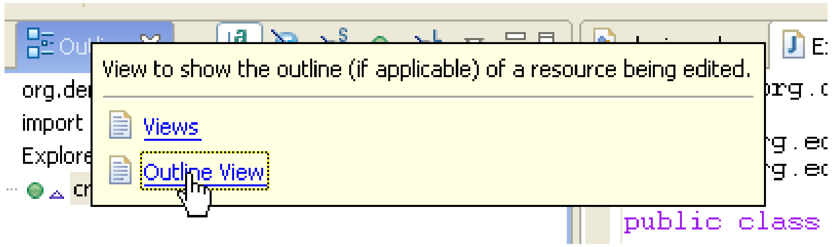


Help System

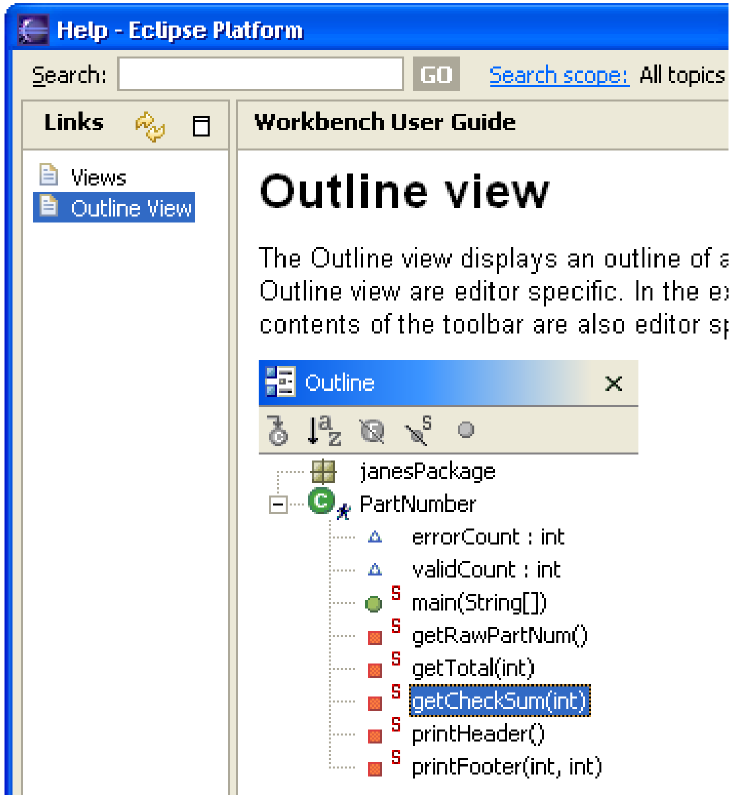

Help
(optional)
Update
(optional)
Text
(optional)
IDE
Text
Compare
Debug
Search
Team/
CVS
IDE personality
Generic Workbench
Resources
(optional)
JFace
SWT
Runtime (OSGi)

Help System

- Provides user help via F1 and Search
- Help files are written in HTML
- Content structure is defined in XML
- Help is presented in Web-Browser
- Highly scalable



View to show the outline (if applicable) of a resource being edited.



Outline view

The Outline view displays an outline of a Outline view are editor specific. In the e contents of the toolbar are also editor sp

Developing Plug-ins: PDE

- PDE = Plug-in development environment
- Extenders use PDE to implement plug-ins
- Specialized tools for developing Eclipse plug-ins
- Built atop Eclipse Platform and JDT
  - Implemented as Eclipse plug-ins
  - Using Eclipse Platform and JDT APIs and extension points
- Features
  - Specialized PDE editor for plug-in manifest files
  - Templates for new plug-ins
  - PDE runs and debugs another Eclipse application

Rich Client Platform Summary

- **Runtime**: Plug-in model and extension point architecture
- **OSGi**: Support for dynamic plug-ins
- **SWT**: Cross-platform native widget library, with tight OS integration
- **JFace**: UI framework to simplify common tasks
- **Workbench**: Highly scalable, managed UI
- Base RCP is relatively small: disk footprint is 5.5M
- Many optional components: Help UI, Update, Intro, Cheat Sheets, Forms, GEF, EMF, GEF, …
- Tool support provided by PDE
- Solid architecture, proven by successful products
- Lots of documentation, and very good community support
- Opportunities for use of, and/or participation in, other Eclipse technology

Where can I find out more ?

- RCP UI page:
  http:/www.eclipse.org/platform > UI > RCP Home Page

- Ed Burnette’s RCP tutorials

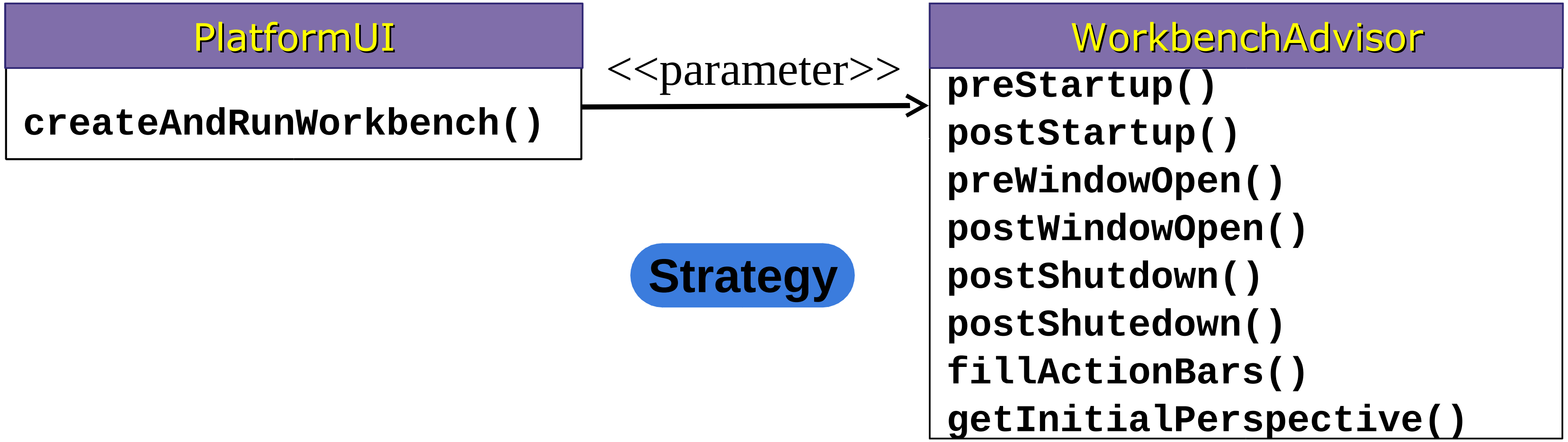
- Platform and RCP newsgroups:
  news://news.eclipse.org/eclipse.platform.rcp
  news://news.eclipse.org/eclipse.platform

- Gamma, Beck: Contributing to Eclipse – Principles, Patterns, and Plug-ins, Addison-Wesley, 2004
  www.awprofessional.com/series/eclipse

End of presentation. Code snippets follow.

Configuring the Workbench Window

- WorkbenchAdvisor
  - a *strategy* object to configure a workbench window
  - provides hook methods called at strategic points during the workbench life cycle
  - defines the initial perspective



PlatformUI

createAndRunWorkbench()

<<parameter>>

Strategy

WorkbenchAdvisor

preStartup()
postStartup()
preWindowOpen()
postWindowOpen()
postShutdown()
postShutedown()
fillActionBars()
getInitialPerspective()

A minimal WorkbenchWindow

```
class MinimalAdvisor extends WorkbenchAdvisor {

  public void preWindowOpen(IWorkbenchWindowConfigurer configurer) {
     super.preWindowOpen(configurer);
     configurer.setShowCoolBar(true);
}

  public void postWindowOpen(IWorkbenchWindowConfigurer configurer) {
     super.postWindowOpen(configurer);
     configurer.setTitle(“File Explorer");
  }

  public String getInitialWindowPerspectiveId() {
    return "org.demo.fileexplorer.workbench.explorerPerspective";
  }
}
```

Defining the Perspective Layout

- contribute a perspective factory
  - hide the editor area

```
<extension point="org.eclipse.ui.perspectives">
  <perspective name=“File Explorer“
     id="org.demo.fileexplorer.workbench.explorerPerspective"
     class="org.demo.fileexplorer.workbench.ExplorerPerspective“/>
  </perspective>
</extension>
```

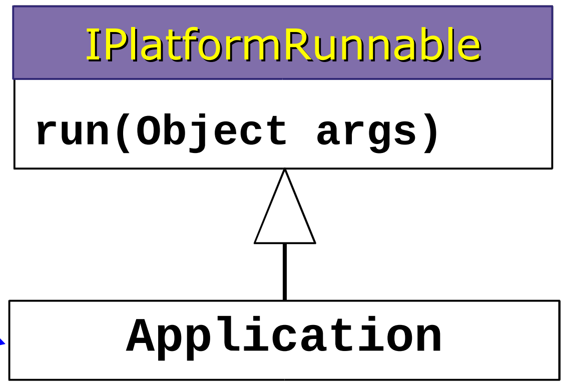
```
class ExplorerPerspective implements IPerspectiveFactory {
  public void createInitialLayout(IPageLayout layout) {
    String editorArea = layout.getEditorArea();
    layout.addView(ExplorerPlugin.DIRECTORY_VIEW,
     IPageLayout.TOP, 0.33f, editorArea);
    layout.addView(ExplorerPlugin.FILE_VIEW,
     IPageLayout.RIGHT, 0.5f, ExplorerPlugin.DIRECTORY_VIEW);
  }
}
```

Define an Eclipse Application

- We can run our contributions using the standard eclipse application
  - our contributions shows-up as part of the standard eclipse workbench
- define a custom entry point
  - *everything is a contribution*

  …even the entry point into the eclipse platform

```
<extension id="application"
  point="org.eclipse.core.runtime.applications">
  <application>
    <run class="....workbench.Application"/>
  </application>
</extension>
```



IPlatformRunnable

run(Object args)

Application

Launching the Application

- Run the workbench with the advisor

```
public class Application implements IPlatformRunnable {
  public Object run(Object args) throws Exception {
    WorkbenchAdvisor wa = new MinimalAdvisor();
    Display d= PlatformUI.createDisplay();
    int code= PlatformUI.createAndRunWorkbench(d, wa);
    return new Integer(code);
  }
}
```

- Launch the application with your contributed application

```
java -cp startup.jar org.eclipse.core.launcher.Main
     -application org.demo.fileexplorer.workbench.application
```