20. Eclipse and its Framework Extension Language

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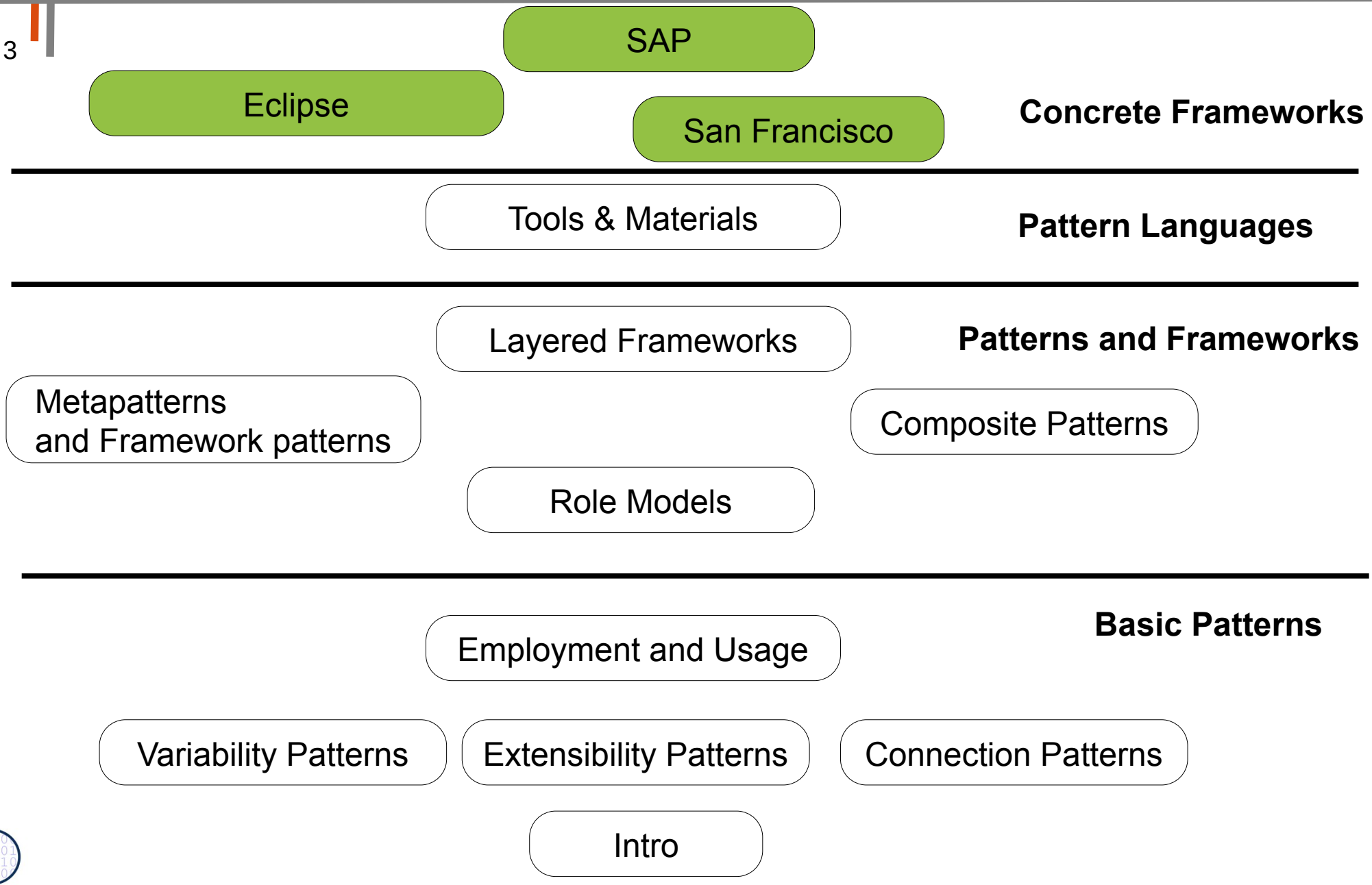
Version 13-0.1, 1/2/14

References

- Frank Gerhardt, Christian Wege. Neuer Reichtum – Eclipse als Basis für Rich-Client-Anwendungen. IX 7/2004, Heise-Verlag.
- Ed Burnett. RCP tutorial. http://www.eclipse.org/articles/Article-RCP-1/tutorial1.html
- S. Shavor, J. D'Anjou, S. Fairbrother, D. Kehn, J. Kellerman, P. MacCarthy. The Java Developer's Guide to Eclipse. Addison-Wesley, 2003

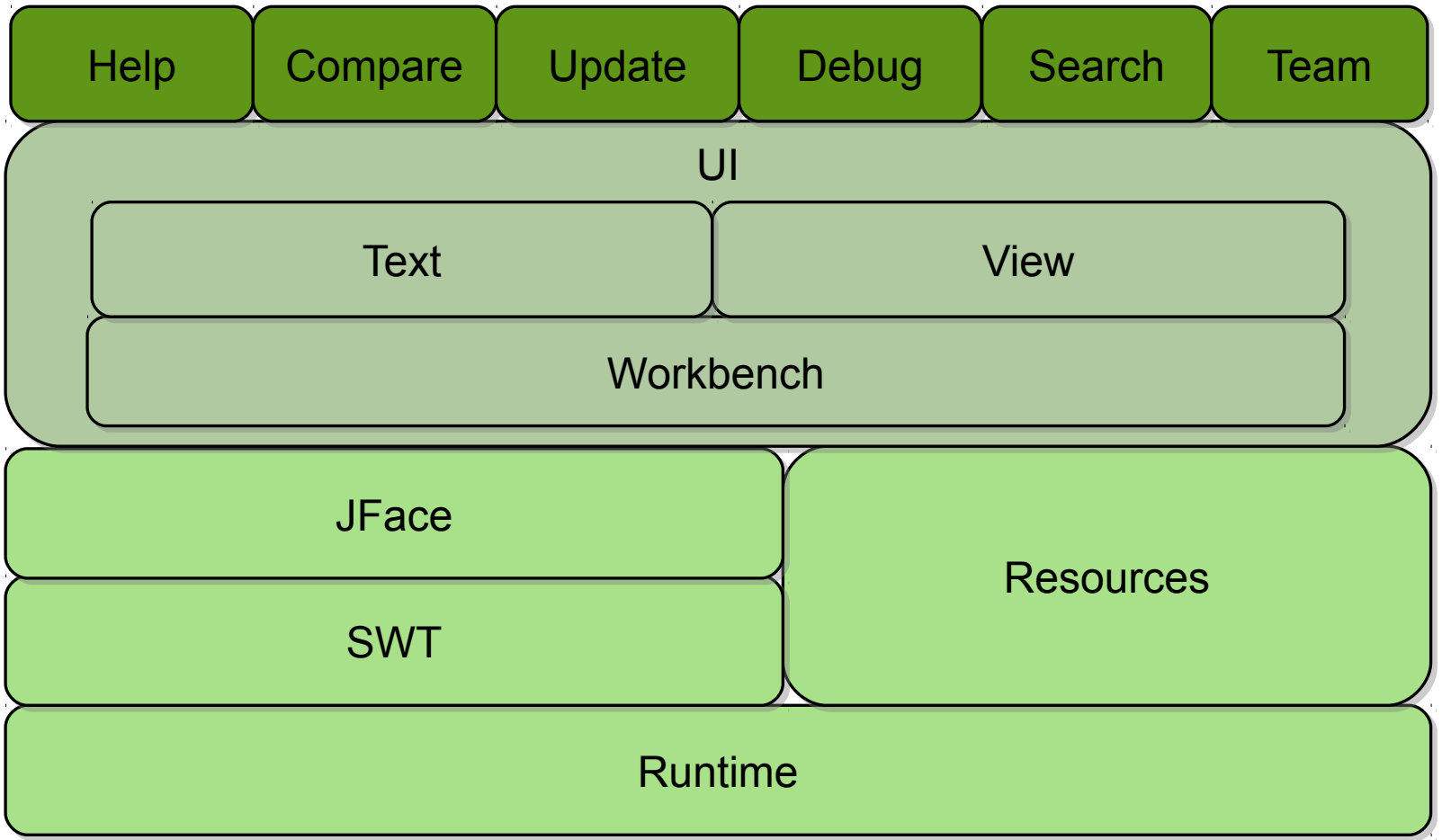
Overview of the Course



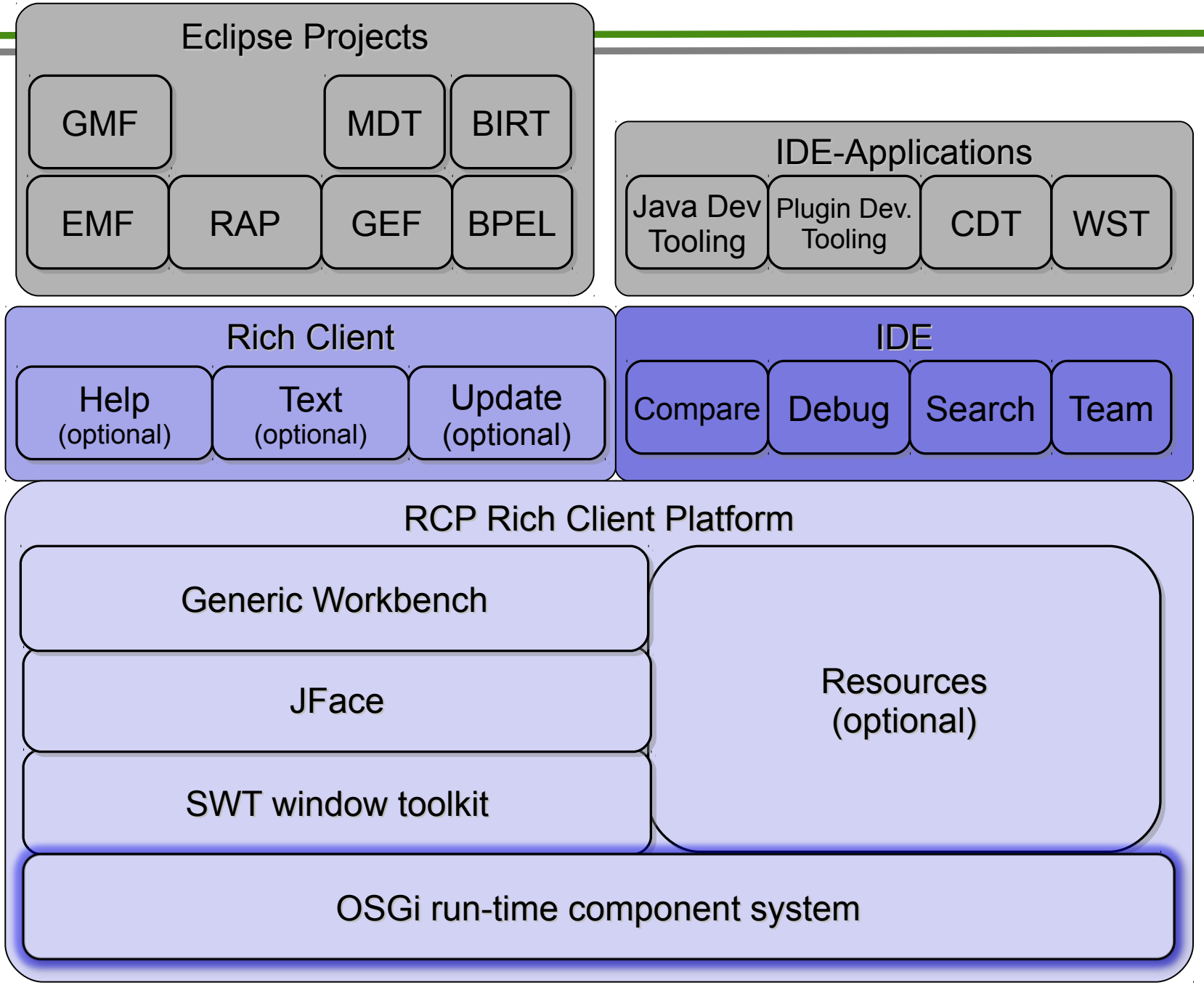
Eclipse Structure

- Eclipse is a set of frameworks for development of
  - IDE applications
  - IDE (not only for Java, but also for C, C++, C#, Scala, etc.)
  - GUI applications
  - Rich thin clients
  - Rich web clients
- To this end, it stacks several frameworks

Eclipse Framework 2.x

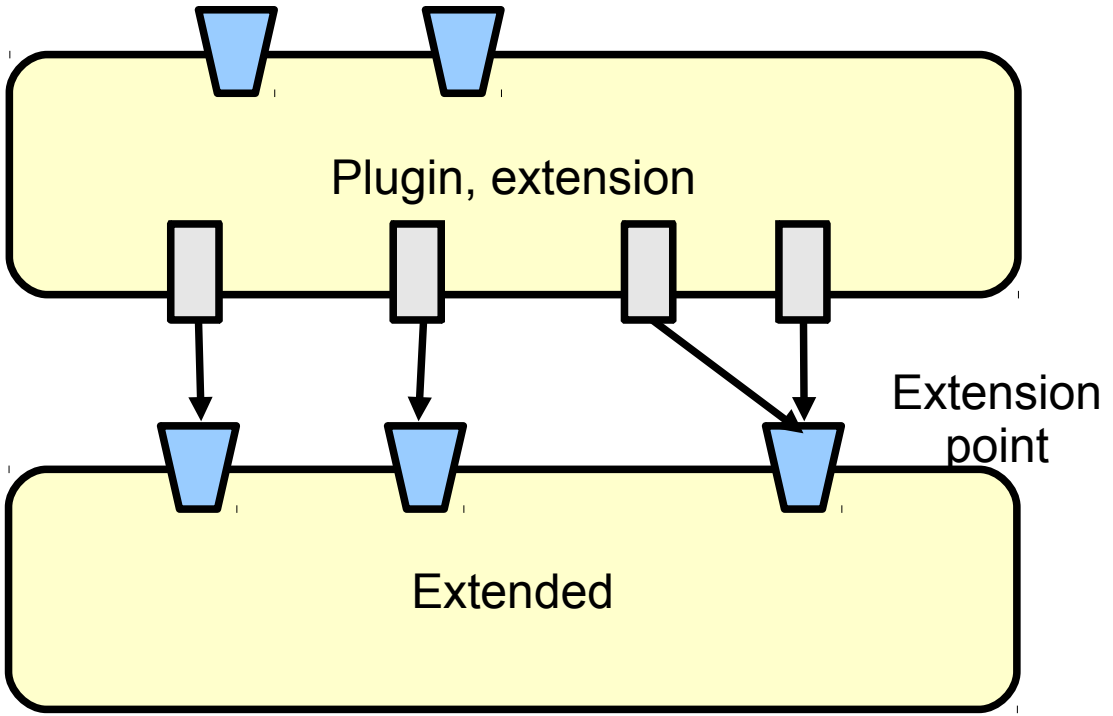


Eclipse Framework 3.x



Plugins and Extensions Points

- Eclipse frameworks carry framework extension hooks, *extension points*.
  - No variation points for variability
- An upper-level framework (or the rest of the application), which is fed into a lower-level framework, is called *plugin* or *extension*
- Extension points can be classes, menus, properties, class path entries, aso.



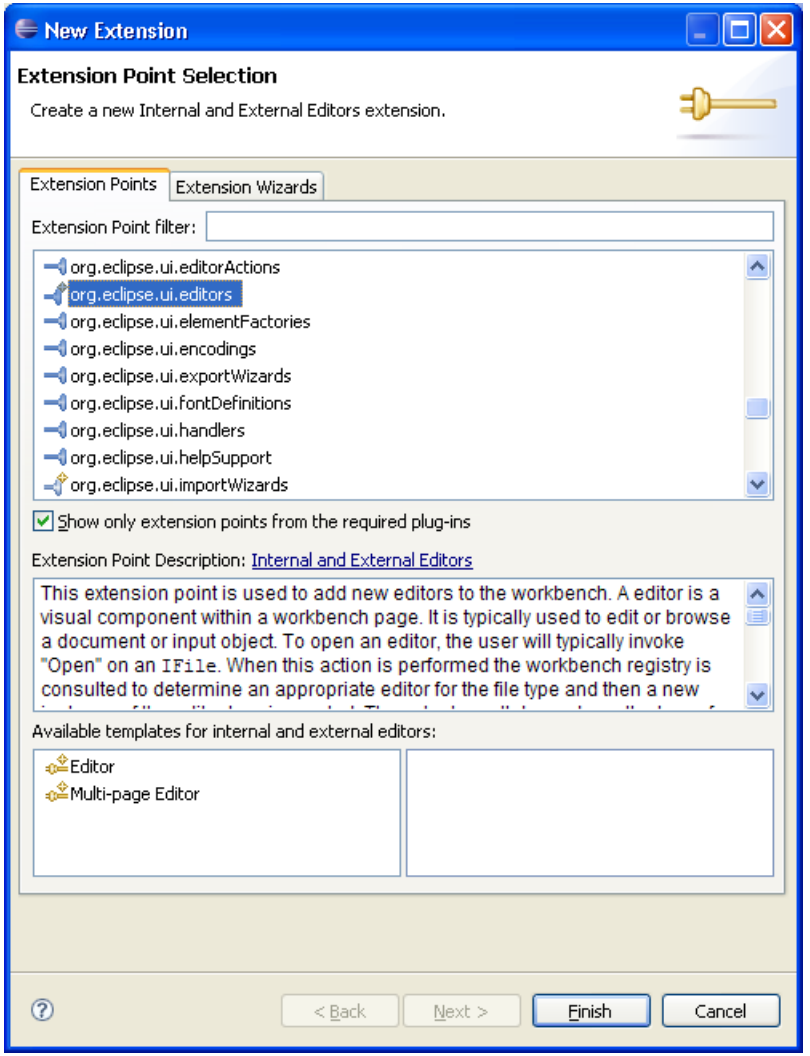
Plugins (Extensions)

- Are classes that are dynamically loaded from a special directory `eclipse/plugins`
- Every plugin is represented by a *plugin class*,
- Specifies a **manifest** file (runtime properties)
- And the plugin.xml (usage of extension points)

Manifest-Version: 1.0
Bundle-SymbolicName: org.eclipse.ui; *singleton:=true*
Bundle-Activator: org.eclipse.ui.internal.UIPlugin
Bundle-ManifestVersion: 2
Bundle-Version: 3.4.0.I20080610-1200
Require-Bundle: org.eclipse.core.runtime;*bundle-version="[3.2.0,4.0.0)"*,
org.eclipse.swt;*bundle-version="[3.3.0,4.0.0)";visibility:=reexport*,
org.eclipse.jface;*bundle-version="[3.4.0,4.0.0)";visibility:=reexpor*t,
org.eclipse.ui.workbench;*bundle-version="[3.4.0,4.0.0)";visibility:*=reexport,
org.eclipse.core.expressions;*bundle-version="[3.4.0,4.0.0)"*
Bundle-Name: %Plugin.name
Bundle-Localization: plugin
Bundle-ClassPath: .
Bundle-ActivationPolicy: lazy
Export-Package: org.eclipse.ui.internal;*x-internal:=true*

Some Extension Points

- Actions
  - Menu bar, toolbar to views and editors
  - Menu choices
  - Object context menu
- Creation wizard for File->New
- Preference page to Window ->Preferences
- Views for Window->ShowView
- Perspectives for Window ->OpenPerspectives
- Help manual for Help ->HelpContents



Using Extension Points and Extensions in plugin.xml


```
<?xml version="1.0" encoding="UTF-8"?>
<?eclipse version="3.2"?>
<plugin>
      <extension-point id="org.tud.ospp.ProcessState" name="ProcessState"
            schema="schema/org.tud.ospp.ProcessState.exsd"/>
      <extension
            point="org.eclipse.ui.perspectives">
         <perspective
               name="Modeller Perspective"
               class="org.tud.ospp.graph.ModellerPerspective"
               id="ospp.modeller">
         </perspective>
      </extension>
      <extension
            point="org.eclipse.ui.views">
         <view
            allowMultiple="false"
               icon="icons/repo1.png"
               name="Proccess Repository View"
               class="org.tud.ospp.graph.view.RepositoryView"
               id="ospp.repository">
         </view>
      </extension>
</plugin>
```

Declare a new ExtensionPoint

Register a perspective

Register a view

The Plugin Class

- Represents the plugin
- Extends class `Plugin` or `AbstractUIPlugin`
- Has functions to handle directories for persistent state and intermediate data
- Handles input streams, treats plugin preferences

```
public class LocalityPlugin extends AbstractUIPlugin
{
    /**
     * This method is called upon plug-in activation
     */
    public void start(BundleContext context) throws Exception
    {
        super.start(context);
    }

    /**
     * This method is called when the plug-in is stopped
     */
    public void stop(BundleContext context) throws Exception
    {
        super.stop(context);
    }
}
```

Extension Points are Ubiquitous

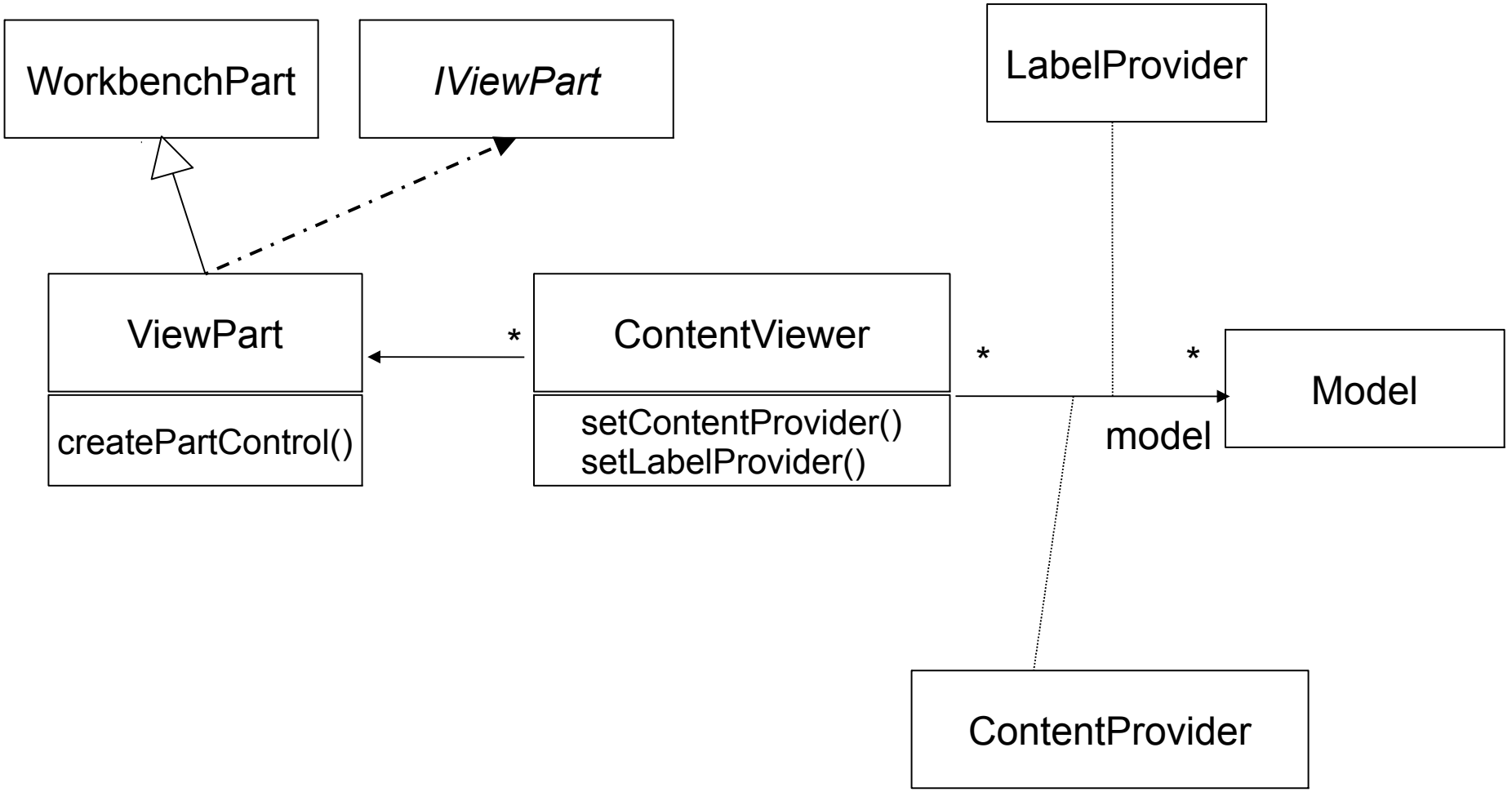
- Eclipse generalizes the hook concept from framework hooks to extension points of
  - Resources
  - Pages for page tabs
  - Menu entries and their underlying commands, e.g., creation wizards
  - Views
  - Editors
  - Perspectives
  - Help
- i.e., to other conceptual entities of the Eclipse RCP

To make a good application GUI framework, hooks need to be defined on all tools, materials, and environments of the framework

The Generic Workbench (part of the RCP)

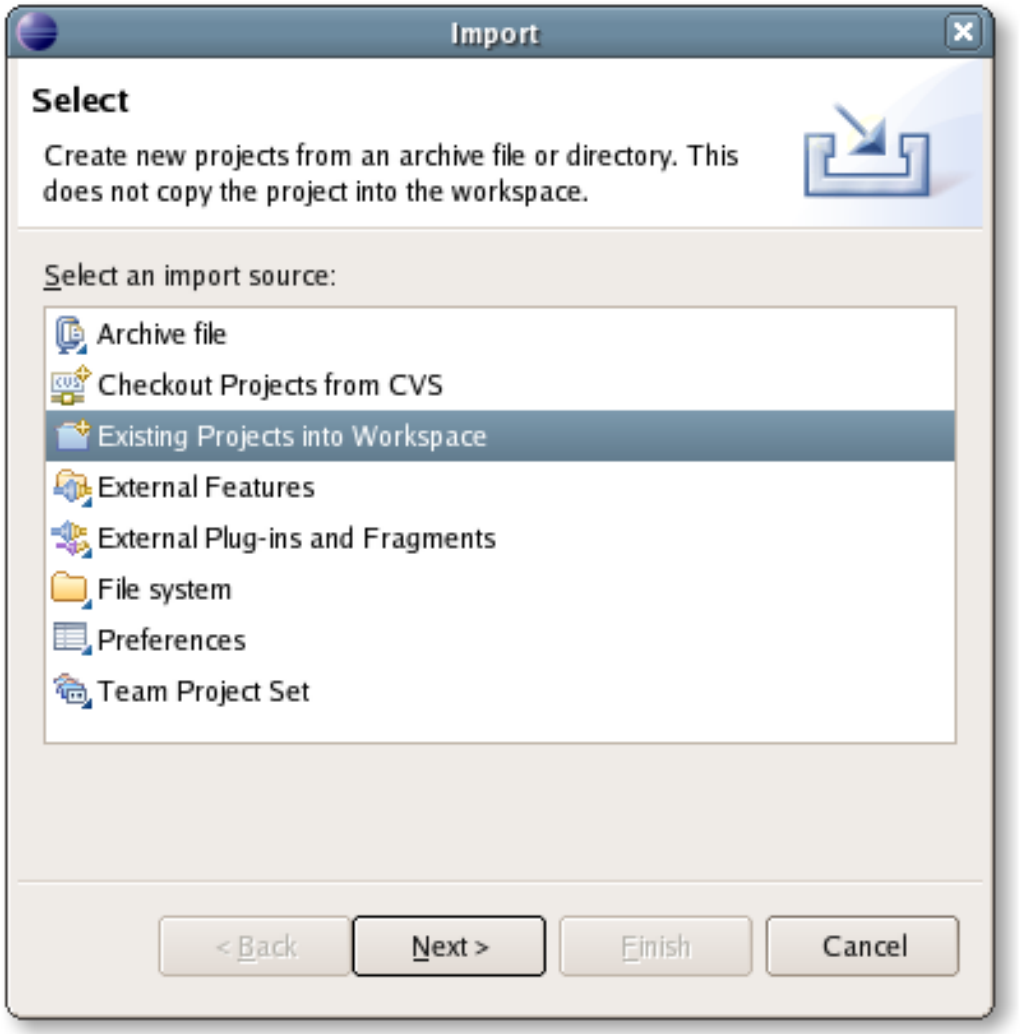
- The Generic Workbench structures and organizes the GUI of an RCP application
  - File, Edit, Resources, Run, Navigate, Help menu entries
  - Uses one or several Perspectives with Editors and Views
- **Perspective**: A collection of editors and views, bundled together in a specific GUI configuration
- **Editors**: tool to edit an artifact
- **View**: view onto an artifact
  - Outline views
  - Structural views
  - Property views
  - Graphic views
- The **workbench** can be extended on all three levels (new perspectives, new editors, new views)

Views Use Viewers to Display Models



JFace Predefined Viewers

- JFace on top of SWT
- Predefined Dialogs, Actions, Wizards and Viewer:
  - TableViewer
  - TextViewer
  - TreeViewer
  - **ListViewer**
  - PropertySheetViewer
  - CheckboxTreeViewer
  - …



The Plugin Development Environment PDE

- PDE has a *registry* for plugins
  - Different views and editors for plugins (e.g., Tree-based view)
- PDE New Extension wizard for creating extensions
  - Template-controlled wizards
  - User-written wizards
- The Extension Wizard selects a project code generation wizard
  - A wizard generating the initial plugin code
  - Creating a standalone version of the RCP application, without the development environment (if the application should run standalone)

Eclipse Relies onLanguage-Controlled Framework Extension

- Framework extension points (framework hooks) are ***interpreted*** in Eclipse.
  - Instead of specifying them as a framework hook pattern, the core interpreter interprets XML files to know how to extend extension points
  - Hence, Eclipse has a little domain-specific language (DSL) for extension points and bindings of them (language-controlled extension)
- This goes beyond the framework hook patterns, because they only use polymorphism and design patterns.

Eclipse' main feature is an *extension language interpreter.*

The Future of Eclipse

Eclipse will stay, because it has the first
framework extension language

- There might be a market for about 3-5 framework extension languages, in which the product families of the world will be made
- *Can you define other framework extension languages?*

The Nature of Framework Hooks

Framework hook patterns provide a very simple framework extension language.

- The framework hook patterns can all be written down in logic (see exercises).
- Hence, they provide a little constraint language for variability and extensibility of frameworks.
- Variability and Extensibility are distinguished by
  - 1 or n multiplicity constraint (see description logic)
  - Object recursion or non-recursion (recursive logic or non-recursive)

The End

- www.eclipse.org