

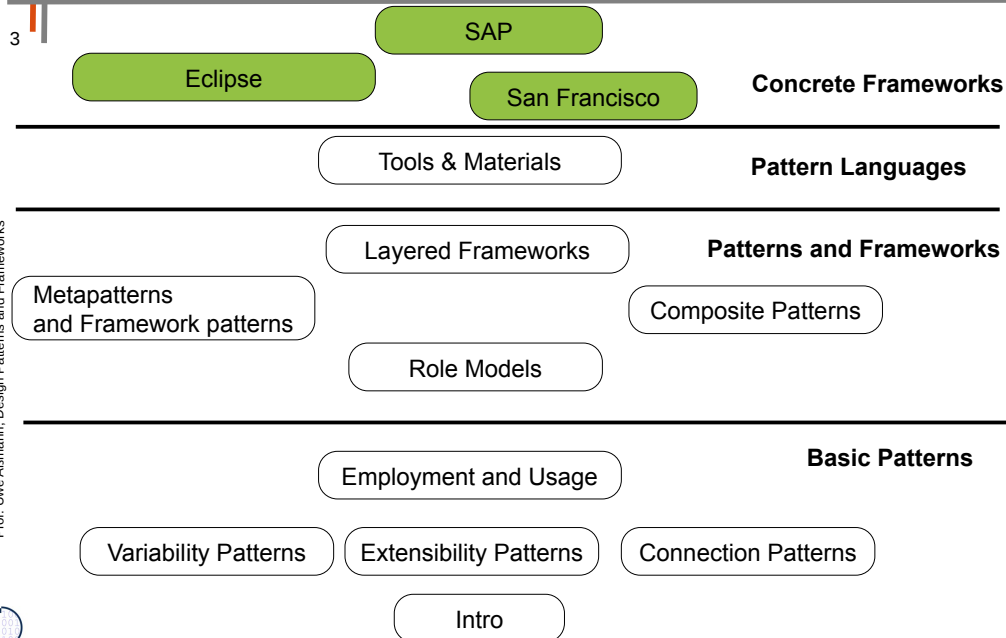
20. Eclipse and its Framework Extension Language

1 Prof. Uwe Aßmann
TU Dresden
Institut für Software- und
Multimediatechnik
Lehrstuhl
Softwaretechnologie
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Overview of the Course



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References

- 2
- ▶ 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. McCarthy. The Java Developer's Guide to Eclipse. Addison-Wesley, 2003

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Eclipse Structure

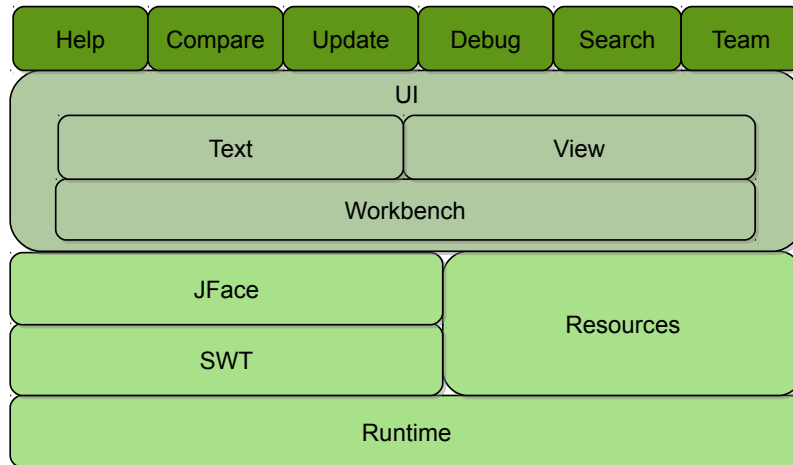
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- ▶ Eclipse is a set of frameworks for development of
 - IDE applications
 - IDE (not only for Java, but also for C, C++, C#, Scala, etc.)
 - GUI applications
 - Rich thin clients
 - Rich web clients
 - ▶ To this end, it stacks several frameworks

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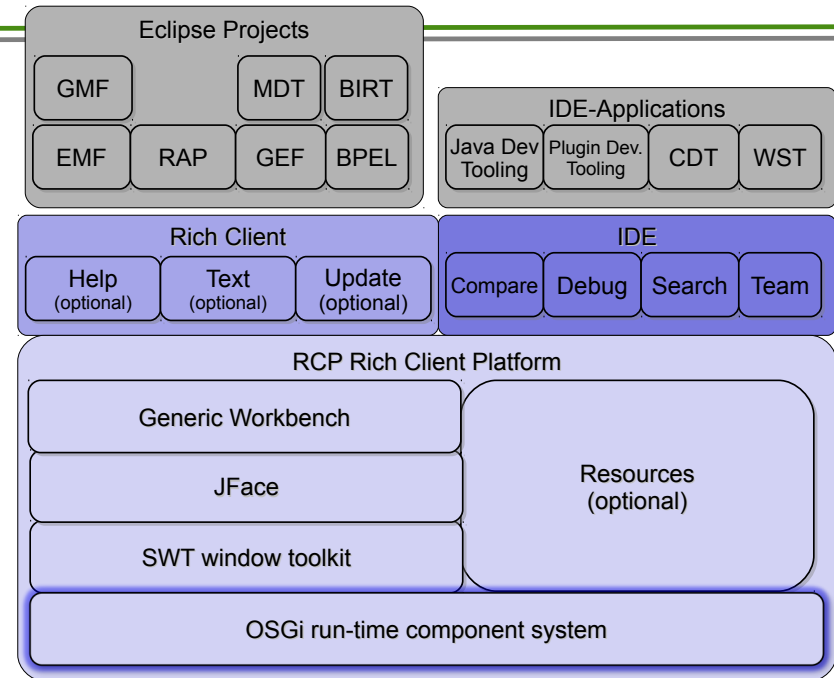
Eclipse Framework 2.x

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Eclipse Framework 3.x

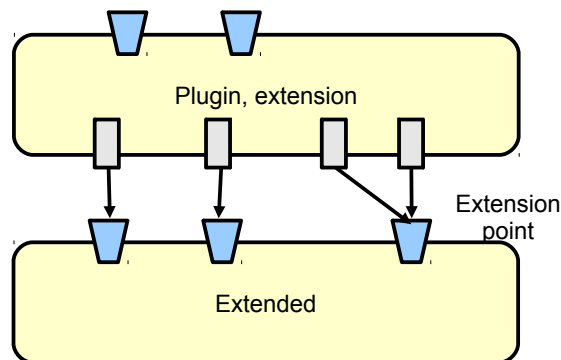
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Plugins and Extensions Points

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- ▶ 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)

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- ▶ 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)

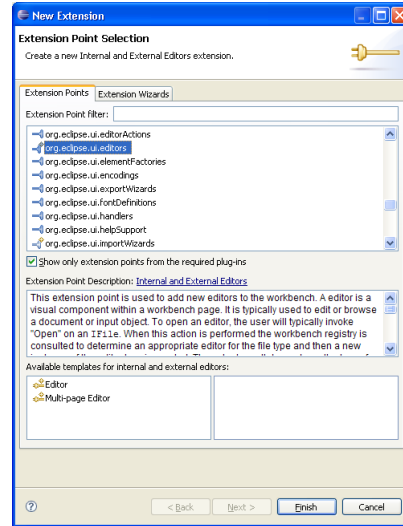
```

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=reexport,
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="Process 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

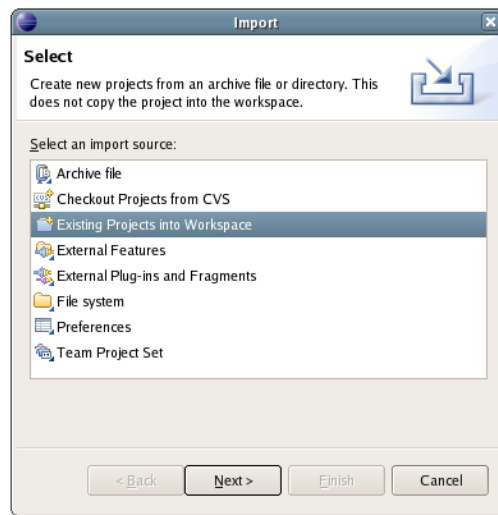
The Generic Workbench (part of the RCP)

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- ▶ 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)

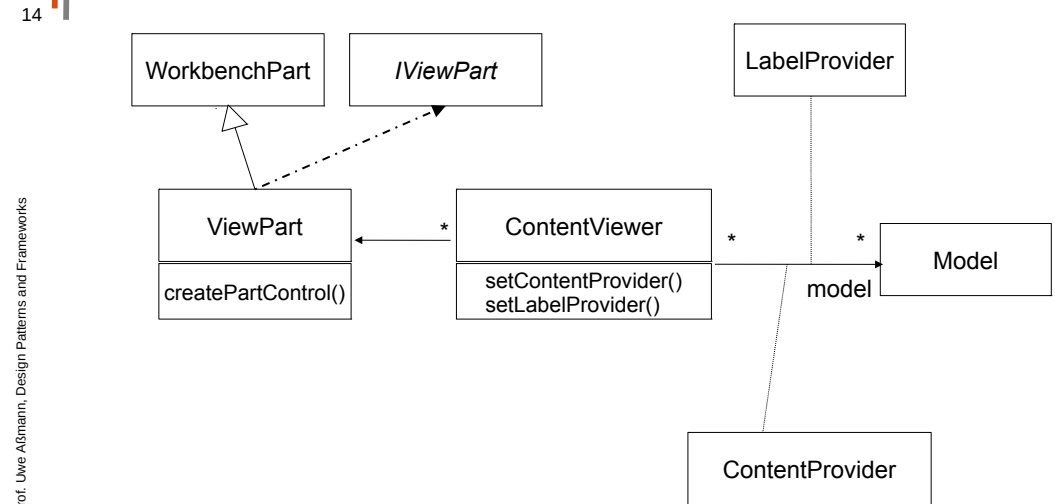


JFace Predefined Viewers

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- ▶ JFace on top of SWT
 - ▶ Predefined Dialogs, Actions, Wizards and Viewer:
 - ▶ TableView
 - ▶ TextView
 - ▶ TreeView
 - ▶ **ListViewer**
 - ▶ PropertySheetViewer
 - ▶ CheckboxTreeView
 - ▶ ...



Views Use Viewers to Display Models



The Plugin Development Environment PDE

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- ▶ 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 on Language-Controlled Framework Extension

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- ▶ 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

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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

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- 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

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- ▶ www.eclipse.org