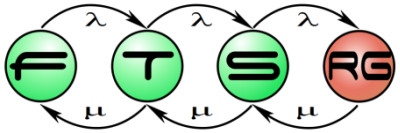
High Level GUI Programming

Eclipse Based Technologies

http://inf.mit.bme.hu/edu/courses/eat



SWT and JFace

- SWT
  - Native, low level widget kit
  - Controllable behaviour
  - Lot of coding required
- JFace
  - High level components (based on SWT)
  - More automatic
  - Structured data
  - Easier reuse
  - Sometimes does not work as needed

JFace Viewers

Displaying Structured Data

JFace Viewers

- Common handling for structured widgets
  - SWT Table, Tree és List
- Approach
  - Different widgets
  - Same processing methods
    - Data connection
    - Filtering, ordering
    - Editing

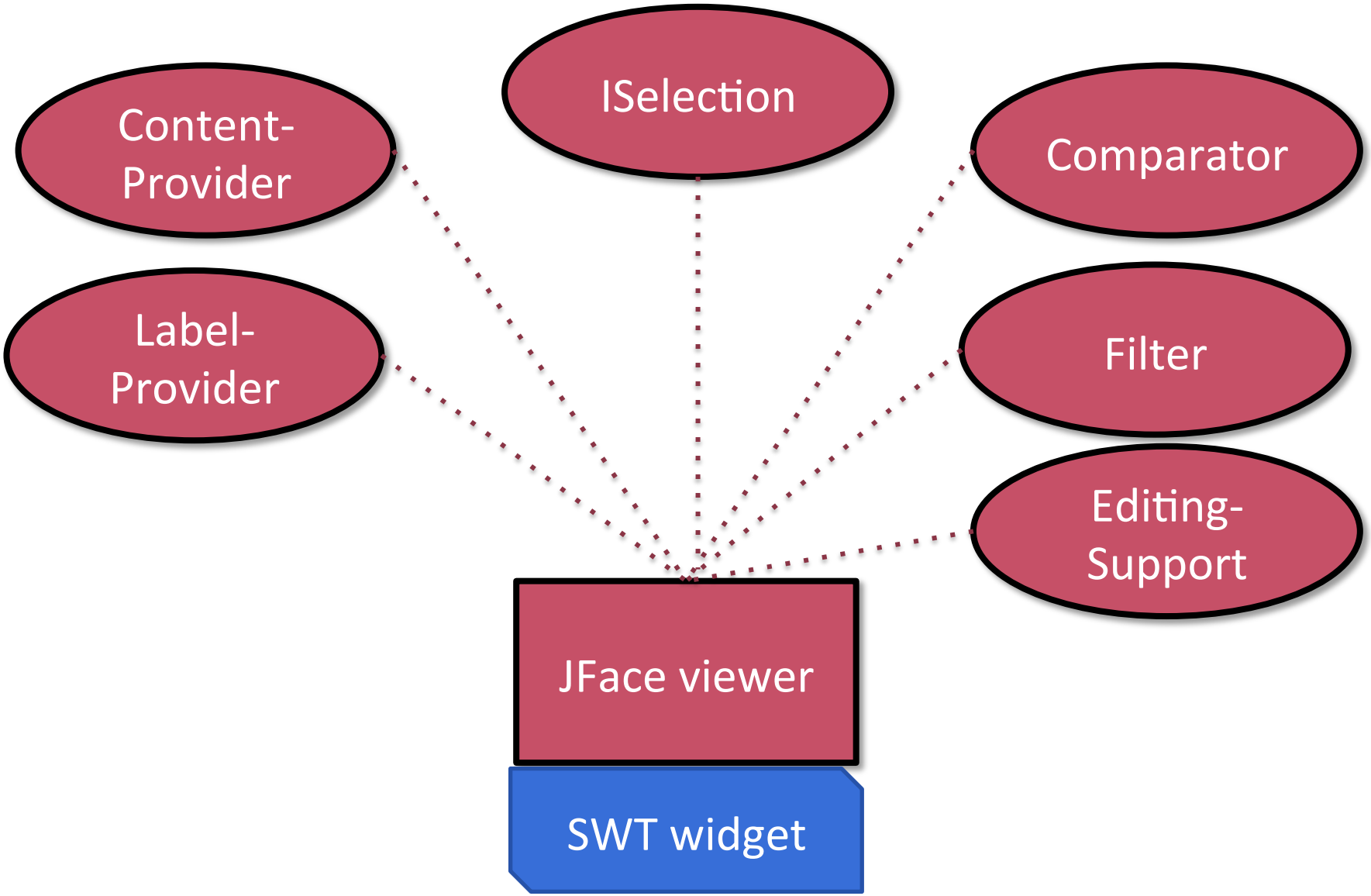
Important!

Eclipse Views and JFace Viewers are different!

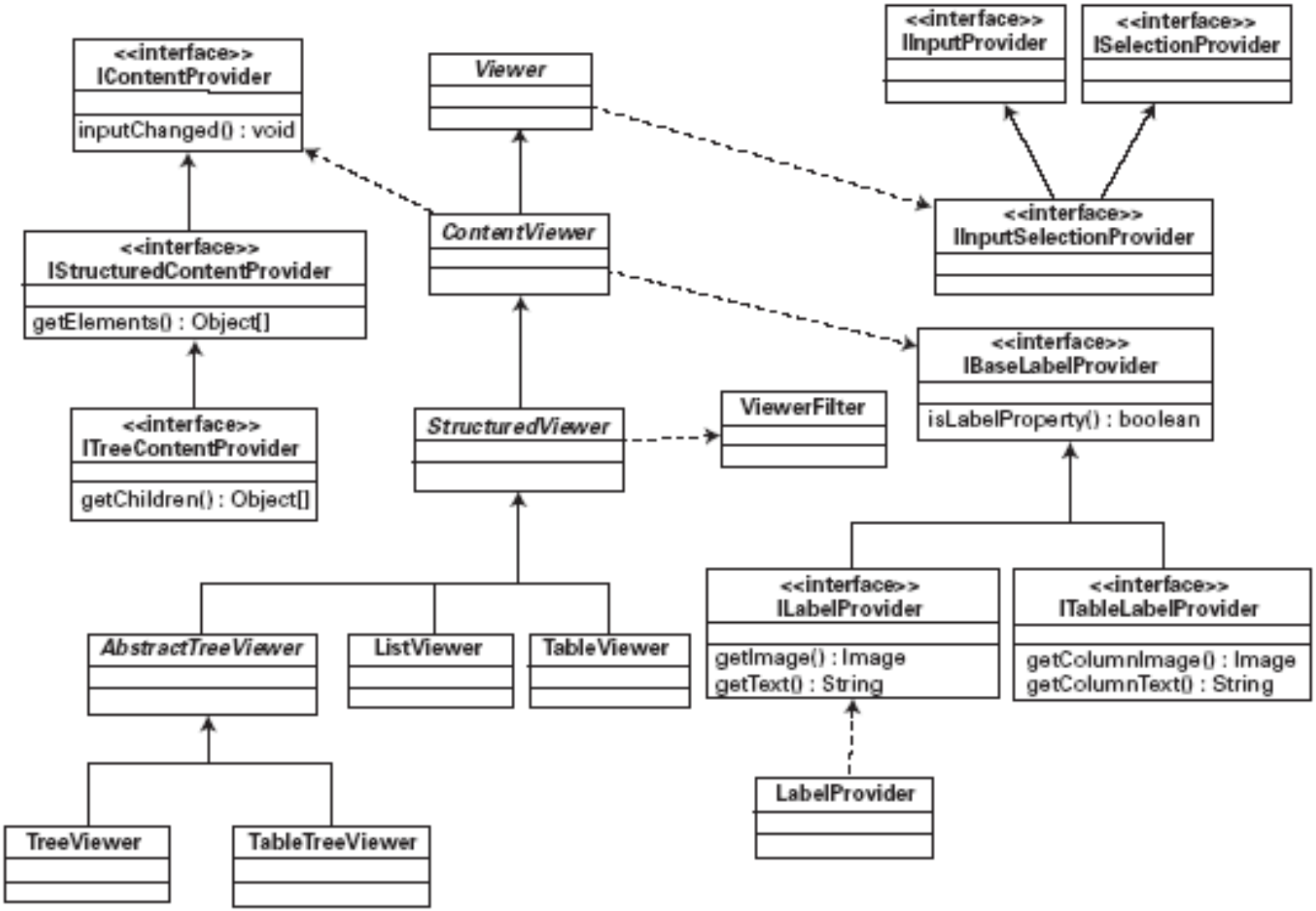
JFace Viewers

- MVC pattern
  - Model:
    - Any kind of model works
    - Binding to viewer: ContentProvider, LabelProvider
  - View:
    - Uses selected SWT widget
    - Filtering, ordering
    - Selection handling
  - Controller:
    - Event listeners
    - Editing support
    - …

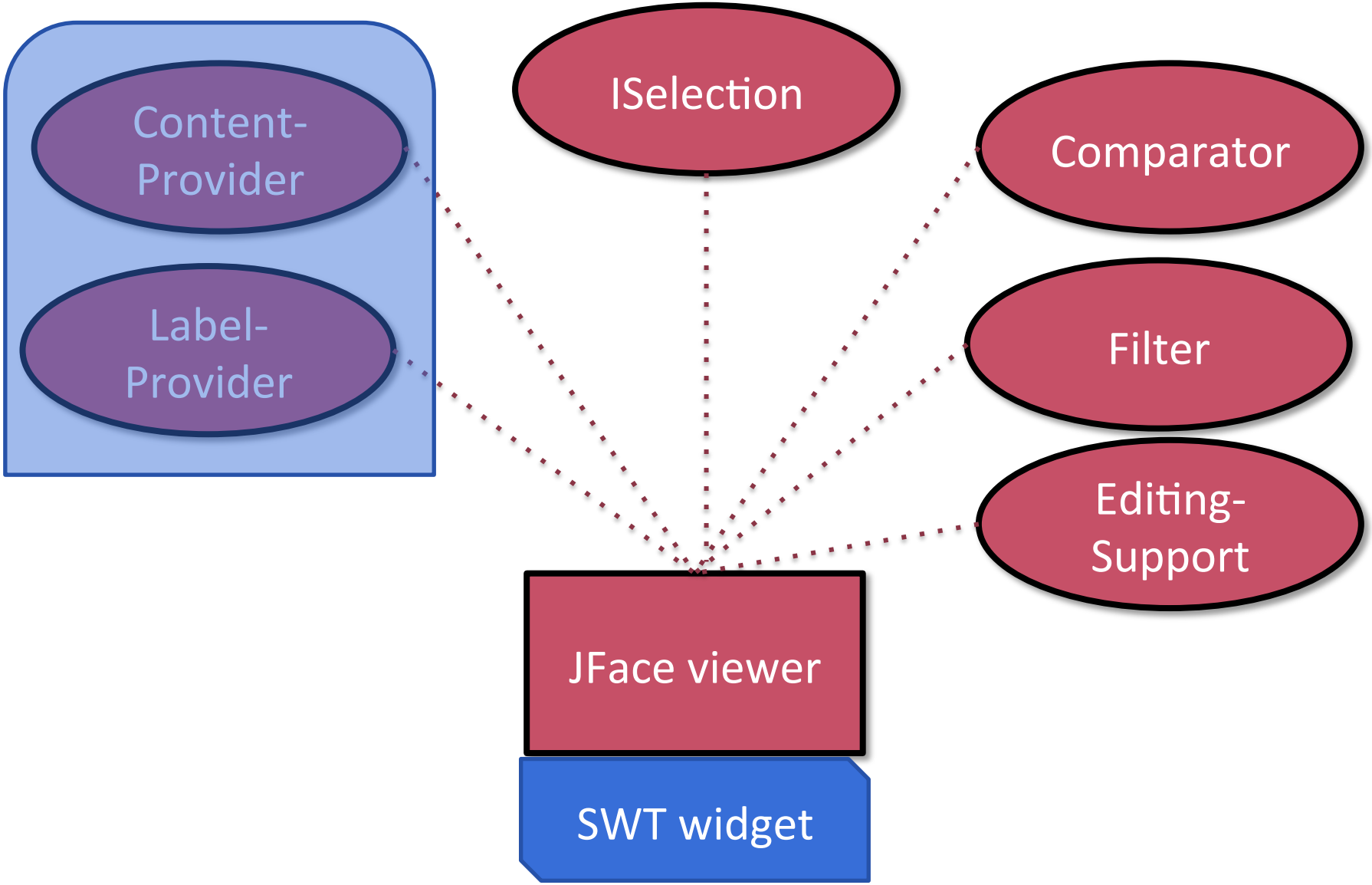
JFace Viewers - Keywords



JFace Viewers – Class Hierarchy



JFace Viewers - Keywords



Providing data

- Three steps
  1. **Content provider** selection
     - Collects used items in an array
  2. **Label provider** selection
     - Calculates label for individual items
  3. Providing **input**
     - An object through the entire model can be accessed
     - E.g. model root, database connection object, array, etc.

Content Provider

- `#inputChanged(Viewer, Object, Object)`
  - Notification that the input is changed
    - input can be saved here
    - getElements() will be called later
    - Never call directly, use viewer.setInput(Object)
- `#getElements()`
  - Returns an array of items
  - Only called after #inputChanged was executed

Label Provider

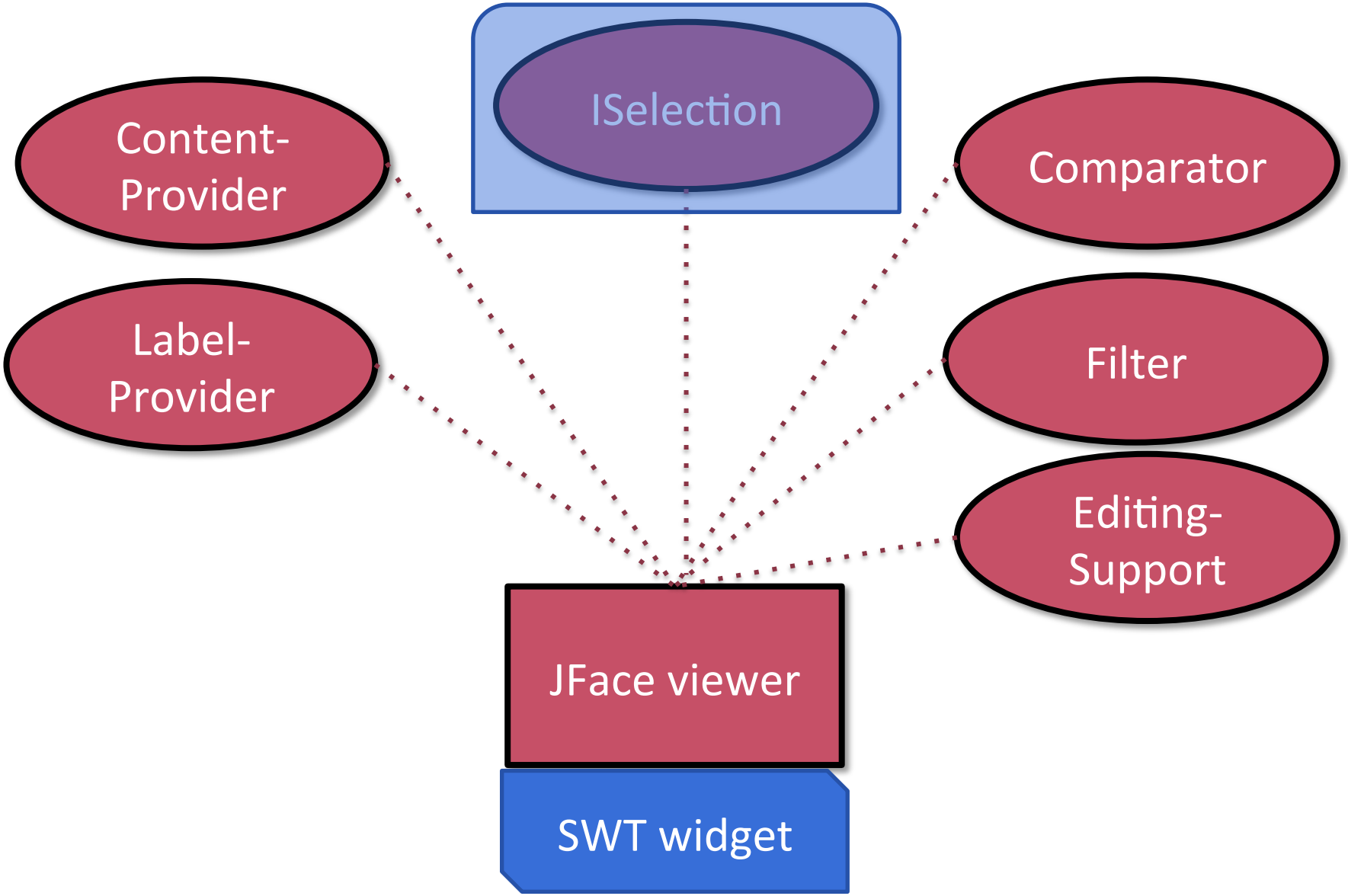
- Assigns labels and icons
  - `#getText()`
  - `#getImage()`
  - `#isLabelProperty()`
    - Has the label changed because of a property change?
- Default implementation
  - For label it uses `toString()`
  - Does not return any icon

In runtime

	Viewer	Content provider	Label provider
1.	setInput		
2.		inputChanged	
3.		getElements	
4.			getLabel
5.			getImage

- Step 3
  - May happen in several steps, e.g. lazy loading
- Step 4-5:
  - Called for each item

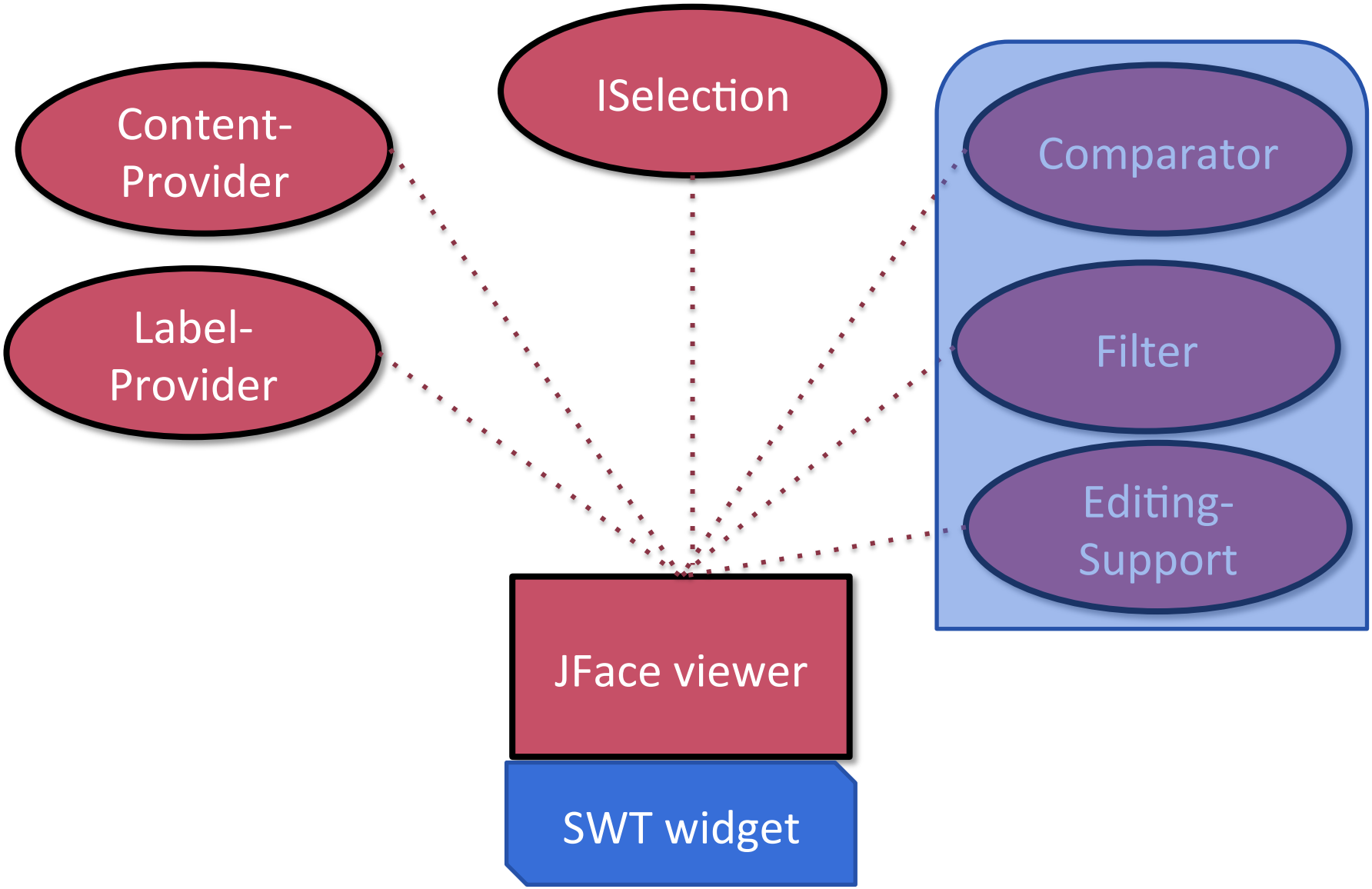
JFace Viewers - Keywords



Selection support

- getSelection()
  - ISelection
    - Generic selection marker
    - Cannot be used directly
  - IStructuredSelection
    - A selection of some items
    - Use an Iterator to traverse items
  - ITreeSelection
    - IStructuredSelection descendant
    - Describes hierarchy

JFace Viewers - Keywords



Ordering

- Define ordering
  - ViewerComparator interface
  - Compares any two instances
    - Must be fast!
  - Uses quick sort
    - Fast enough, but hard to debug

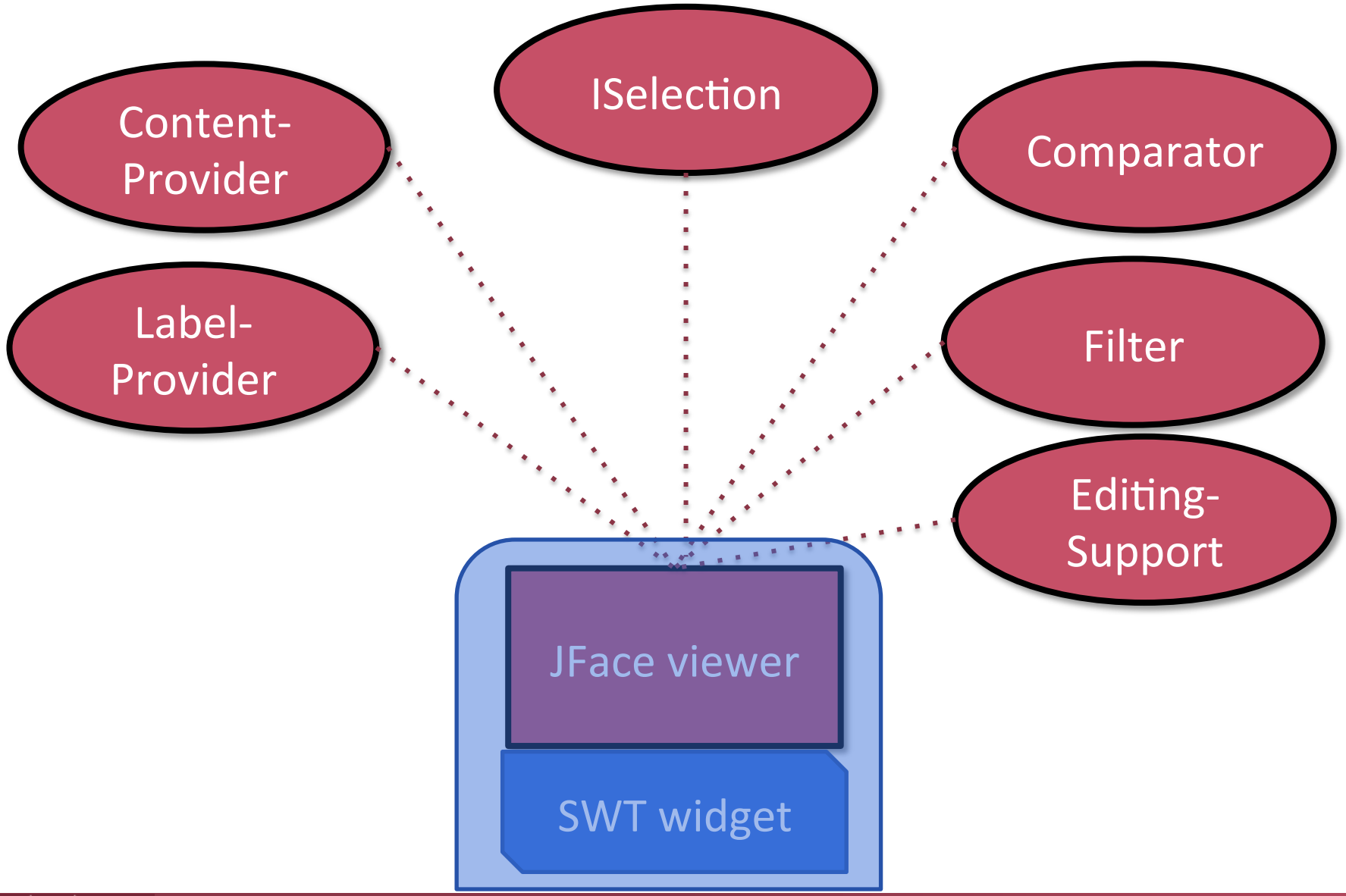
Filtering

- Filter interface
  - Decides for each item whether it should be visible
    - Must be fast
  - Possible to set up multiple filters
- Where to filter content?
  - Content provider:
    - Better performance
  - As filter
    - More versatile
    - Can be turned on/off during runtime

Editing Support

- Viewer editing
  - Temporary editing widget on top of the viewer
- Editingsupport component
  - Not all Viewers support it
  - Read API ☺

JFace Viewers - Keywords



ListViewer

- Displays a list of items
- Uses IStructuredContentProvider
  - getElements()
    - Only returns the items of the list
- Every feature available
  - Sorter
  - Filter
  - Label Provider

TreeViewer

- Display items in a tree structure
- Uses ITreeContentProvider
  - Returns the elements to display
  - Additional methods for tree structure
    - getChildren()
      - Returns the children of an item
    - hasChildren()
      - Returns whether an item has children
      - If slow to calculate, always return true
    - getParent()
      - Return parent
      - Required for lazy trees!

TableViewer

- To manage tables
  - Each row is an item
- TableLayout – adjusting table columns
  - addColumnData()
- ITableLabelProvider
  - To display content in a cell (row/column pair)

Táblázatok szerkesztése

- CellEditor
  - ICellModifier
    - getValue()
      - Load default value from editor
    - canModify()
      - Decide whether value is editable
    - modify()
      - Writes back the new value
  - CellEditor
    - Built-in: Checkbox, Combo box, pop-up dialog, text
    - Custom celleditor possible

TableViewer problems

- Column identifier: index
- One cell editor per column
  - Row-dependant cell editor is problematic
    - E.g. drop-down list with row-specific content
- Many manual, error-prone code needed

- Since Eclipse 3.3 new API
  - TableViewerColumn

TableViewerColumn

- Defines a column in the table
- Own LabelProvider
  - Use ColumnLabelProvider base class
- Custom editing support

EditingSupport

- Helper class for editing
- canEdit(Object element)
  - Can we edit the selected cell
- getCellEditor(Object element)
  - Returns the cell editor
- setValue(Object element, Object value)
  - Sets the modified value in the model
- getValue(Object element)
  - Returns the value from the model
  - The Cell editor needs to understand the return value!

EditingSupport example

```
protected abstract class AbstractEditingSupport
  extends
    EditingSupport {

  private TextCellEditor editor;

  public AbstractEditingSupport(TableViewer viewer)
  {
    super(viewer);
    editor = new TextCellEditor(viewer.getTable());
  }

  protected boolean canEdit(Object element) {
    return true;
  }
```

…

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Textual cell editor definition

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  }
…
```

Setting modifiability

EditingSupport example – 2.

```
…
  protected CellEditor getCellEditor(Object element) {
    return editor;
  }

  protected void setValue(Object element, Object value)
  {
    ((Person) element).email = value.toString();
    getViewer().update(element, null);
  }

  protected Object getValue(Object element) {
    return ((Person) element).email;
  }

}
```

EditingSupport example – 2.

```
…
  protected CellEditor getCellEditor(Object element) {
    return editor;
  }

  protected void setValue(Object element, Object value)
  {
    ((Person) element).email = value.toString();
    getViewer().update(element, null);
  }

  protected Object getValue(Object element) {
    return ((Person) element).email;
  }

}
```

Return specific CellEditor

EditingSupport example – 2.

```
...
  protected CellEditor getCellEditor(Object element) {
    return editor;
  }

  protected void setValue(Object element, Object value)
  {
    ((Person) element).email = value.toString();
    getViewer().update(element, null);
  }

  protected Object ge                          nt) {
    return ((Person) e
  }

}
```

Set correct values

EditingSupport example – 2.

```
…
  protected CellEditor getCellEditor(Object element) {
    return editor;
  }

  protected void setValue(Object element, Object value)
  {
    ((Person) e                          value.toString();
    getViewer()                          null);
  }

  protected Objec  getValue(Object element) {
    return ((Person) element).email;
  }

}
```

Return the stored value

JFace Dialogs and Wizards

JFace dialogs

JFace dialogs

- MessageDialog
  - Displays messages
- ErrorDialog
  - Displays error messages
  - Uses IStatus to describe error
    - Severity
    - Message
    - Exception
- InputDialog
  - Simple text input
  - IInputValidator
    - Input validation!

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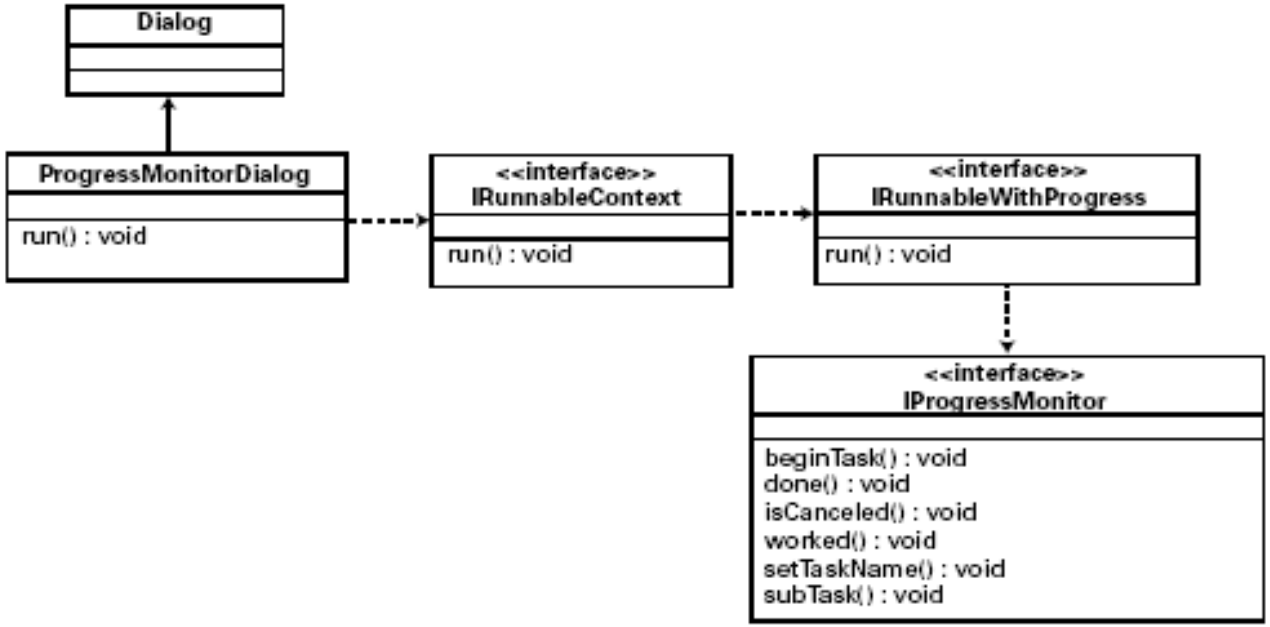
ProgressDialog

- Display background progress



Custom dialog

- Base class: org.eclipse.jface.dialogs.Dialog
- Callback methods
  - `createDialogArea(Composite parent)`
    - Dialog content
  - `createButtonBar(Composite parent)`
    - Button setup
- Header configuration
  - Redefine configureShell method

```
protected void configureShell(Shell
  shell) {
    super.configureShell(shell);
    shell.setText("My Dialog Title");
}
```

Dialog Configuration

- Keeping dialog values (save/restore): DialogSettings class
  - `DialogSettings(String)`
  - `put(String, Object)`
  - `save(String)`
  - `load(String)`
  - `get(String)`
  - `get*(String)`

Wizards

- WizardContainer class
  - A set of wizards
  - E.g. Import wizards
- Wizard class
  - Stores a set of wizard pages
  - Manages the control flow
  - Most important methods
    - `canFinish()`
    - `performCancel()`,`performFinish()`
    - `createPageControls()`

Wizards

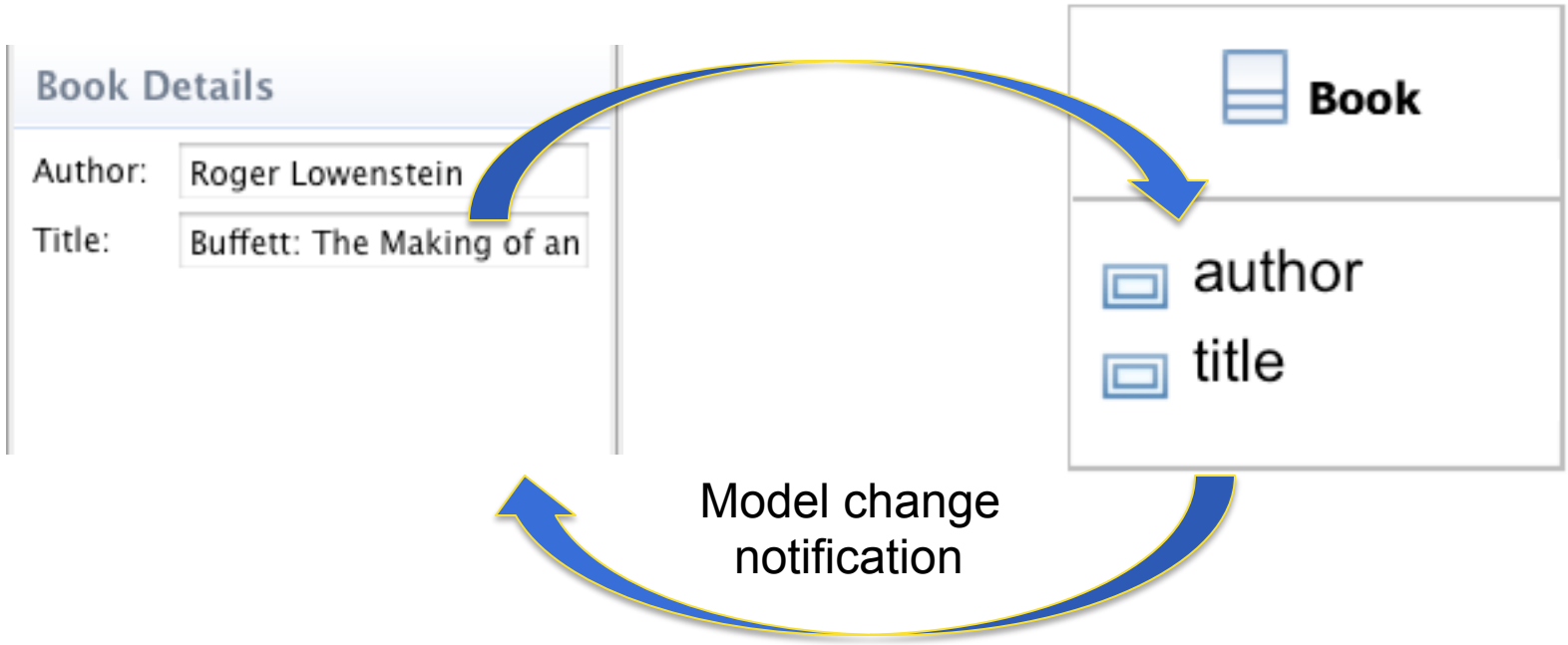
- WizardPage
  - A single wizard page
  - Manages input (+ validation)
  - Does not manage final setup
  - Methods
    - `getName()`
    - `getNextPage(),getPreviousPage()`
    - `isPageComplete()`
    - `canFlipToNextPage()`

Wizards

- Tasks
  - WizardPage
    - Information presentation
    - Data input and validation
  - Wizard
    - Order of pages
    - Read of data/context
    - Business logic/control flow
      - Between pages: collect store the entered data
      - Optionally leave out pages
      - After finished: make the required changes in the environment

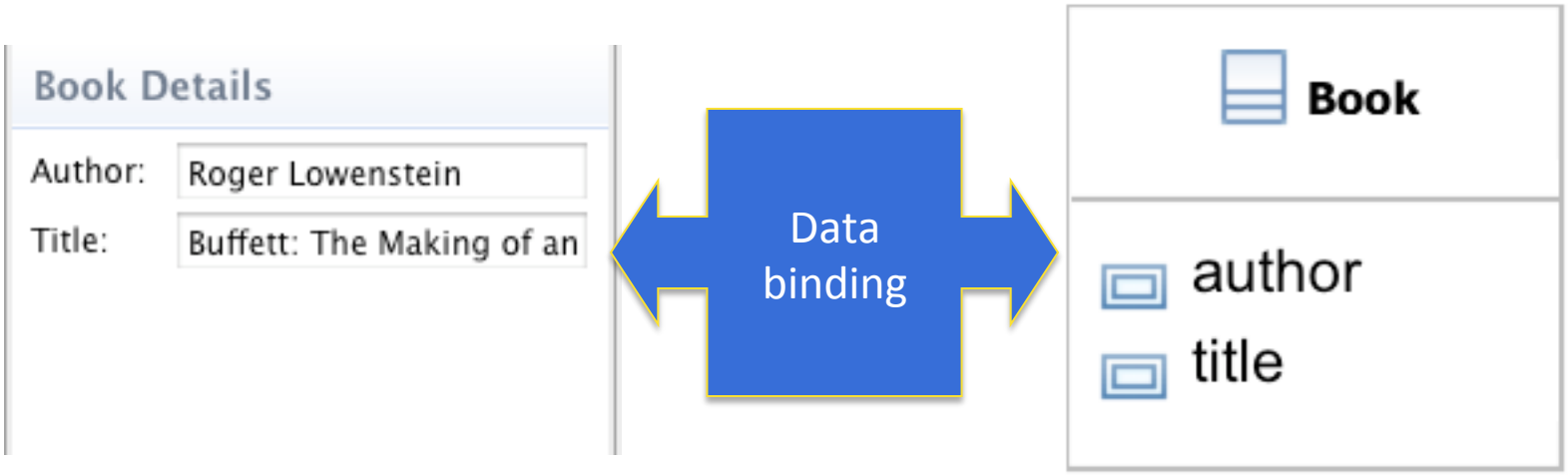
Data Binding

User Interface and Data Models



- Synchronization: complex, but mechanical
  - Easy to make mistakes
  - Is it automatable?

User Interface and Data Models



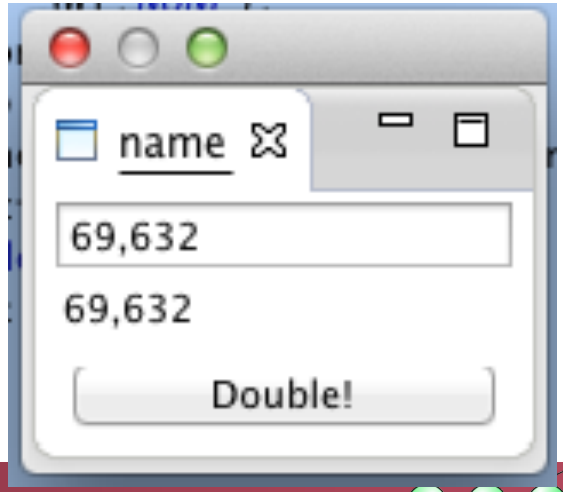
- Data Binding
  - Synchronization between data model and UI
- JFace Data Binding
  - Set up model and UI objects
  - Conversion and validation support

JFace Data Binding - Terminology

- **Observable**
  - Structured object, e.g., value, list, set…
  - State changes can be observed
- **Binding**
  - Connects two *Observables*
  - Uni- or bidirectional mapping
- **Data binding context**
  - Stores all bindings
- **Realm**
  - Serializes all *Observable* access
  - Automatically created during Workbench startup

Data Binding Example - Form

```
text = new Text(parent, SWT.BORDER);
label = new Label(parent, SWT.NONE);
Button button = new Button(parent, SWT.PUSH);
button.setText("Double!");
button.addSelectionListener(new SelectionAdapter(){
 public void widgetSelected(SelectionEvent e){
   final int amount = model.getAmount();
   model.setAmount(amount * 2);
 }
});
```



Data Binding Example - Bindings

```
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dbc.bindValue(
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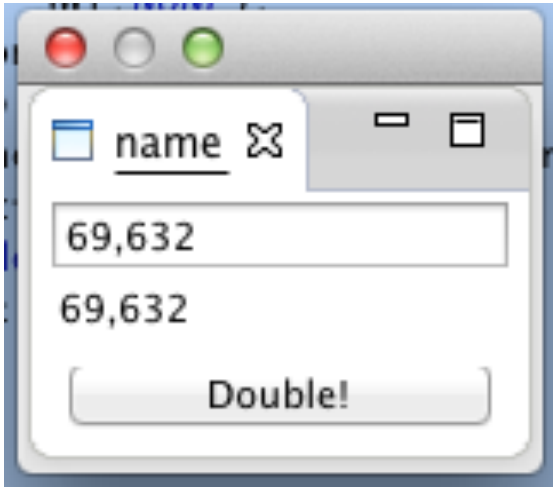

Data Binding Example - Bir

Observable for the „amount” property of model

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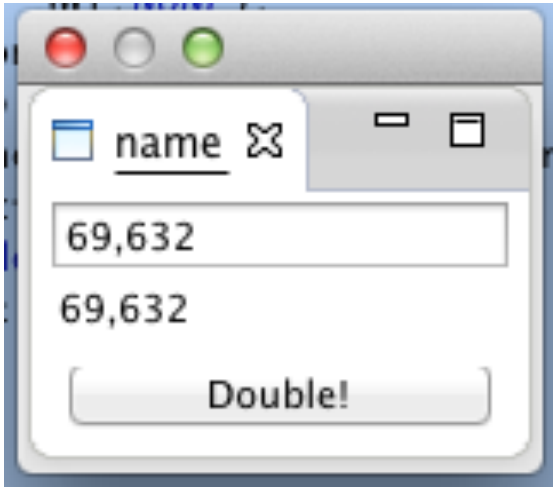

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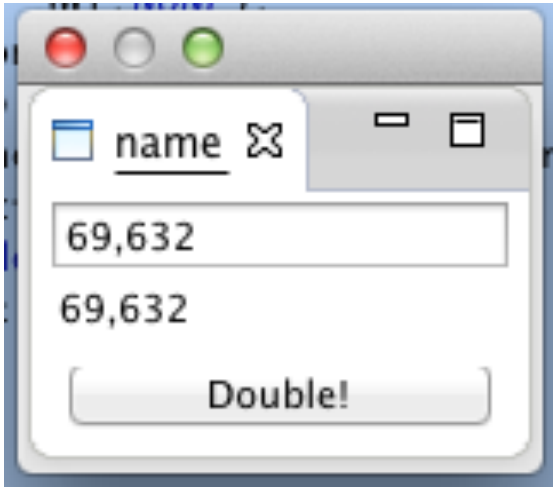

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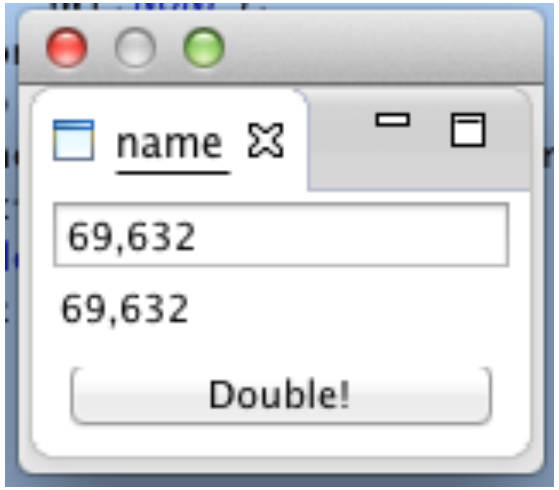
Binding text ...



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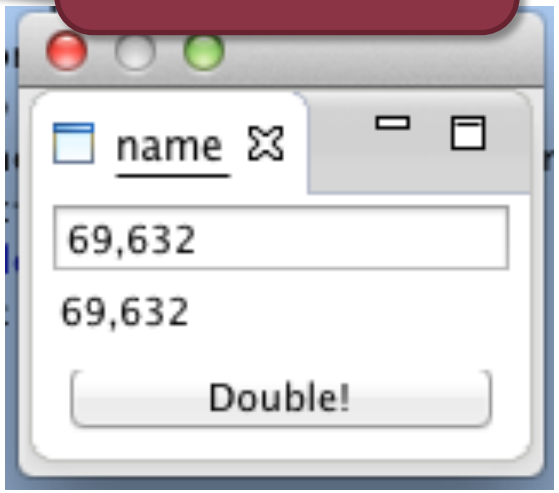
Binding text ...

... to model observable ...



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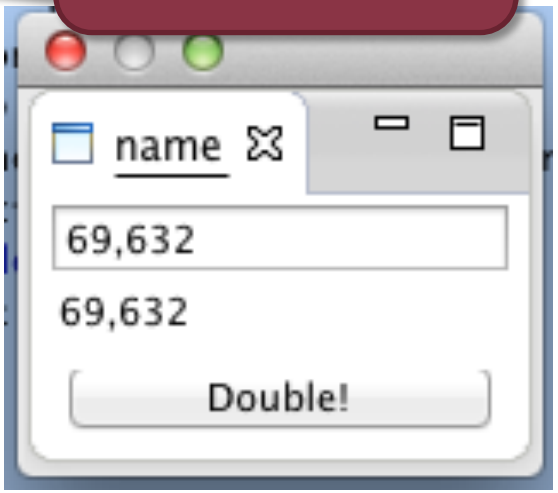
Binding text ...

... to model observable ...

... using default conversion



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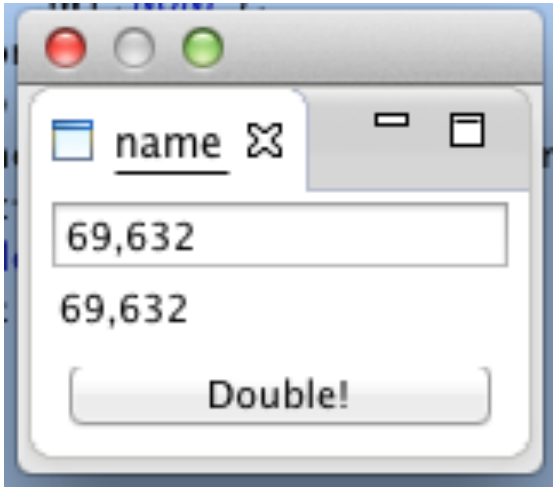

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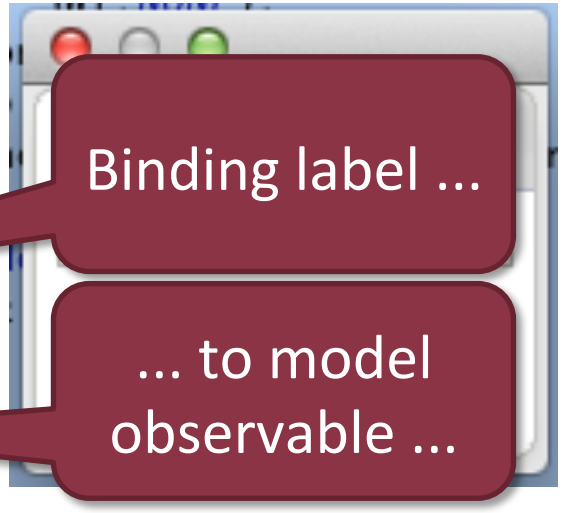

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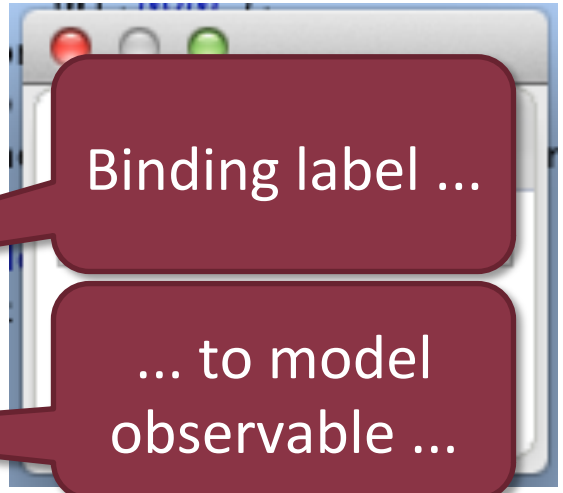

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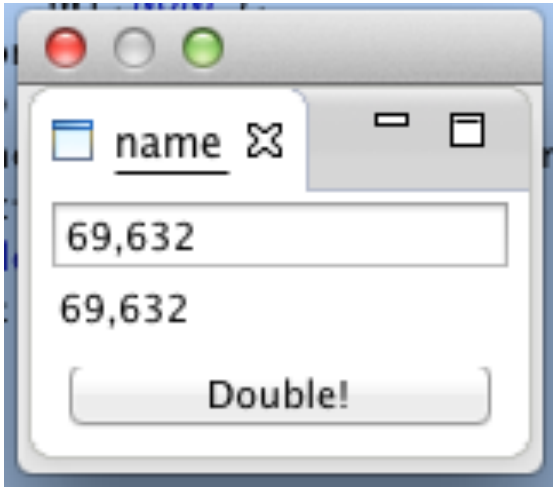

Creating Observables – Factory Classes

Creating Observables – Factory Classes

- SWTObservables
  - SWT widget properties
  - Label, color, enabledness, etc.
- ViewersObservables
  - Sets up viewer contents
  - Multiple valued Observables
- BeansObservables
  - Connects to simple Java objects
  - **Notification support needed!**

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Bean Observable - Notifications

- Use PropertyChangeSupport
  - Helps listener management
- Requires
  - Public listener registration/deregistration
  - Notifying the support class in setters
- Problems
  - Relies on conventions
  - In case of errors, no feedback is available

Bean Model

```
public class Model {

  private int amount = 0;
  public void setAmount(int newAmount) {

   this.amount = newAmount;

  }
  public int getAmount() { return amount; }
}
```

Bean Model

```
public class Model {
  private PropertyChangeSupport change = new PropertyChangeSupport(this);
  public void addPropertyChangeListener(String name,
PropertyChangeListener listener) {
   change.addPropertyChangeListener(name, listener);
  }
  public void removePropertyChangeListener(String name,
PropertyChangeListener listener) {
   change.removePropertyChangeListener(name, listener);
  }
  private int amount = 0;
  public void setAmount(int newAmount) {

   this.amount = newAmount;


  }
  public int getAmount() { return amount; }
}
```

Bean Model

```
public class Model {
  private PropertyChangeSupport change = new PropertyChangeSupport(this);
  public void addPropertyChangeListener(String name,
PropertyChangeListener listener) {
   change.addPropertyChangeListener(name, listener);
  }
  public void removePropertyChangeListener(String r
PropertyChangeListener listener) {
   change.removePropertyChangeListener(name, listen
  }
  private int amount = 0;
  public void setAmount(int newAmount) {

   this.amount = newAmount;


  }
  public int getAmount() { return amount; }
}
```

Listener Management

Bean Model

```
public class Model {
  private PropertyChangeSupport change = new PropertyChangeSupport(this);
  public void addPropertyChangeListener(String name,
PropertyChangeListener listener) {
   change.addPropertyChangeListener(name, listener);
  }
  public void removePropertyChangeListener(String name,
PropertyChangeListener listener) {
   change.removePropertyChangeListener(name, listener);
  }
  private int amount = 0;
  public void setAmount(int newAmount) {

   this.amount = newAmount;


  }
  public int getAmount() { return amount; }
}
```

Bean Model

```
public class Model {
  private PropertyChangeSupport change = new PropertyChangeSupport(this);
  public void addPropertyChangeListener(String name,
PropertyChangeListener listener) {
   change.addPropertyChangeListener(name, listener);
  }
  public void removePropertyChangeListener(String name,
PropertyChangeListener listener) {
   change.removePropertyChangeListener(name, listener);
  }
  private int amount = 0;
  public void setAmount(int newAmount) {
   int oldAmount = this.amount;
   this.amount = newAmount;
   change.firePropertyChange("amount", oldAmount, newAmount);
  }
  public int getAmount() { return amount; }
}
```

Bean Model

```
public class Model {
  private PropertyChangeSupport change = new PropertyChangeSupport(this);
  public void addPropertyChangeListener(String name,
PropertyChangeListener listener) {
   change.addPropertyChangeListener(name, listener);
  }
  public void removePropertyChangeListener(String name,
PropertyChangeListener listener) {
   change.removePropertyChangeListener(name, listener);
  }
  private int amount = 0;
  public void setAmount(int newAmount) {
   int oldAmount = this.amount;
   this.amount = newAmount;
   change.firePropertyChange("amount", oldAmount, newAmount);
  }
  public int getAmount() { return amount; }
}
```

Notifying listeners in setter

Validation

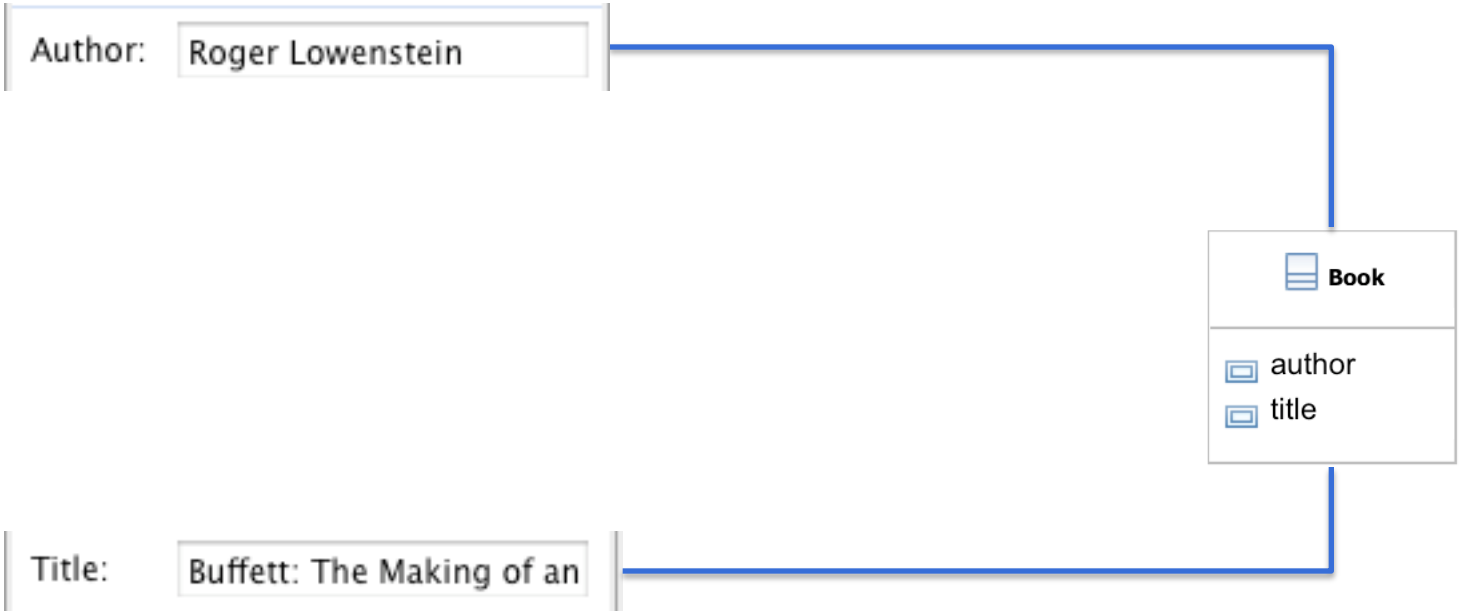
- Text-number conversion in example
  - Null parameters: default conversion and validation
- Custom validation
  - Define an UpdateValueStrategy

```
dbc.bindValue(SWTObservables.observeText(text, SWT.Modify),
    modelObservable,
    // UI to model
    new UpdateValueStrategy().
      setAfterConverValidator(anIntValidator),
    //model to UI
    new UpdateValueStrategy.
      setConverter(anIntToStringConverter);
```

UpdateValueStrategy

- Common object to describe validation and update
- Phases
  1. Validate after get
     - Validation after reading the value
  2. Conversion
     - Between source and target domains
  3. Validate after conversion
     - Validation after the conversion finishes
  4. Validate before set
     - Validation before writing back the value
  5. Value set
     - Writing back the value to the target object

Data binding – In Action

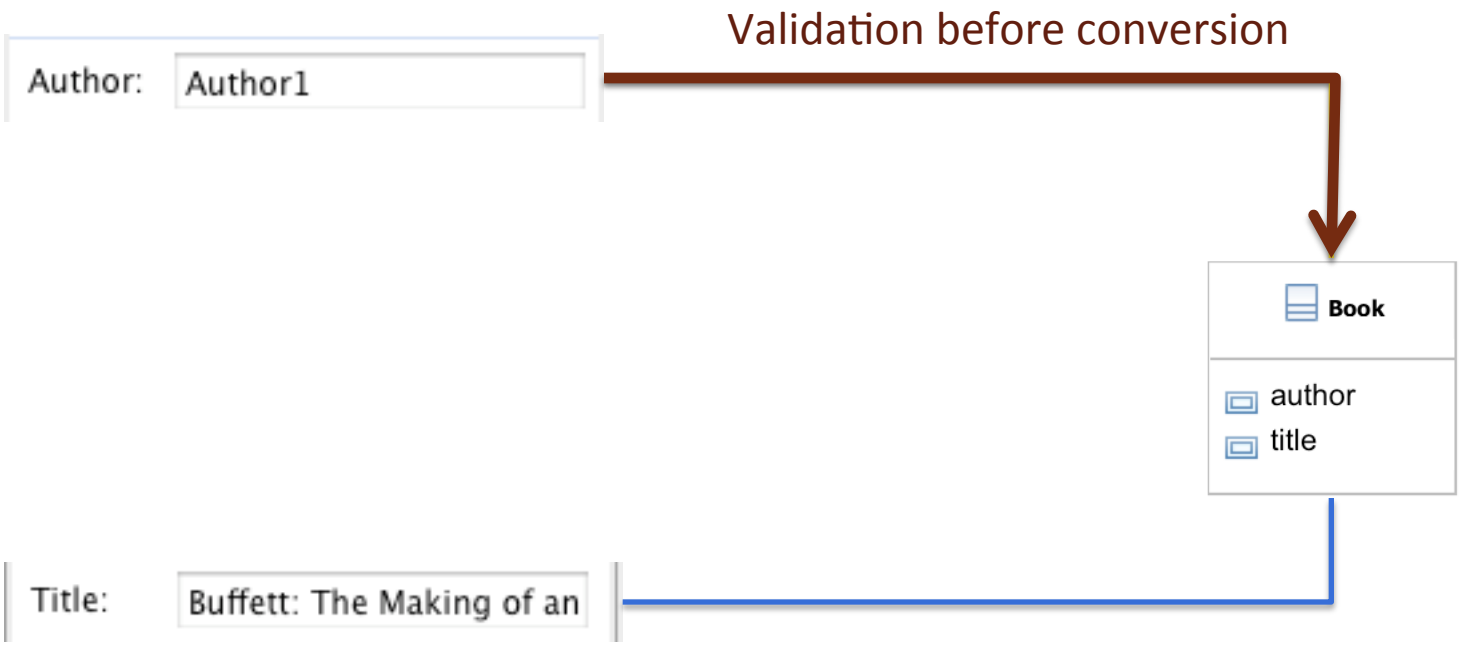


Both text field is bound to the same Book object

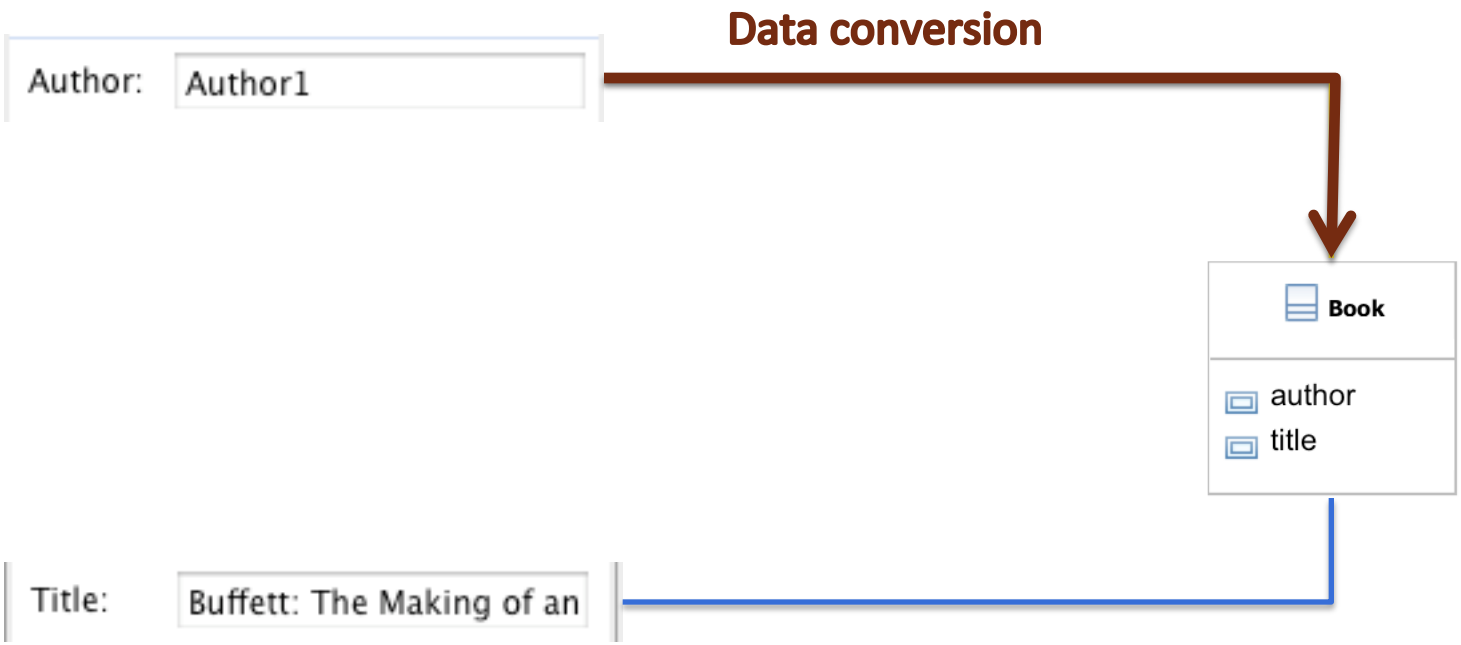
Data binding – In Action

Author changed

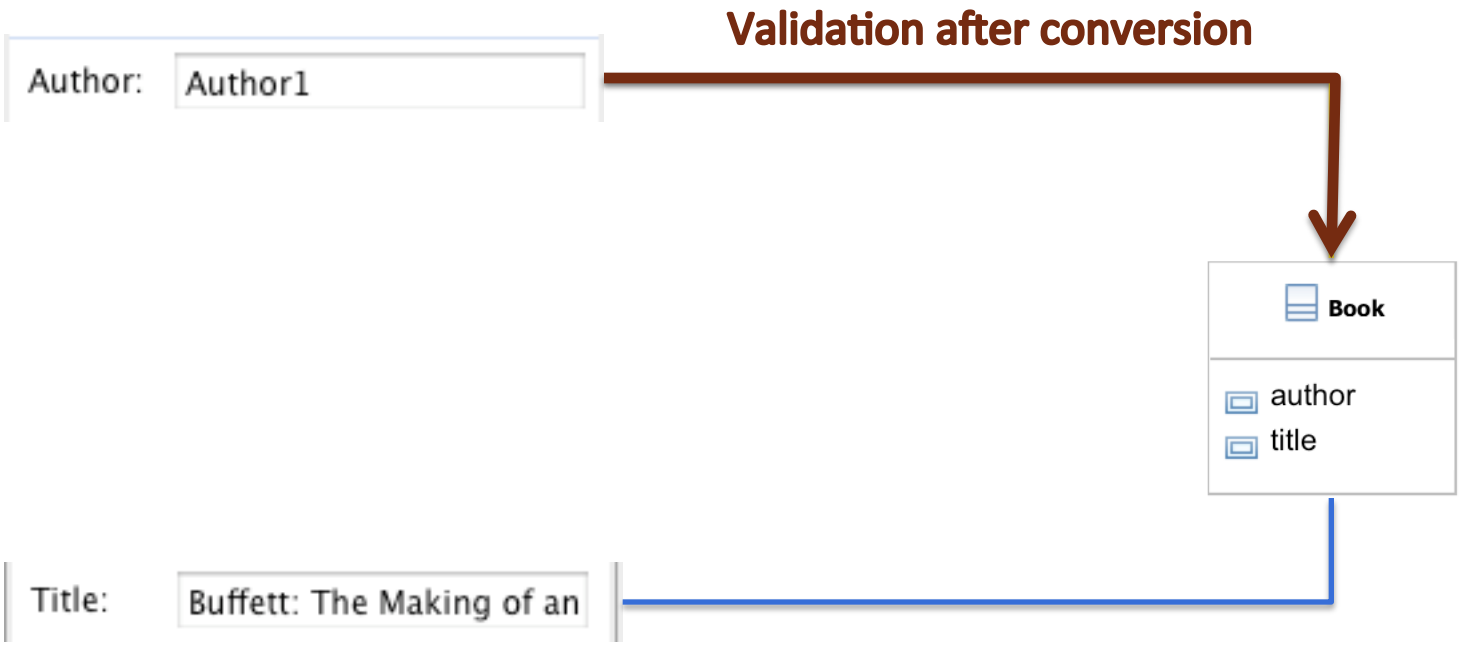
Data binding – In Action



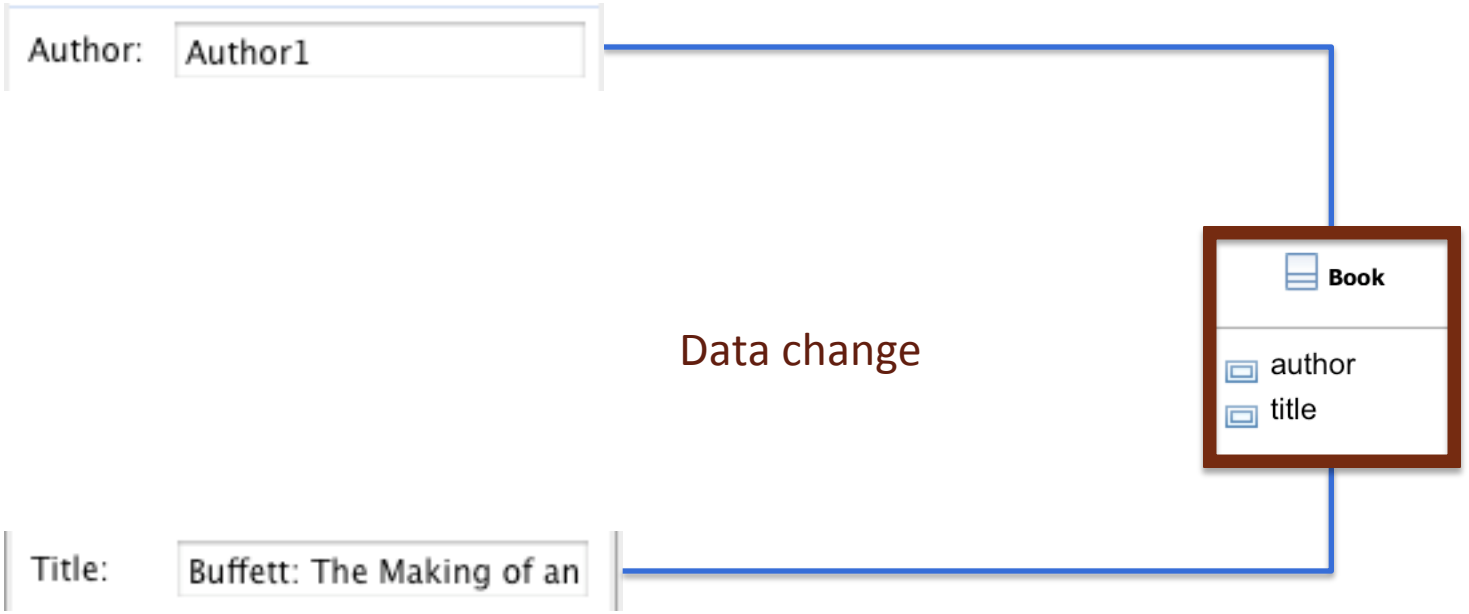
Data binding – In Action



Data binding – In Action

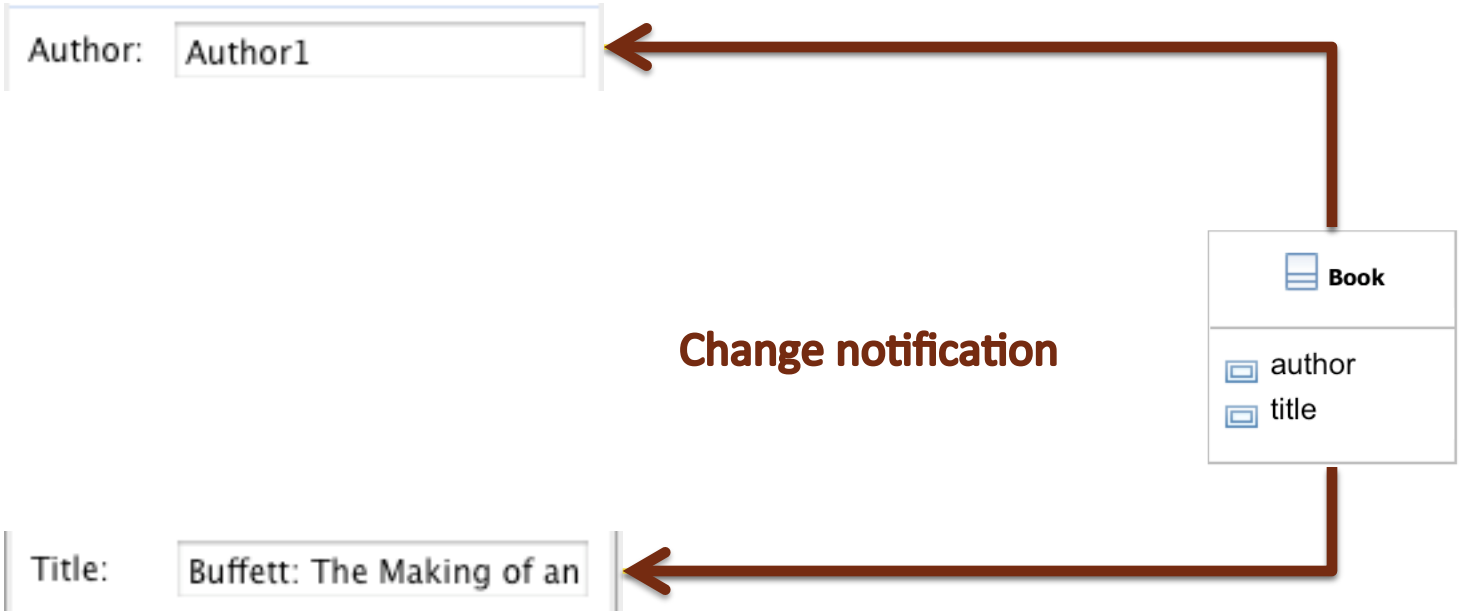


Data binding – In Action

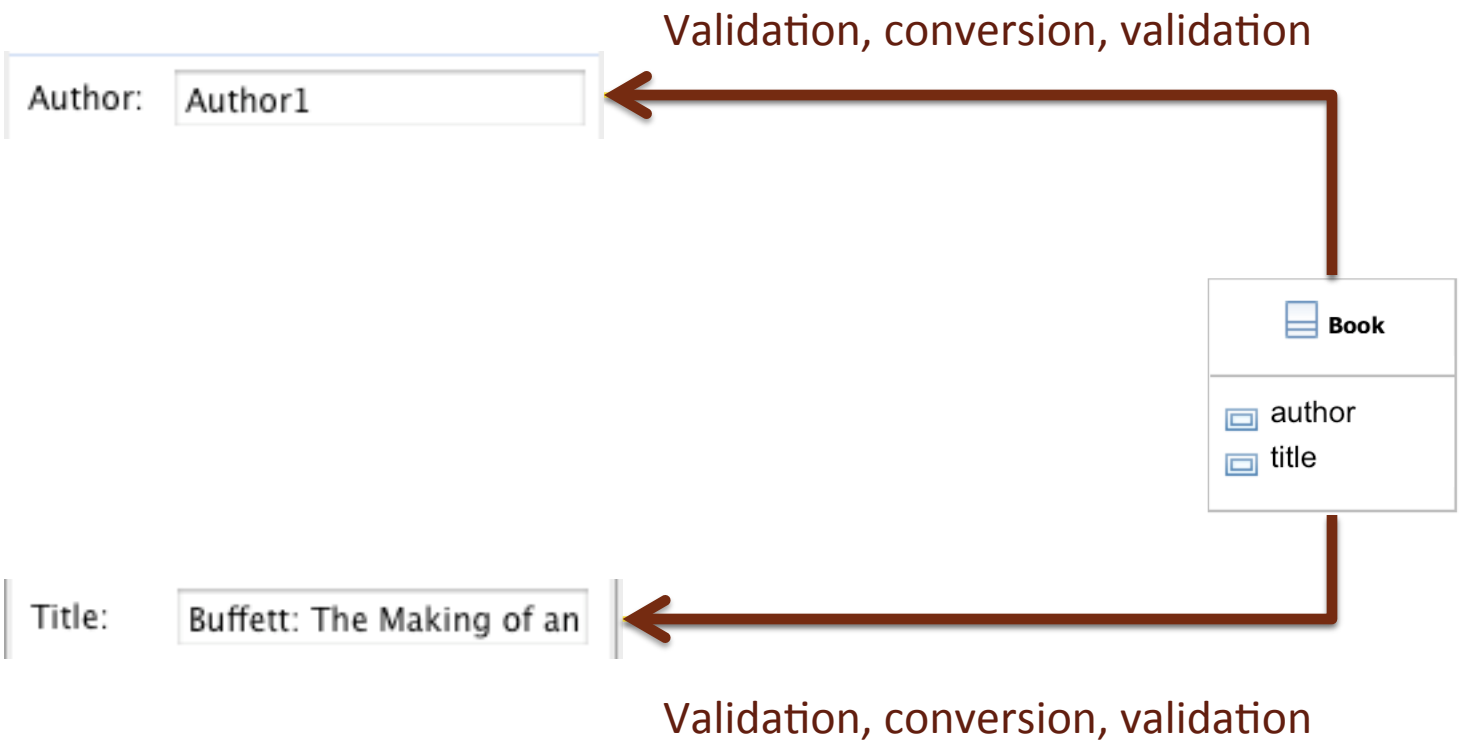


Author changed

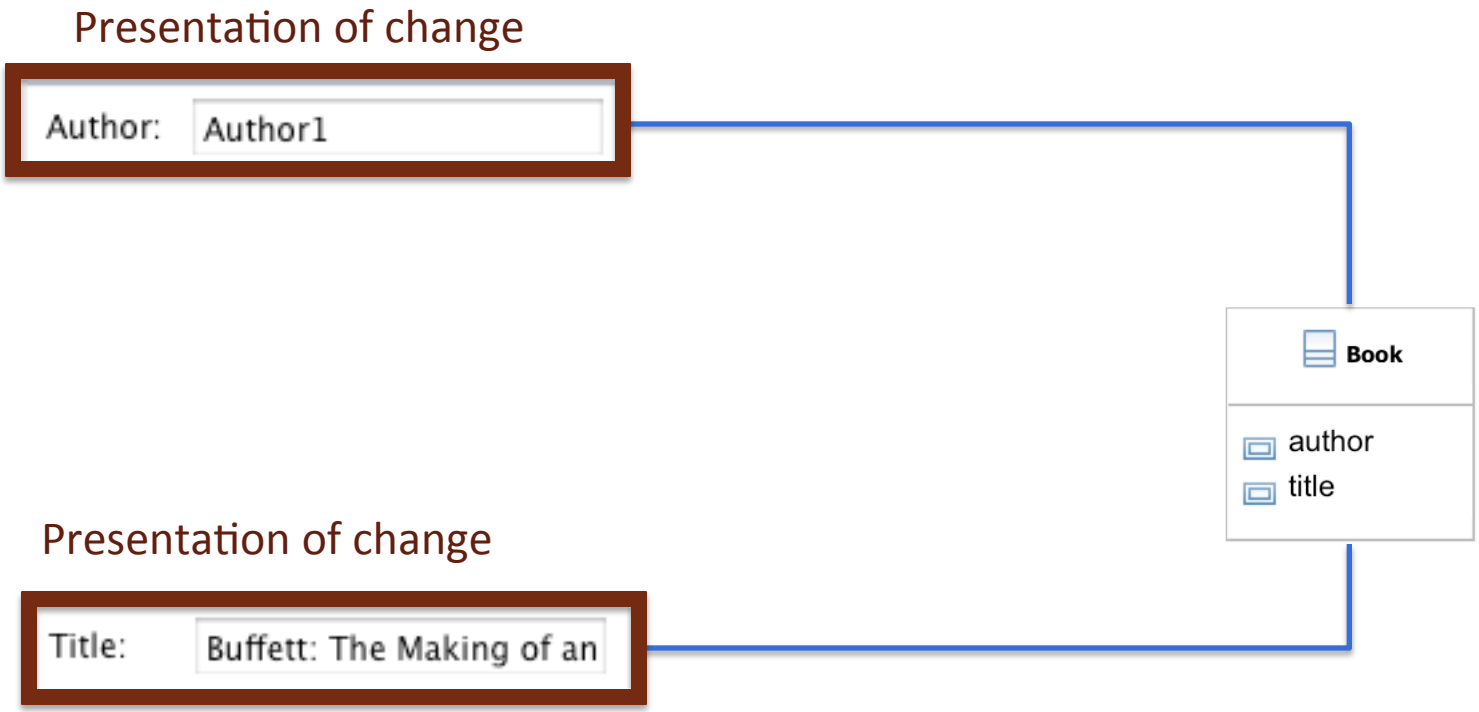
Data binding – In Action



Data binding – In Action



Data binding – In Action



Writing Validators

- Use interface *IValidator*
- Return value:
  - ValidationStatus.ok()
  - ValidationStatus.info(String message)
  - ValidationStatus.warning(String message)
  - ValidationStatus.error(String message)

Writing Converters

- Use interface IConverter
  - Define source and target classes
  - Manages the real conversion
  - Built-in converters available
    - NumberToStringConverter
    - StringToNumberConverter

Presenting Validation Errors

- Error information
  - Available as IObservable
  - Boundable to the user interface
- Observing all binding errors:
  - `new AggregateValidationStatus( dbc.getBindings(), AggregateValidationStatus.MAX_SEVERITY), null, null);`
- Observable of a selected binding b
  - `b.getValidationStatus()`

Computed Observable Values

- Attribute changes are managed
  - Can be used to calculate computed values
  - ComputedValue, ComputedList change accordingly
- Example for computed value – full name

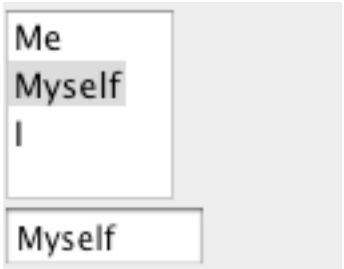
```
final IObservableValue firstName =
   SWTObservables.observeText(firstNameField, SWT.Modify);


final IObservableValue lastName =
   SWTObservables.observeText(lastNameField, SWT.Modify);


 IObservableValue formattedName = new ComputedValue() {
    protected Object calculate() {
   return lastName.getValue() + firstName.getValue();
    }
 };
```

Master-Detail Binding

- Task:
  - Observing (and binding) the current selection
  - If selection changes
    - Old bindings are to be disposed
    - New bindings are to be created
- Support: Master-Detail Binding
  - Define observable for selection (Master Observable)
  - Observe selection (observeDetailValue)

Master-Detail példa

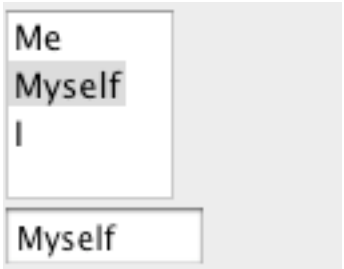
```
// 1. Observe changes in selection.
IObservableValue selection =
   ViewersObservables.observeSingleSelection(viewer);
// 2. Observe the name property of the current selection.
IObservableValue detailObservable =
   BeansObservables .observeDetailValue(selection, "name",
   String.class);
// 3. Bind the Text widget to the name detail (selection's
   name).
new DataBindingContext().bindValue(
  SWTObservables.observeText(name, SWT.None),
  detailObservable,
  new UpdateValueStrategy(false,
    UpdateValueStrategy.POLICY_NEVER),
  null);
```



Master-Detail példa

```
// 1. Observe changes in selection.
IObservableValue selection =
   ViewersObservables.observeSingleSelection(viewer);
// 2. Observe the name property of the cur    t selection.
IObservableValue detailObservable =
   BeansObservables .observeDetailValue
   String.class);
// 3. Bind the Text widget to the name
   name).
new DataBindingContext().bindValue(
  SWTObservables.observeText(name, SWT.None),
  detailObservable,
  new UpdateValueStrategy(false,
    UpdateValueStrategy.POLICY_NEVER),
  null);
```

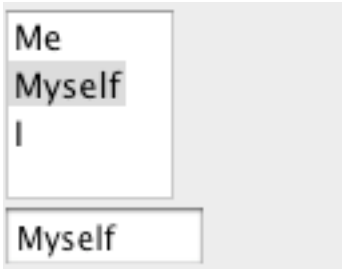
Create observer for single selection (Viewer)



Master-Detail példa

```
// 1. Observe changes in selection
IObservableValue sele
   ViewersObservables.                lection(viewer);
// 2. Observe the nam                 e current selection.
IObservableValue detailO servable =
   BeansObservables .observeDetailValue(selection, "name",
   String.class);
// 3. Bind the Text widget to the name detail (selection's
   name).
new DataBindingContext().bindValue(
  SWTObservables.observeText(name, SWT.None),
  detailObservable,
  new UpdateValueStrategy(false,
    UpdateValueStrategy.POLICY_NEVER),
  null);
```

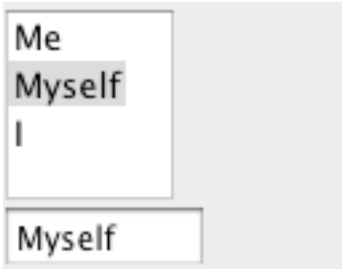
Creating Detail Observable



Master-Detail példa

```
// 1. Observe changes in selection.
IObservableValue selection =
   ViewersObservables.observeSingleSelection(viewer);
// 2. Observe the name property of the current selection.
IObservableValue detailObservable =
   BeansObservables .observeDetailValue(selection, "name",
   String.class);
// 3. Bind the Text widget to the nar                tion's
   name).
new DataBindingContext().bindValue(
  SWTObservables.observeText(name, SWT.    one),
  detailObservable,
  new UpdateValueStrategy(false,
    UpdateValueStrategy.POLICY_NEVER),
  null);
```

Binding



Data Binding - Summary

- High level data synchronization
  - Different binding available (e.g. EMF)
- Documentation available on Eclipse Wiki:
  http://wiki.eclipse.org/index.php/JFace_Data_Binding

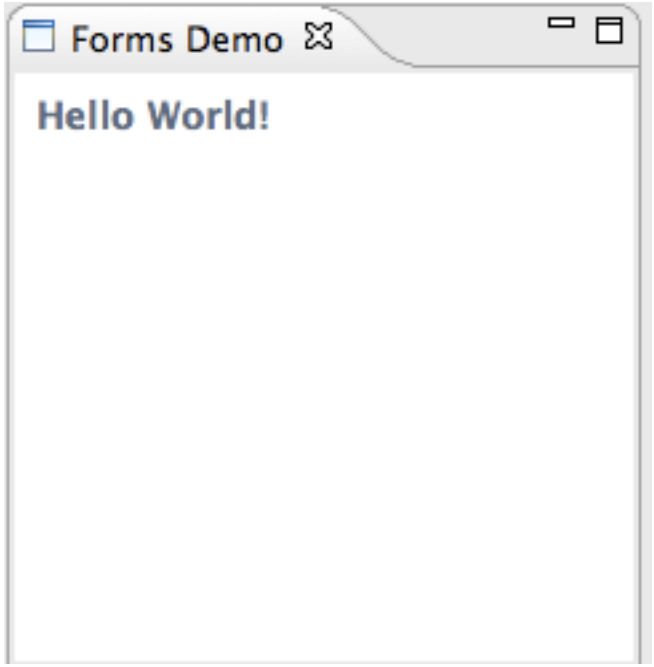
Forms API

Forms API

- Form definition API
  - Uniform appearance
  - Based on SWT and JFace
- New widgets
  - Sections
  - Layouts
  - Scroll support
  - …
- Useful in
  - Dialogs, views, editors

Forms Hello, world!

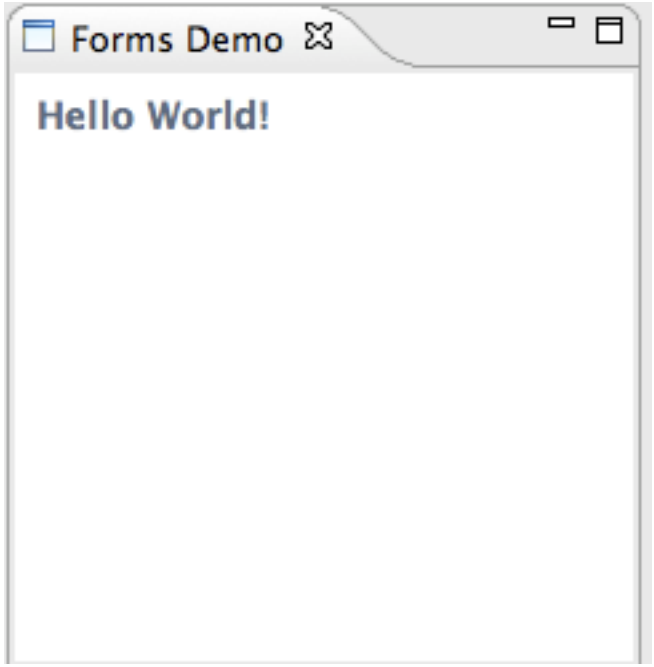
```
FormToolkit toolkit;
Form form;

public void createPartControl(Composite parent) {
  toolkit = new FormToolkit(parent.getDisplay());

  form= toolkit.createForm(parent);
  form.setText("Hello World!");
}

@Override
public void setFocus() {
  form.setFocus();
}

@Override
public void dispose(){
  toolkit.dispose();
  super.dispose();
}
```



Forms Hello, world!

```
FormToolkit toolkit;
Form form;

public void createPartControl(Composite parent) {
  toolkit = new FormToolkit(parent.getDisplay());

  form= toolkit.createFor arent);
  form.setText("Hello W
}

@Override
public void setFocus() {
  form.setFocus();
}

@Override
public void dispose(){
  toolkit.dispose();
  super.dispose();
}
```

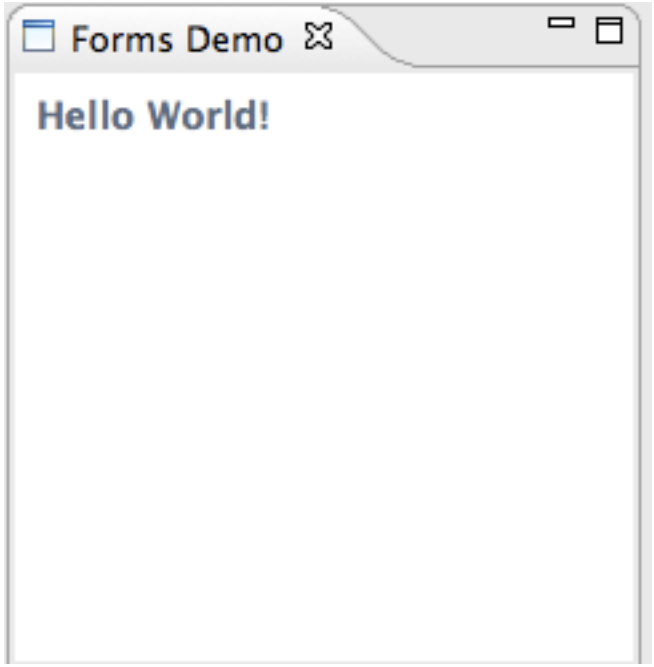
Initialize factory



Forms Hello, world!

```
FormToolkit toolkit;
Form form;

public void createPartControl(Composite parent) {
  toolkit = new FormToolkit(parent.getDisplay());

  form= toolkit.createForm(parent);
  form.setText("He   o World!");
}

@Override
public void setF
  form.setFocus();
}

@Override
public void dispose(){
  toolkit.dispose();
  super.dispose();
}
```

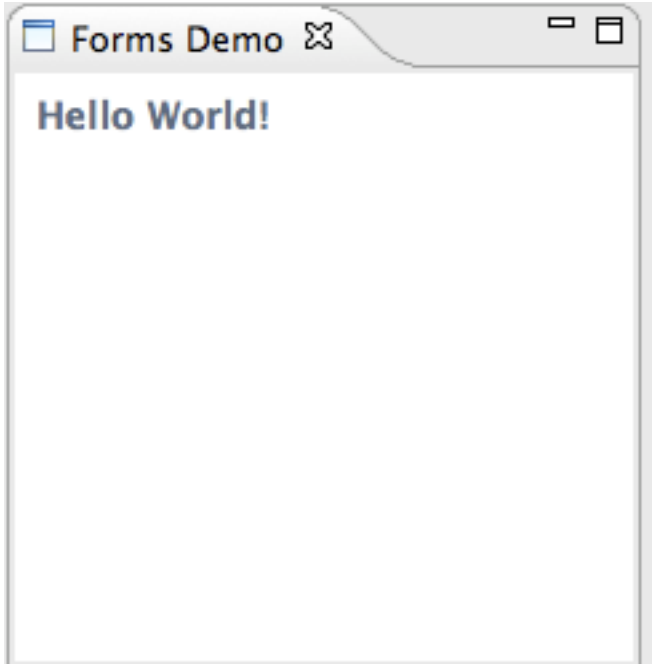
Initialize form



Forms Hello, world!

```
FormToolkit toolkit;
Form form;

public void createPartControl(Composite parent) {
  toolkit = new FormToolkit(parent.getDisplay());

  form= toolkit.createForm(parent);
  form.setText("Hello World!");
}

@Override
public void setFocus() {
  form.setFocus
}

@Override
public void dispo    (){
  toolkit.dispose();
  super.dispose();
}
```

Dispose toolkit (important!)

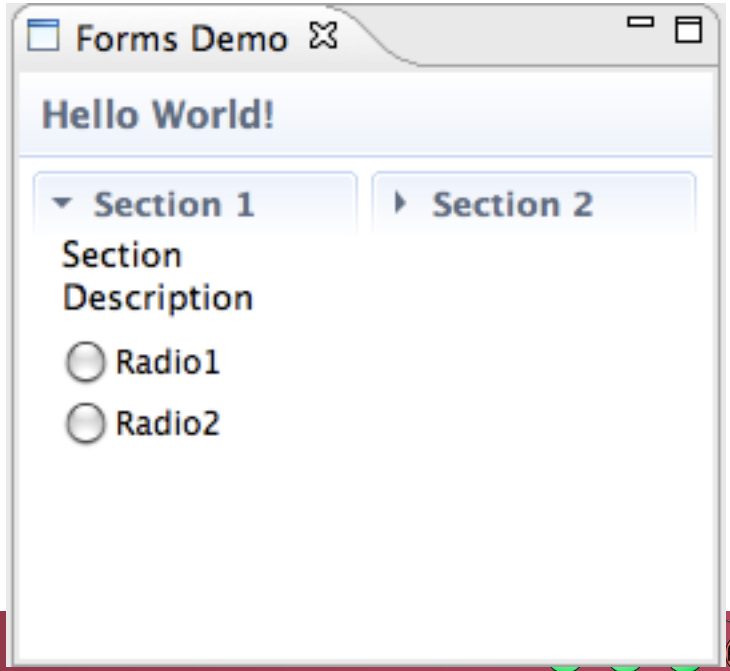


Structure of Forms

- Head composite
  - Title area
  - Warnings/errors usually displayed here
  - Predefined decoration available
    - `toolkit.decorateFormHeading(form);`
- Body composite
  - Real body
  - No preset layout
  - Place your widgets here

Sections

- Composite
  - Heading
  - Textual description below title
  - Separator between header and contents
- Can be collapsed (via style bits)
  - EXPANDED/COLLAPSED



SectionExample

```
public void createPartControl(Composite parent) {
 …
 Section section1 =
   toolkit.createSection(form.getBody(),
     Section.DESCRIPTION|Section.TITLE_BAR|
   Section.EXPANDED);
 section1.setText("Section 1");
 section1.setDescription("Section Description");
 Composite sectionClient1 =
   toolkit.createComposite(section1);
 sectionClient1.setLayout(new GridLayout());
 section1.setClient(sectionClient1);
 toolkit.createButton(sectionClient1, "Radio1",
   SWT.RADIO);
 toolkit.createButton(sectionClient1, "Radio2",
   SWT.RADIO);
 …
}
```

SectionExample

```
public void createPartControl(Composite parent) {
 …
 Section section1 =
   toolkit.createSection(form.getBody(),
     Section.DESCRIPTION|Section.TITLE_BAR|
   Section.EXPANDED);
 section1.setText("Section 1");
 section1.setDescription("Section 1 description");
 Composite sectionClient1 =
   toolkit.createComposite(section1);
 sectionClient1.setLayout(new GridLayout());
 section1.setClient(sectionClient1);
 toolkit.createButton(sectionClient1, "Radio1",
   SWT.RADIO);
 toolkit.createButton(sectionClient1, "Radio2",
   SWT.RADIO);
 …
}
```

Create section

SectionExample

```
public void createPartControl(Composite parent) {
 …
 Section section1 =
   toolkit.createS                    Body(),
     Section.DESCR                    TITLE_BAR|
   Section.EXPANDE
 section1.setText(
 section1.setDescription("Section Description");
 Composite sectionClient1 =
   toolkit.createComposite(section1);
 sectionClient1.setLayout(new GridLayout());
 section1.setClient(sectionClient1);
 toolkit.createButton(sectionClient1, "Radio1",
   SWT.RADIO);
 toolkit.createButton(sectionClient1, "Radio2",
   SWT.RADIO);
 …
}
```

New composite for contents!

SectionExample

```
public void createPartControl(Composite parent) {
 …
 Section section1 =
   toolkit.createSection(form.getBody(),
     Section.DESCRIPTION|Section.TITLE_BAR|
   Section.EXPANDED);
 section1.setText("
 section1.setDescri                    cription");
 Composite section
   toolkit.createCo
 sectionClient1.setLa      t(new GridLayout());
 section1.setClient(sectionClient1);
 toolkit.createButton(sectionClient1, "Radio1",
   SWT.RADIO);
 toolkit.createButton(sectionClient1, "Radio2",
   SWT.RADIO);
 …
}
```

Section stores new Composite

Instantiating Widgets

- SWT widgets
  - FormToolkit.create«Widgetname»()
  - Style bits also supported

```
form.getBody().setLayout(new RowLayout());
Button button = toolkit.createButton(form.getBody(), "My Checkbox”,
   SWT.CHECK);
```

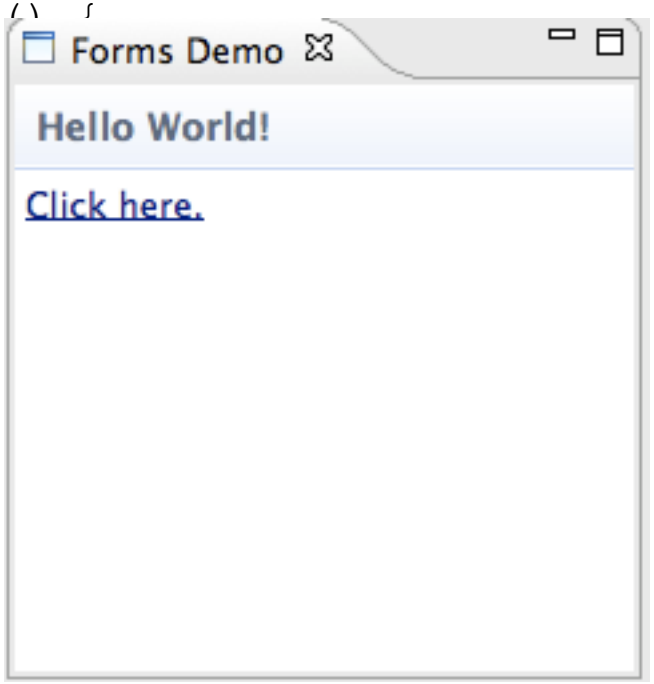
- JFace viewer
  - Create corresponding SWT widget using Factory
  - Create JFace wrapper around it

```
Table table = toolkit.createTable(form.getBody(), SWT.NONE);
TableViewer viewer = new TableViewer(table);
```

Form elements - Hyperlink

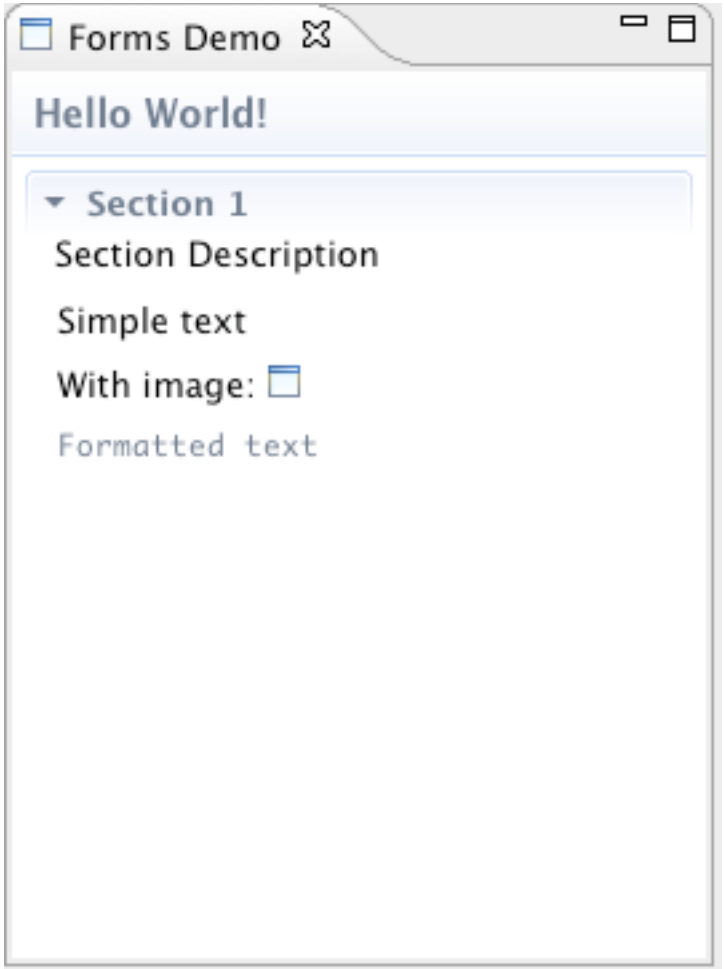
- Define links between for elements
  - href property: target of linke
  - Or use HyperlinkListener

```
Hyperlink link = toolkit.createHyperlink(form.getBody(),
   "Click here.”,SWT.WRAP);
link.addHyperlinkListener(new HyperlinkAdapter() {
  public void linkActivated(HyperlinkEvent e)
    System.out.println("Link activated!");
  }
});
```



Form elements - FormText

- Handles text, icons and links
  - Difficult with separate widgets
- HTML-like rich text
  - HTML labels
  - Icons/fonts loaded manually
- Not editable



FormText example

```
StringBuffer buf = new StringBuffer();
buf.append("<form>");
buf.append("<p>Simple text</p>");
buf.append("<p>With image: <img href=\"image\" /></p>");
buf.append("<p><span color=\"sp\" font=\"sp\">Formatted
   text</span></p>");
buf.append("</form>");

FormText text = toolkit.createFormText(sectionClient1,
   true);
text.setImage("image",
   PlatformUI.getWorkbench().getSharedImages()
.getImage(ISharedImages.IMG_DEF_VIEW));
text.setColor("sp",
   toolkit.getColors().getColor(IFormColors.TITLE));
text.setFont("sp", JFaceResources.getTextFont());
text.setText(buf.toString(), true, true);
```

FormText example

Assemble text

```
StringBuffer buf = r                    r();
buf.append("<form>")
buf.append("<p>Simpl                    .p>");
buf.append("<p>With im ge: <img href=\"image\" /></p>");
buf.append("<p><span color=\"sp\" font=\"sp\">Formatted
   text</span></p>");
buf.append("</form>");

FormText text = toolkit.createFormText(sectionClient1,
   true);
text.setImage("image",
   PlatformUI.getWorkbench().getSharedImages()
.getImage(ISharedImages.IMG_DEF_VIEW));
text.setColor("sp",
   toolkit.getColors().getColor(IFormColors.TITLE));
text.setFont("sp", JFaceResources.getTextFont());
text.setText(buf.toString(), true, true);
```

FormText example

```
StringBuffer buf = new StringBuffer();
buf.append("<form>");
buf.append("<p>Simple text</p>");
buf.append("<p>With image: <img href=\"image\" /></p>");
buf.append("<p><span color=\"sp\" font=\"sp\">Formatted
   text</span></p>");
buf.append("</form>");

FormText text = toolkit.c      ormText(sectionClient1,
   true);
text.setImage("image",
   PlatformUI.getWorkbench().getSharedImages()
.getImage(ISharedImages.IMG_DEF_VIEW));
text.setColor("sp",
   toolkit.getColors().getColor(IFormColors.TITLE));
text.setFont("sp", JFaceResources.getTextFont());
text.setText(buf.toString(), true, true);
```

Map SWT image to name

FormText example

```
StringBuffer buf = new StringBuffer();
buf.append("<form>");
buf.append("<p>Simple text</p>");
buf.append("<p>With image: <img href=\"image\" /></p>");
buf.append("<p><span color=\"sp\" font=\"sp\">Formatted
   text</span></p>");
buf.append("</form>");

FormText text = toolkit                                ionClient1,
   true);
text.setImage("image",
   PlatformUI.getWorkben                               ()
.getImage(ISharedImages.IM                 EF_VIEW));
text.setColor("sp",
   toolkit.getColors().getColor(IFormColors.TITLE));
text.setFont("sp", JFaceResources.getTextFont());
text.setText(buf.toString(), true, true);
```

Map SWT Color to name

FormText example

```
StringBuffer buf = new StringBuffer();
buf.append("<form>");
buf.append("<p>Simple text</p>");
buf.append("<p>With image: <img href=\"image\" /></p>");
buf.append("<p><span color=\"sp\" font=\"sp\">Formatted
   text</span></p>");
buf.append("</form>");

FormText text = toolkit.createFormText(sectionClient1,
   true);
text.setImage("image",
   PlatformUI.getWorkbenc                              )
.getImage(ISharedImages.I
text.setColor("sp",
   toolkit.getColors().getCo                (IFormColors.TITLE));
text.setFont("sp", JFaceResources.getTextFont());
text.setText(buf.toString(), true, true);
```

Map SWT Font to name

FormText example

```
StringBuffer buf = new StringBuffer();
buf.append("<form>");
buf.append("<p>Simple text</p>");
buf.append("<p>With image: <img href=\"image\" /></p>");
buf.append("<p><span color=\"sp\" font=\"sp\">Formatted
   text</span></p>");
buf.append("</form>");

FormText text = toolkit.createFormText(sectionClient1,
   true);
text.setImage("image",
   PlatformUI.getWorkbench()
.getImage(ISharedImages.IM
text.setColor("sp",
   toolkit.getColors().getC
text.setFont("sp", JFaceResour
text.setText(buf.toString(), true, true);
```

2th parameter: Rich text

FormText example

```
StringBuffer buf = new StringBuffer();
buf.append("<form>");
buf.append("<p>Simple text</p>");
buf.append("<p>With image: <img href=\"image\" /></p>");
buf.append("<p><span color=\"sp\" font=\"sp\">Formatted
   text</span></p>");
buf.append("</form>");

FormText text = toolkit.createFormText(sectionClient1,
   true);
text.setImage("image",
   PlatformUI.getWorkbench().getSharedImages()
.getImage(ISharedImages.IMG_DEF_VI
text.setColor("sp",
   toolkit.getColors().getColor(IFo
text.setFont("sp", JFaceResources.get      ront());
text.setText(buf.toString(), true, true);
```

3rd parameter: automatic links

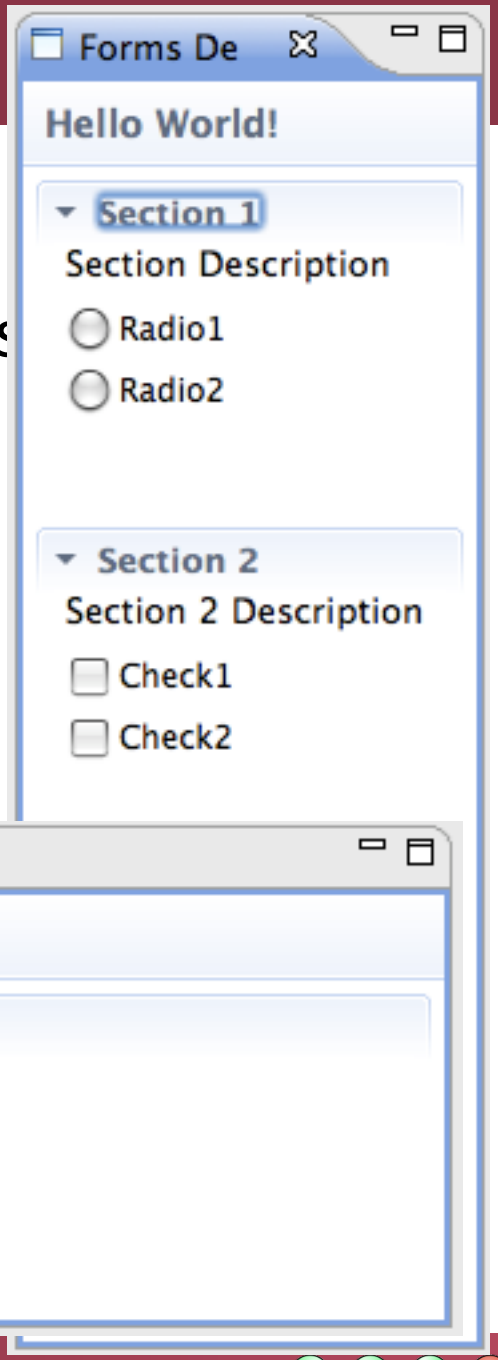
TableWrapLayout

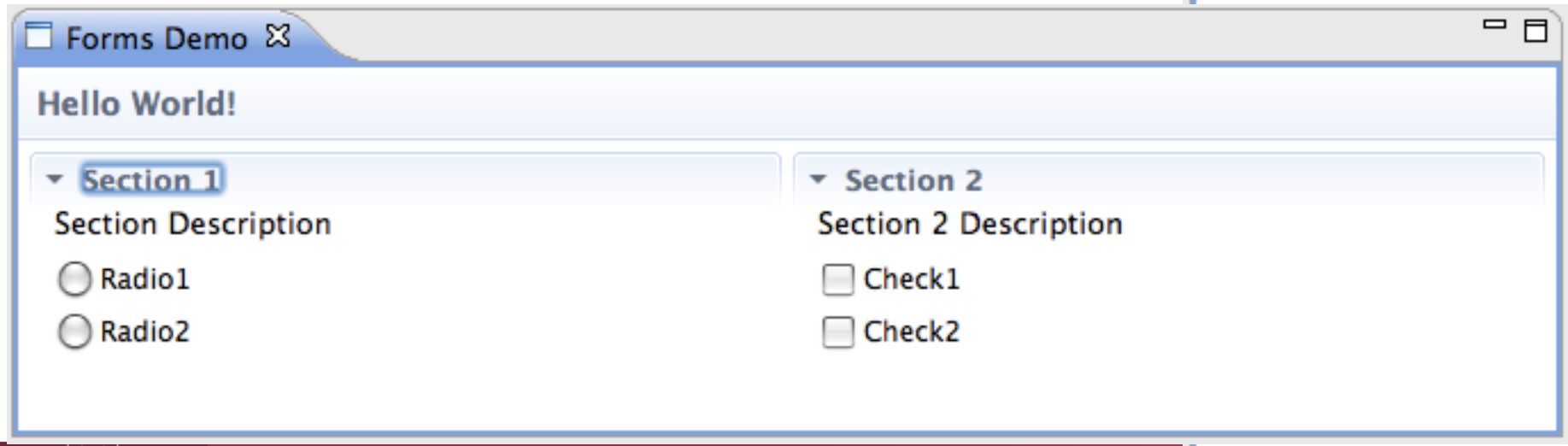
- Similar to GridLayout
  - But: goal is to wrap labels
- TableWrapData layout data objects
  - Size hints

```
TableWrapLayout layout = new TableWrapLayout();
form.getBody().setLayout(layout);
layout.numColumns = 2;
Hyperlink link = toolkit.createHyperlink(form.getBody(), "This
   is an example of a form that is much longer and will need to
   wrap.", SWT.WRAP);
TableWrapData td = new TableWrapData();
td.colspan = 2;
link.setLayoutData(td);
```

Column layout

- Similar to RowLayout
  - But: Balances content between columns
  - But: Varied number of columns
- To define
  - Minimal number of columns (def.: 1)
  - Maximum number of columns (def.: 3)





Forms API – Additional Capabilities

- Form validation
  - Mark widgets with error markers
- Extended headings
  - Error messages
  - Toolbars
  - Dropdown menus
- Multipage editor
  - Look at the plug-in manifest editor in PDE

Forms API - Summary

- Complex form handling
  - Reuse of SWT/JFace widgets
  - New widgets/layouts
  - Uniform presentation

Additional GUI Support

Further GUI Projects

- XWT project
  - Experimental, XML-based form design
- Sapphire project
  - High-level definition of complex forms
  - Relies on annotated Java objects
- JavaFX support
  - SWT over JavaFX under construction
  - Launch workbench directly over JavaFX (Eclipse 4.x)
  - GEF4 support