EclipseCon 2009

UI Test Automation with SWTBot

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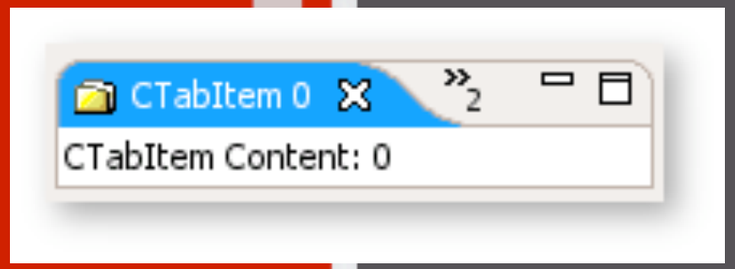
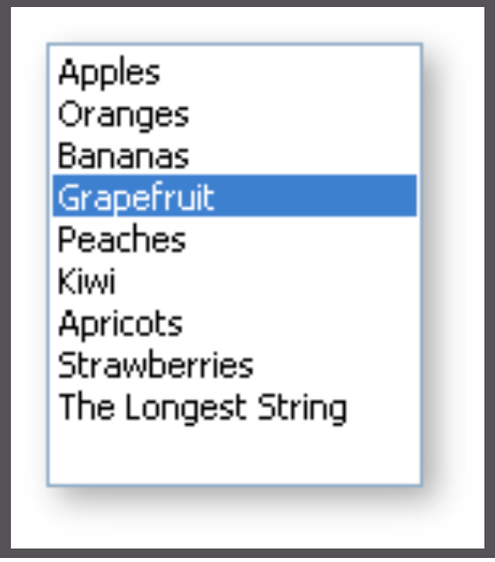
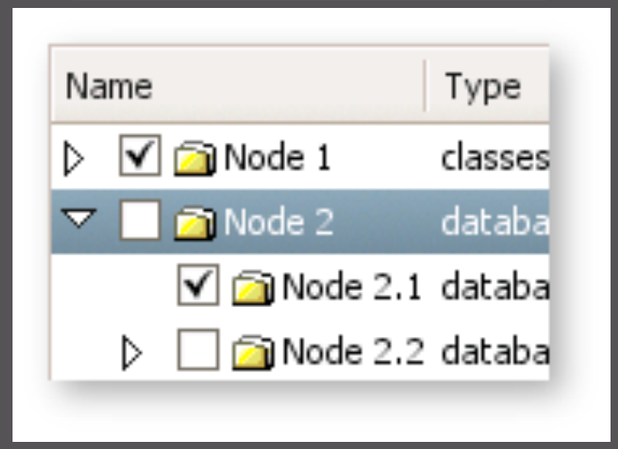
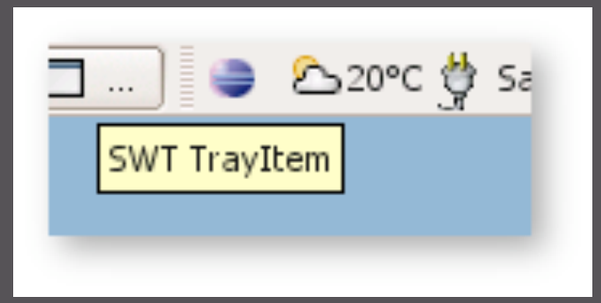
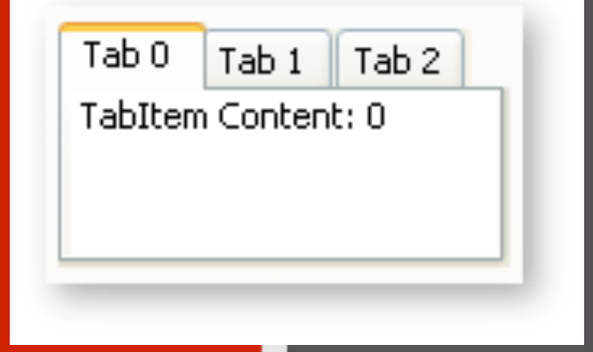
ThoughtWorks Studios.

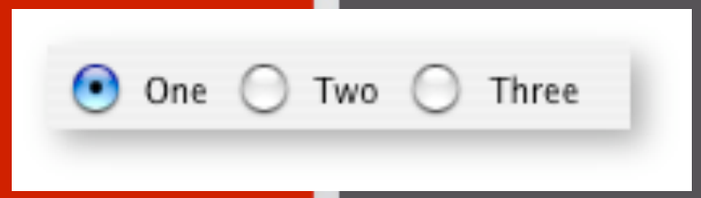


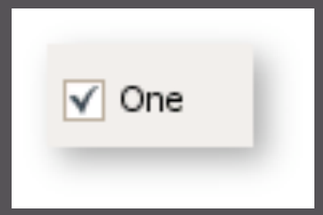


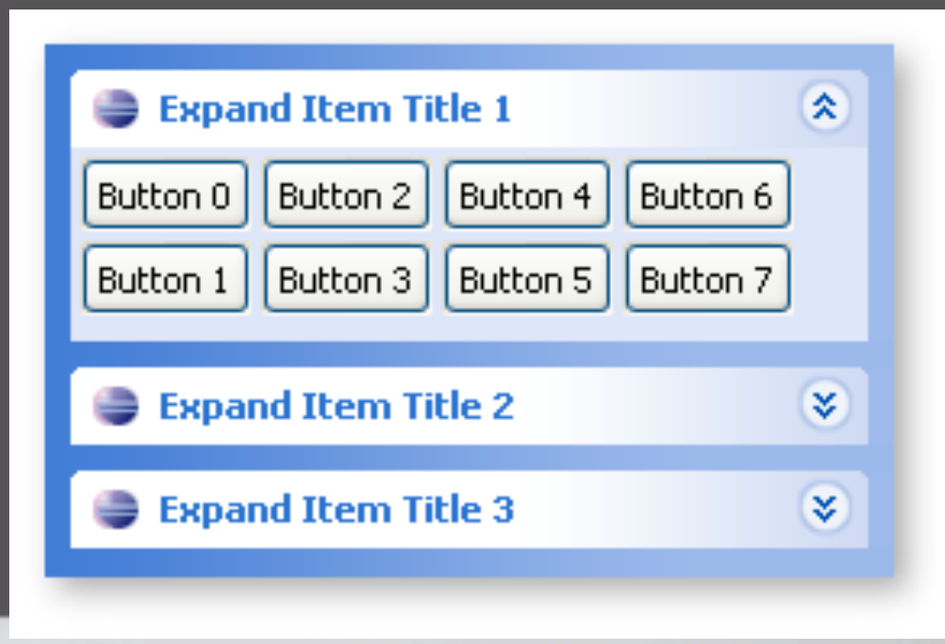


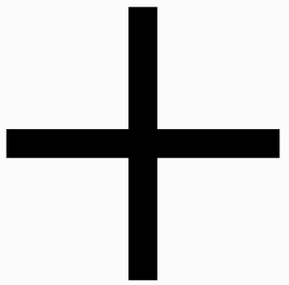












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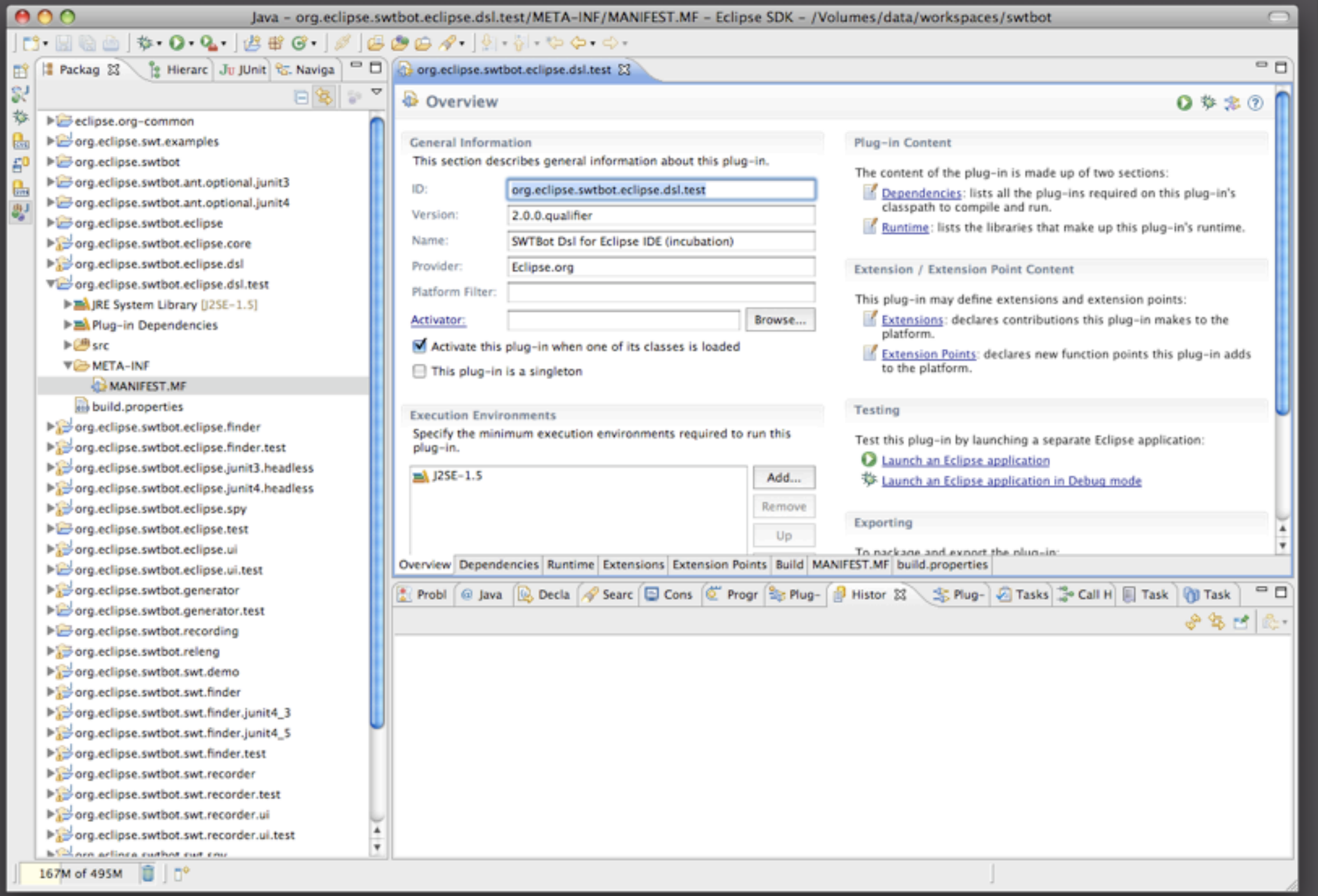

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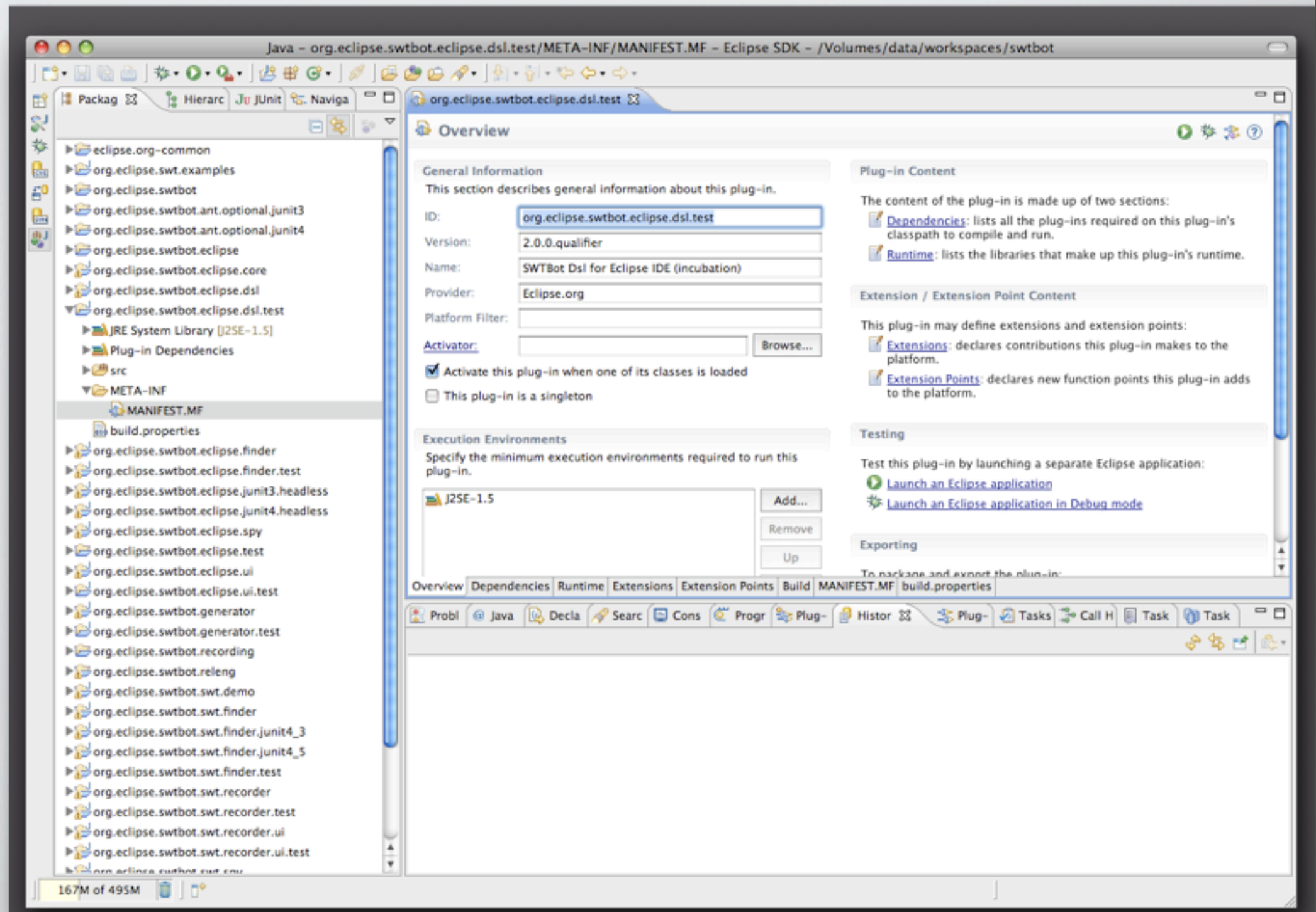
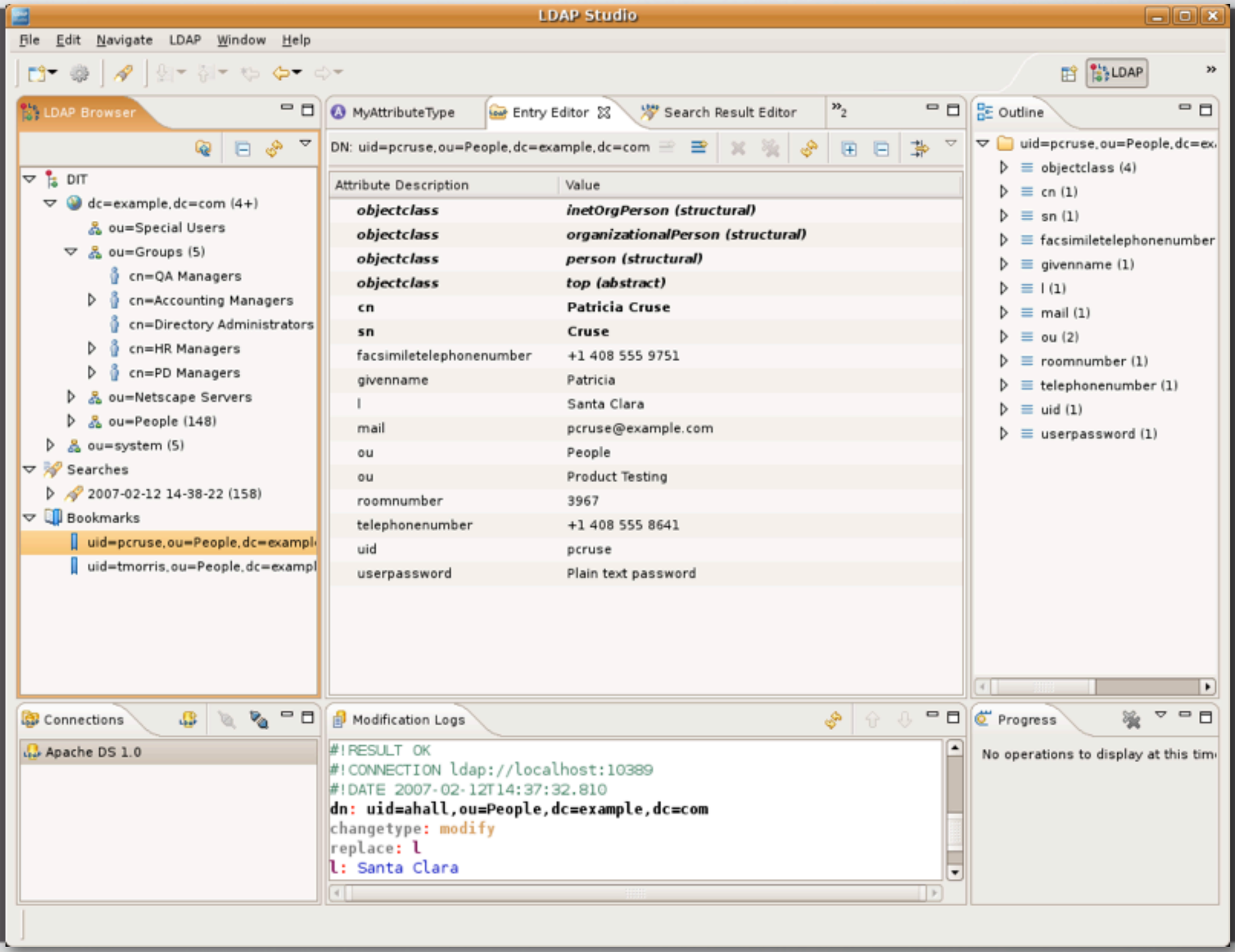
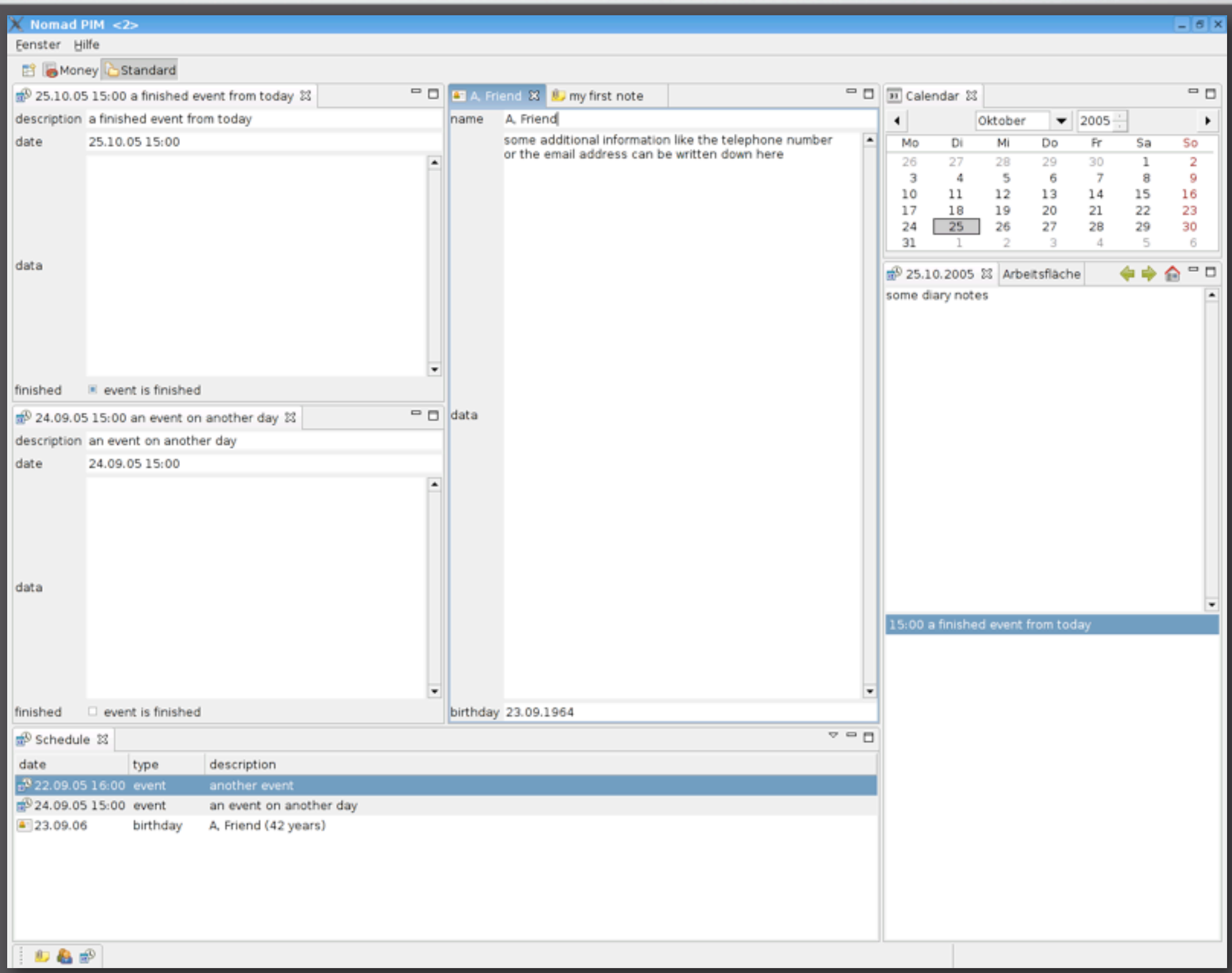
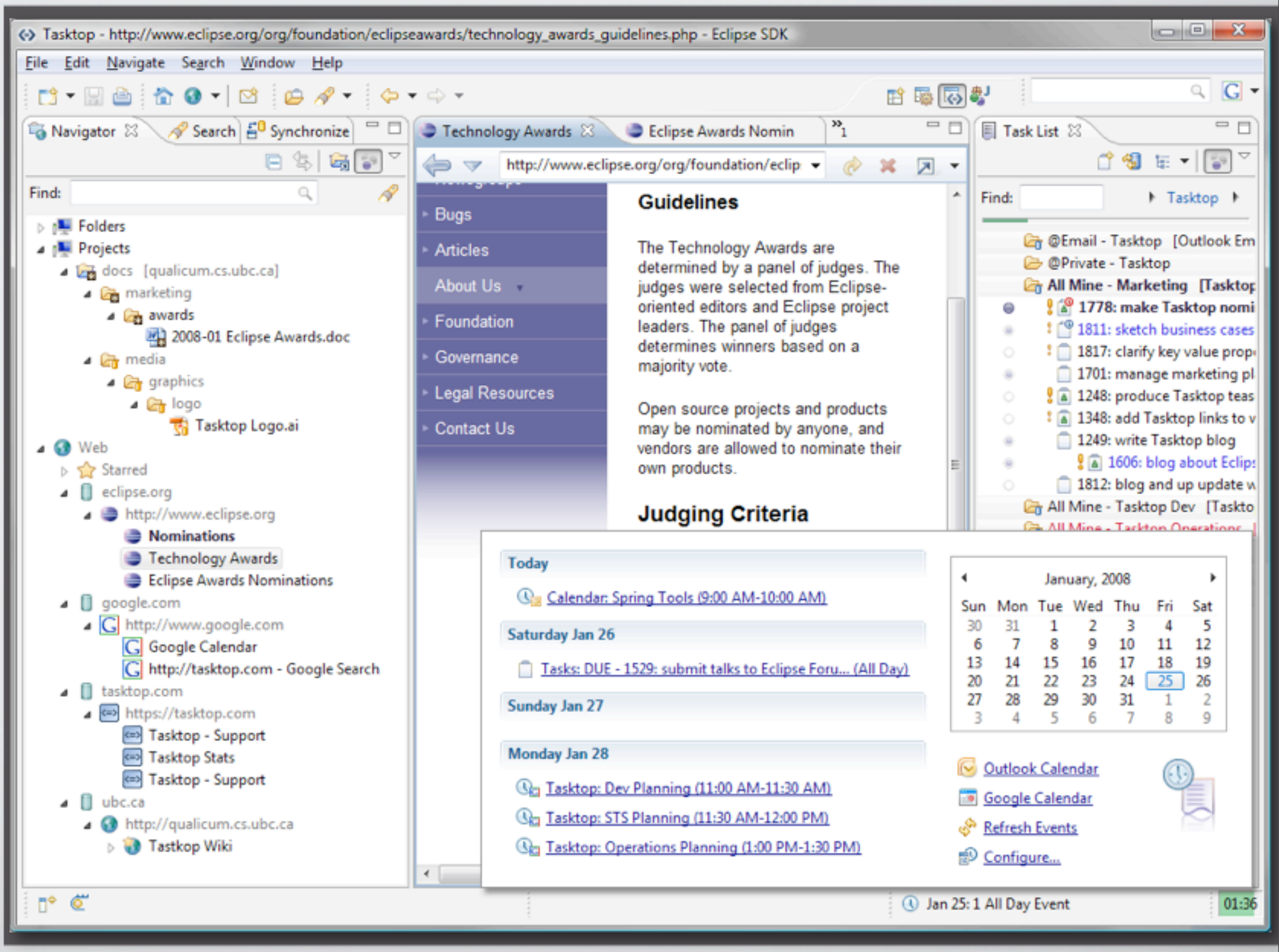








Challenges

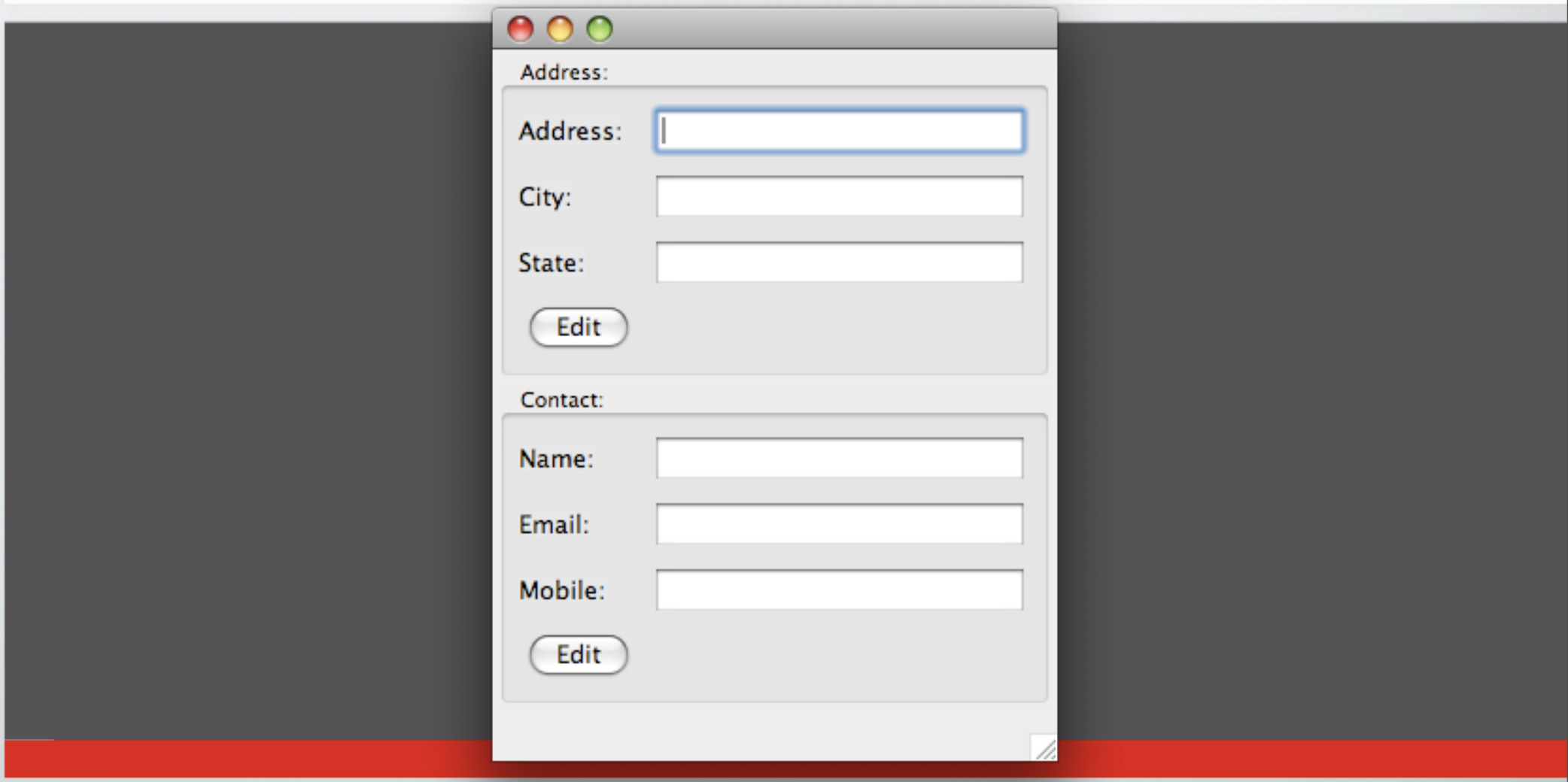
Challenges

Identifying Controls

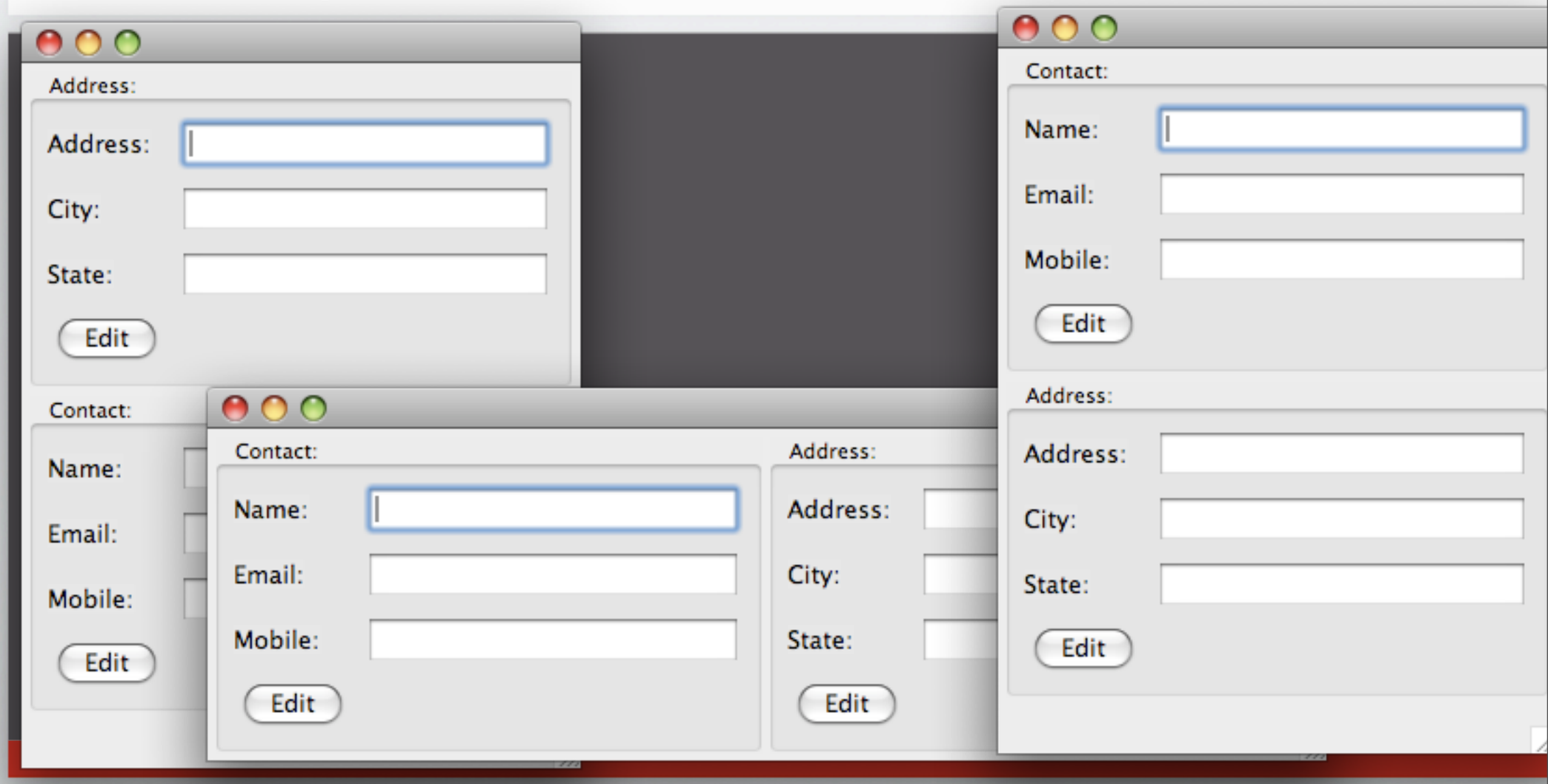
Challenges

Similar looking controls

Similar looking controls



Moving controls



Challenges

Sending “events” to controls

Challenges

Manage SWT Threading

Challenges

Tests to be non-blocking

Challenges

Run in a separate thread

Challenges

Run in a separate thread

Still manage synchronization between threads

Challenges

Multi threaded applications, background jobs

Challenges

Multi threaded applications, background jobs

“Non-deterministic” in amount of time required

Challenges

Internationalization (i18n) and Localization (L10n)

Challenges

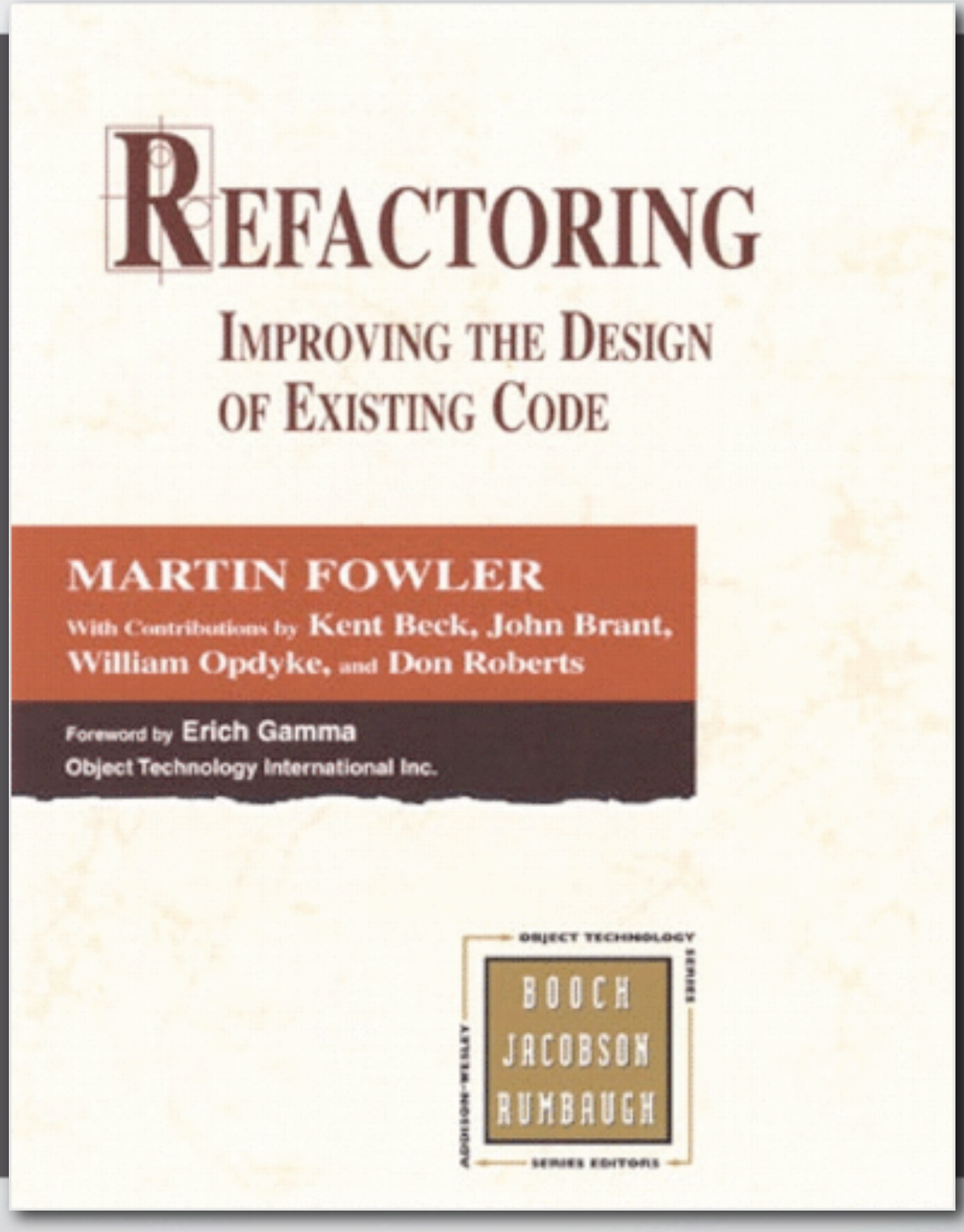
Readability

Challenges

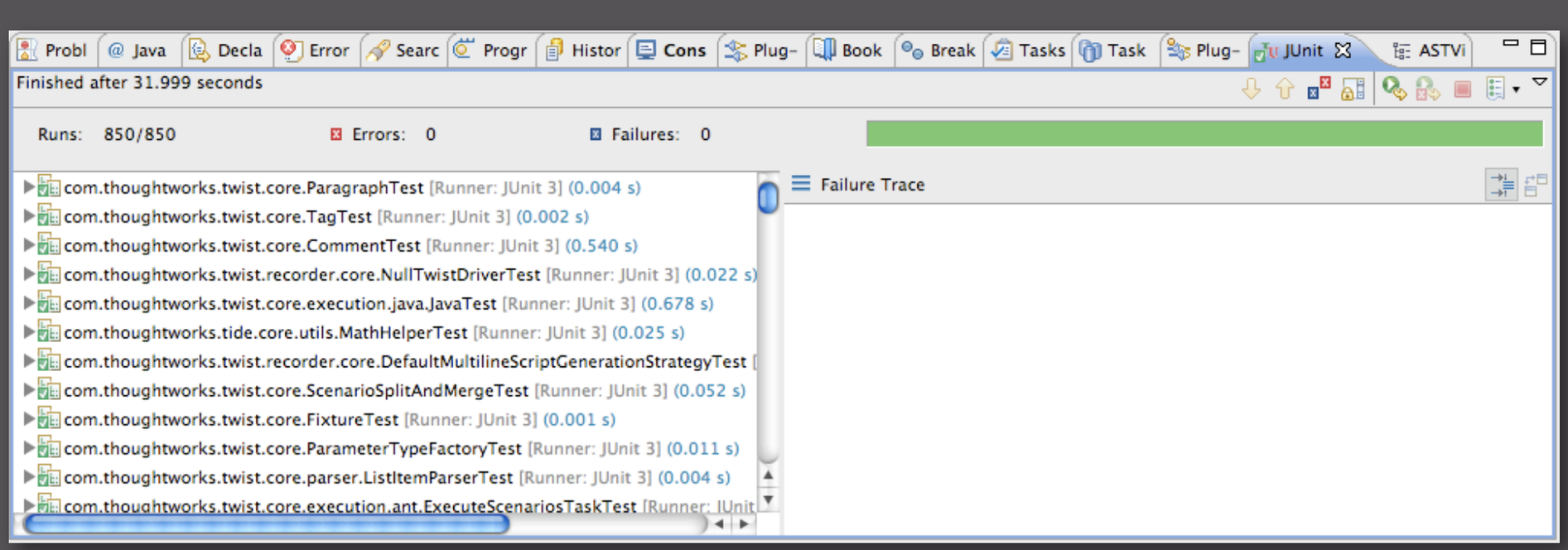
- Identifying controls
- Similar looking controls
- Moving controls
- Sending “events to controls”
- Manage SWT Threading
- Tests to be non-blocking
- Run in a separate thread, and manage synchronization
- Multi threaded applications, background jobs
- Internationalization (i18n) and Localization (L10n)
- Readability

Testing ?

Unit Testing

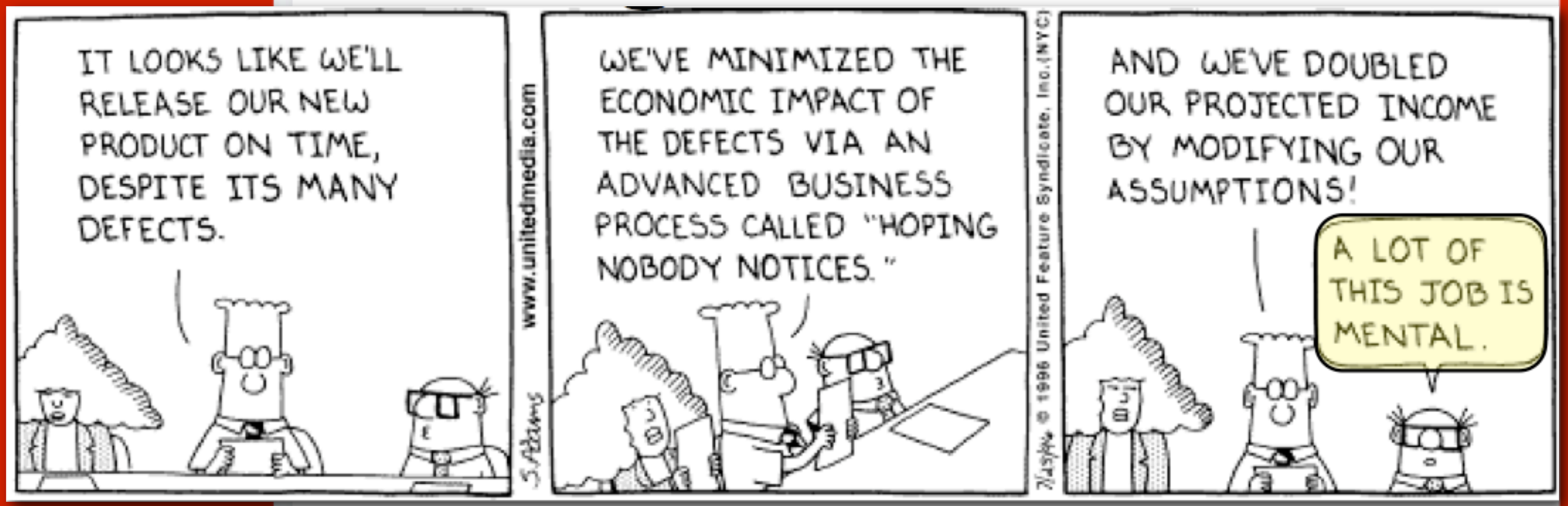


"red green refactor"



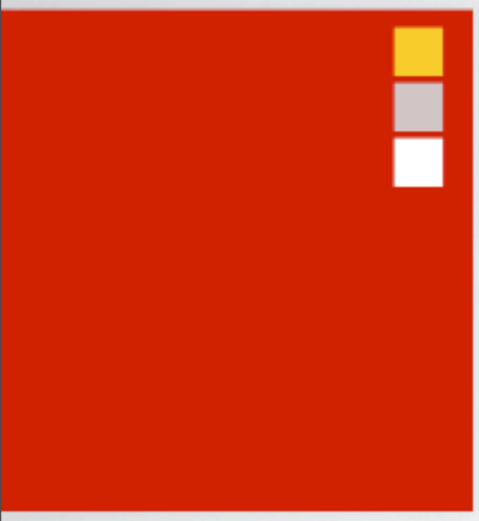
Functional Tests

Writing SWT Tests



Understand SWT

Understand Threading



Quality Analysts/Testers

Quality Analysts/Testers

SWTBot

Agenda

- setting up the environment
- basic SWTBot API
  - custom assertions
  - analyze failures
- how does it work?
  - handling background jobs and long running operations
  - thread safety
  - improve performance
- FluentAPI for common eclipse operations (DSL-ish)

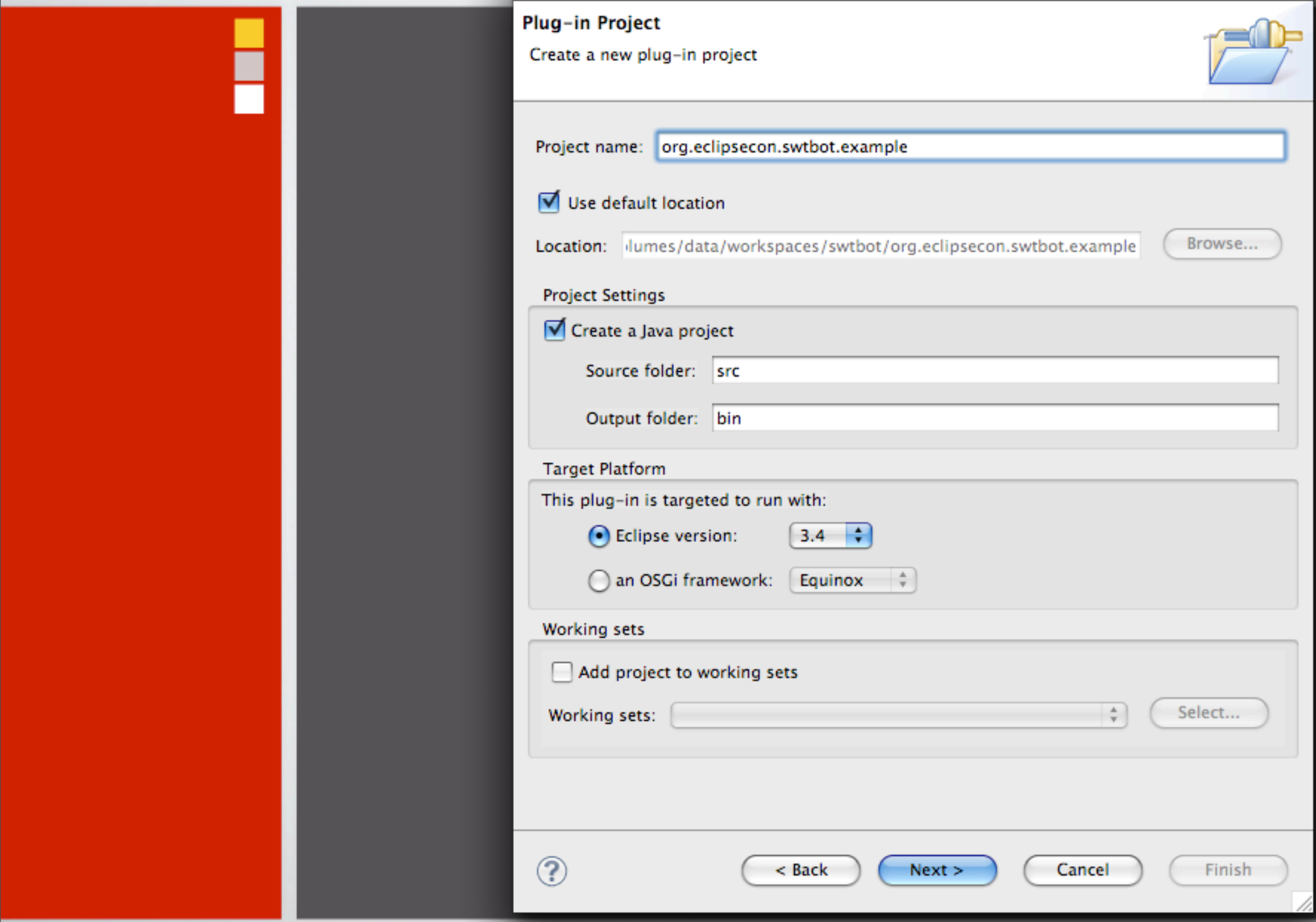
Setting up the Environment

Setting up the Environment

- Eclipse 3.4
- SWTBot update site
  - http://www.eclipse.org/swtbot/downloads.php

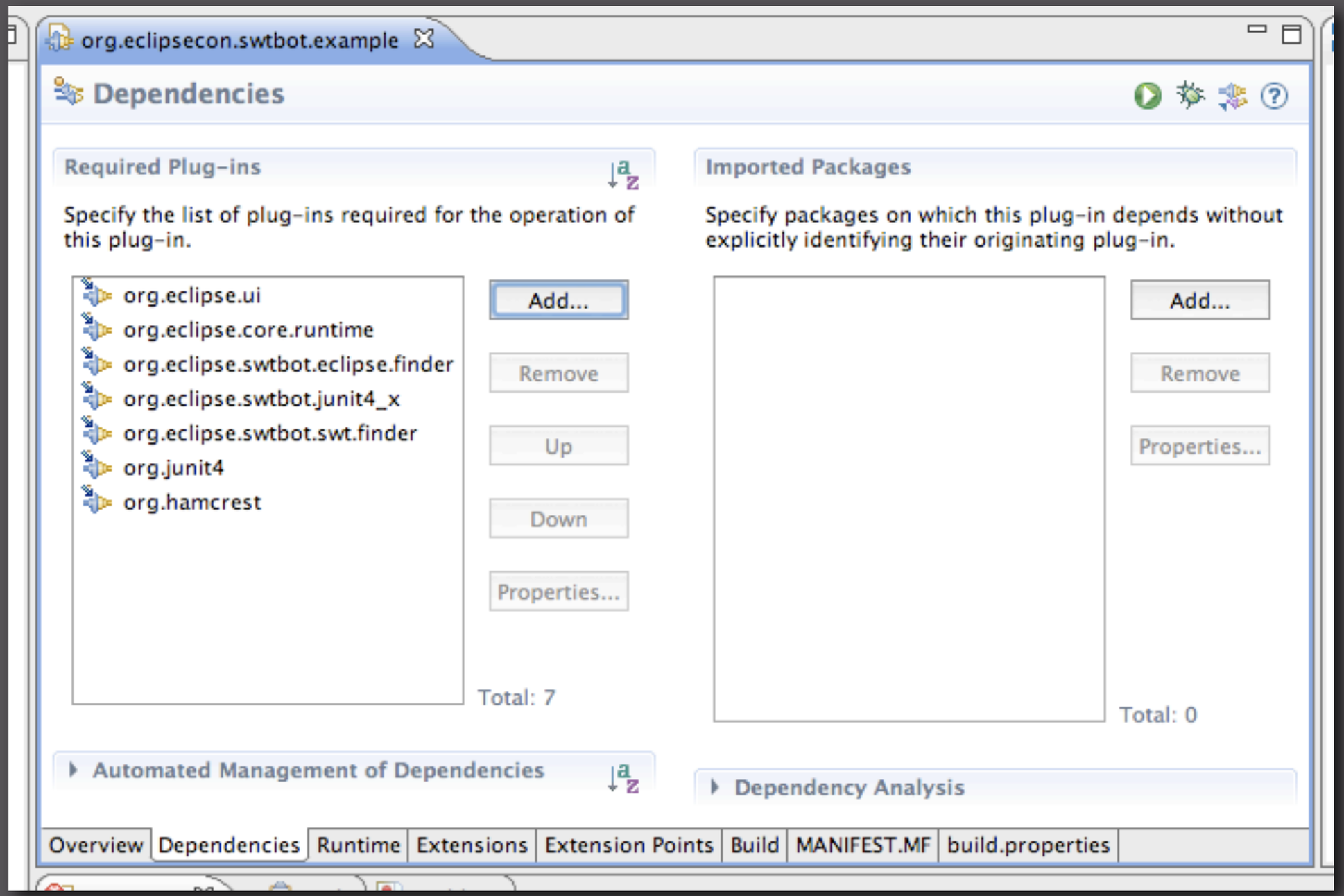
Create a plugin project

- “org.eclipsecon.swtbot.example”



Setup Dependencies

- org.eclipse.ui
- org.eclipse.core.runtime
- org.eclipse.swtbot.eclipse.finder
- org.eclipse.swtbot.junit4_x
- org.eclipse.swtbot.swt.finder
- org.junit4
- org.hamcrest



Basic SWTBot API

The first red and green bar

A “hello world” test!

Setup for the test

- close the “Welcome Page”

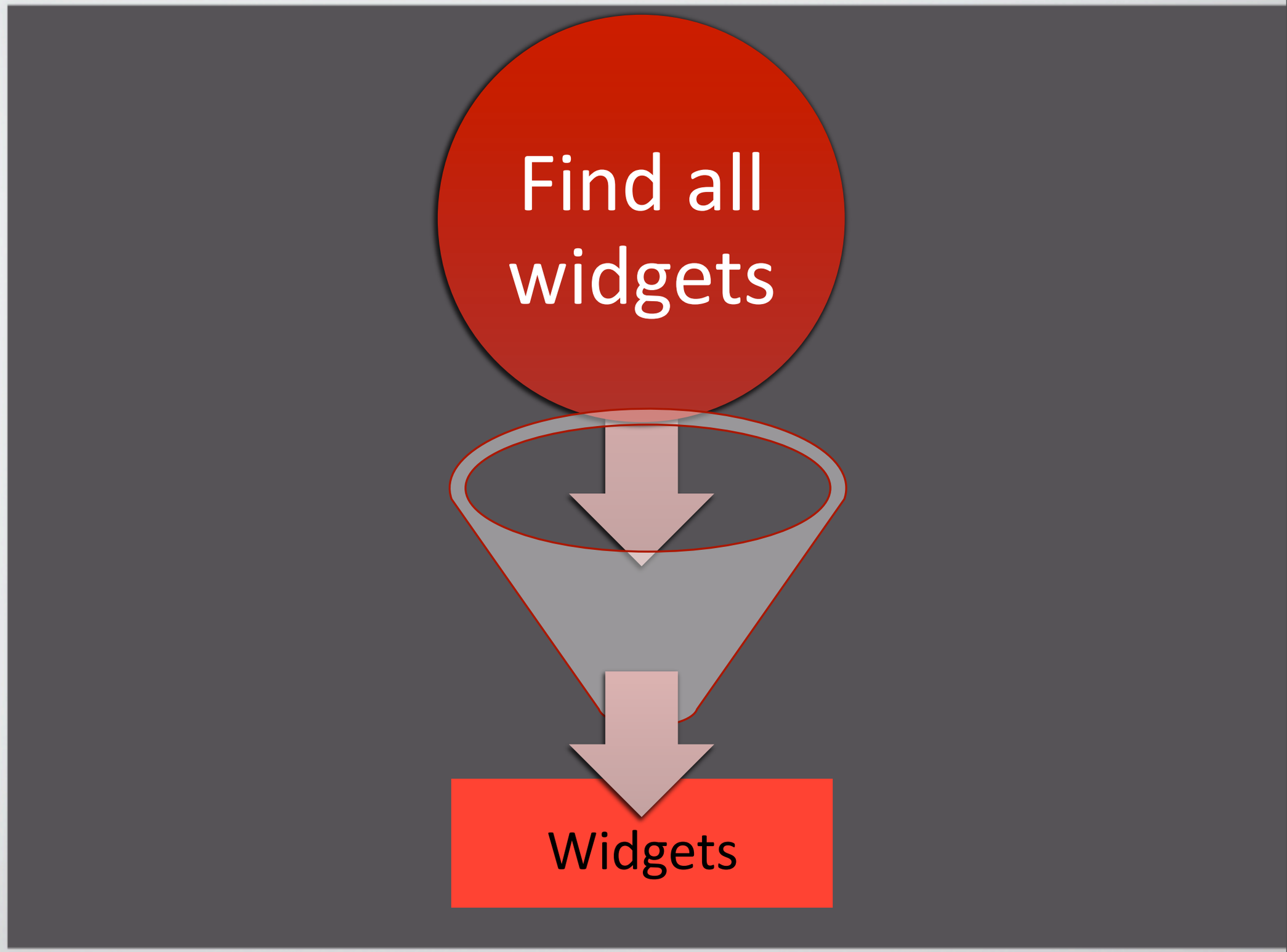
Create tests for

- creating a java project “MyFirstProject”
- creating a java class “org.eclipsecon.project.HelloWorld”
- type in a program that prints “Hello, World”
- execute the program
- verify that the program printed “Hello, World”

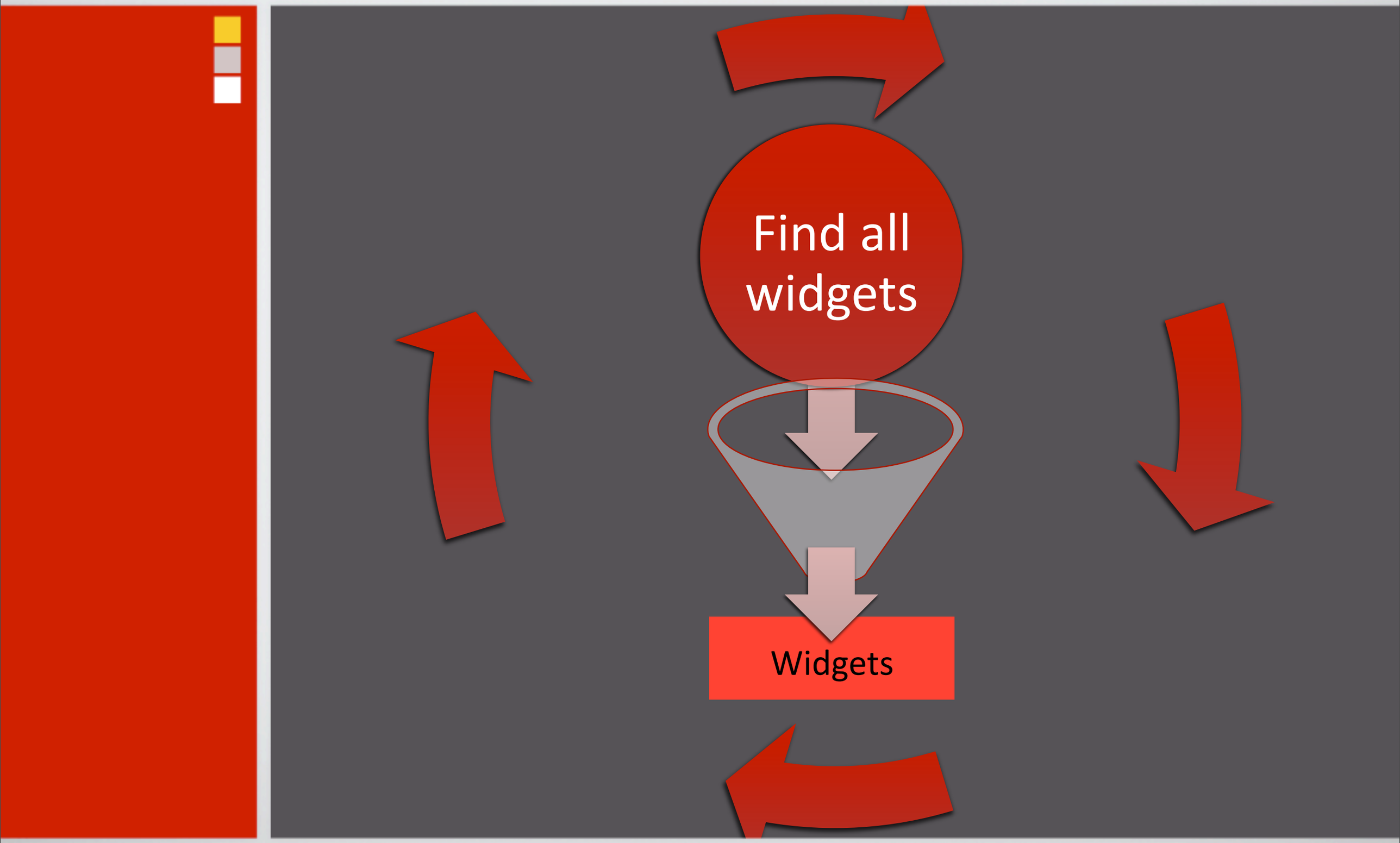
Teardown for the test

- delete the project

How does it work?



Redundancy and Failure Proofing



Find all widgets

- Depth first traversal of UI elements

1. Find top level widgets
    1. Find children of each widget
2. For each child do (1) and (2)

Creating matchers(simple)

- `withText("Finish")`
- `withLabel("Username:")`
- `withRegex("Proceed to step (.*)")`
- `widgetOfType(Button.class)`
- `withStyle(SWT.ARROW, "SWT.ARROW")`

...Creating matchers(combination)

- `allOf(matchers...)`
- `anyOf(matchers...)`
- `not(matcher)`
- `allOf(anyOf(matchers...), matchers...)`

Handling long running operations

- describe a condition
- poll for the condition at intervals
- wait for it to evaluate to `true` or `false`
- of course there's a timeout

Handling Waits(SWTBot.java)

```
private void waitUntil(ICondition condition, long timeout, long interval) {

    long limit = System.currentTimeMillis() + timeout;
    condition.init((SWTBot) this);
    while (true) {
        try {
            if (condition.test())
                return;
        } catch (Throwable e) {
            // do nothing
        }
        sleep(interval);
        if (System.currentTimeMillis() > limit)
            throw new TimeoutException("Timeout after: " + timeout);
    }
}
```

The whole thing put together

The End User API

Finding widgets (SWTBot.java)

```
public SWTBotTree treeWithLabelInGroup(String l, String g, int i) {

      // create the matcher
      Matcher matcher =
            allOf(
                  widgetOfType(Tree.class), withLabel(l), inGroup(g)
            );
      // find the widget, with redundancy built in
      Tree tree = (Tree) widget(matcher, index);
      // create a wrapper for thread safety
      // and convinience APIs
      return new SWTBotTree(tree, matcher);
}
```

Thread Safety

- Tests should run in non-ui thread
- query state of a widget
- change state of a widget

Thread Safety (Query state)

```
public class SWTBotCheckBox {
public boolean isChecked() {
   // evaluate a result on the UI thread
   return syncExec(new BoolResult() {
      public Boolean run() {
         return widget.getSelection();
      }
   });
   }
}
```

Thread Safety(change state)

```
public class SWTBotCheckBox {
    public void select() {
        asyncExec(new VoidResult() {
            public void run() {
                widget.setSelection(true);
            }
        });
        notifyListeners();
    }

    protected void notifyListeners() {
        notify(SWT.MouseDown);
        notify(SWT.MouseUp);
        notify(SWT.Selection);
    }
}
```

Building Abstractions

Features and capabilities of tests (Page Objects)

- Project Explorer
- The Editor
- The Console View
- The main menu bar, tool bar

Features and capabilities of tests (Domain Objects)

- Create a project
- Delete a project
- Create a class
- Execute a class
- more...

Page Objects

http://code.google.com/p/webdriver/wiki/PageObjects

Page Objects... should

- Represent the services offered by the page to the test developer
- Internally knows the details about how these services are offered and the details of UI elements that offer them
- Return other page objects to model the user's journey through the application
- Different results of the same operation modeled differently

Page Objects... should not

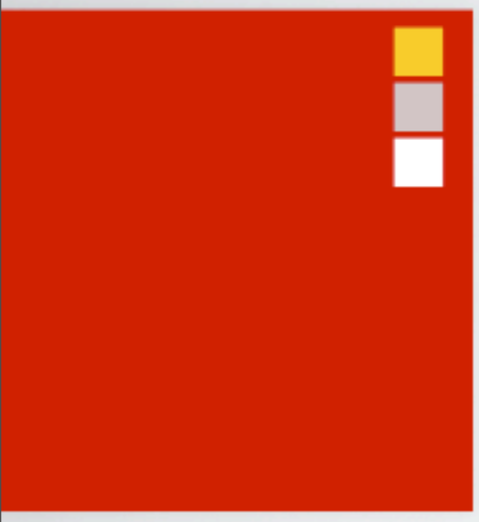
- Expose details about user interface elements
- Make assertions about the state of the UI

Page Objects (implementation)

```
public class LoginPage {

public HomePage loginAs(String user, String pass) {
    // ... clever magic happens here
}

    public LoginPage loginAsExpectingError(String user, String pass) {
        // ... failed login here, maybe because one or both of
        // username and password are wrong
    }

    public String getErrorMessage() {
        // So we can verify that the correct error is shown
    }
}
```

Page Objects (usage)

```
// the bad test
public void testMessagesAreReadOrUnread() {
    Inbox inbox = new Inbox(driver);
    inbox.assertMessageWithSubjectIsUnread("I like cheese");
    inbox.assertMessageWithSubjectIsNotUndread("I'm not fond of tofu");
}

// the good test
public void testMessagesAreReadOrUnread() {
    Inbox inbox = new Inbox(driver);
    assertTrue(inbox.isMessageWithSubjectIsUnread("I like cheese"));
    assertFalse(inbox.isMessageWithSubjectIsUnread("I'm not fond of tofu"));
}
```



```
   LoginPage login = new LoginPage();
HomePage home = login.loginAs("username", "secret");
SearchPage search = home.searchFor("swtbot");
assertTrue(search.containsResult("http://eclipse.org/swtbot"));
```

Exercise: Page Objects

- Refactor the tests in the form of a PageObject

Domain Objects

Domain Objects... should

- Represent the operations that can be performed on concepts

Domain Objects

```
public class JavaProject {
   public JavaProject create(String projectName){
      // create a project and return it
   }
   public JavaProject delete(){
      // delete the project and return it
   }
   public JavaClass createClass(String className){
      // create a class and return it
   }
}
```


Going ahead

- Commonly used functionality bundled as convenience API
- Eclipse Forms
- GEF!
- Use “real” events instead of “mocks”

Questions ?

newsgroup: news://news.eclipse.org/eclipse.swtbot

web: eclipse.org/swtbot

gmail: KetanPadegaonkar

Resources

- http://flickr.com/photos/stuart100/288880576/
- http://flickr.com/photos/60373916@N00/229233928/
- http://www.flickr.com/photos/jfravel/1001472806/
- http://www.flickr.com/photos/54323936@N00/245650981/
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- http://www.flickr.com/photos/pintuck/283795079/
- http://www.flickr.com/photos/o3bor/209925927/
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