Single-Sourcing Techniques for RAP and RCP

Frank Appel
Technical Lead, RAP
fappel@innoopract.com

Agenda

Basics

Setup

Dependencies

Extensions

API Differences

Lift Off

API Differences II

Multi-User Environment

Agenda

Basics

Setup

Dependencies

Extensions

API Differences

Lift Off

API Differences II

Multi-User Environment

What is RAP?

- rich internet application runtime platform
- based on the Eclipse programming model
- single sourcing for rich client- and web-applications

Cobbler, stay with your trade

Single Sourcing

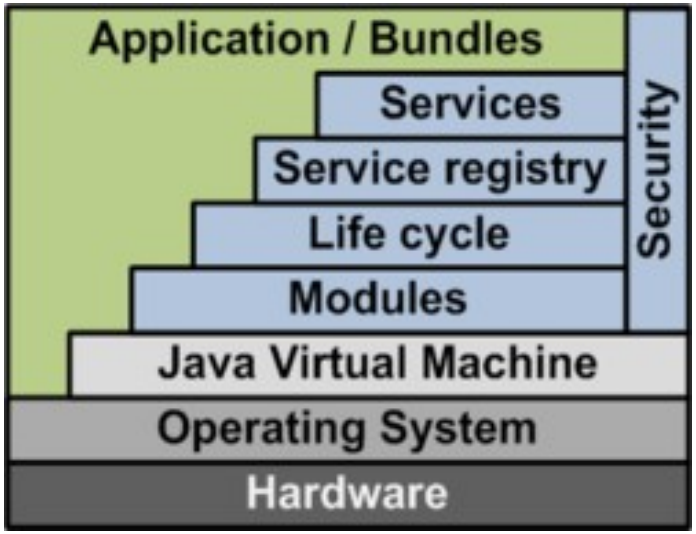
- common codebase for rich- and web-clients
- reuse of existing RCP code
  - 70% - 90% is possible
  - RAP provides only a subset of RCP
  - applications need to become multi-user enabled

Groundwork - OSGi

Plug-ins, Plug-ins, Plug-ins...

OSGi specifies a dynamic component model:

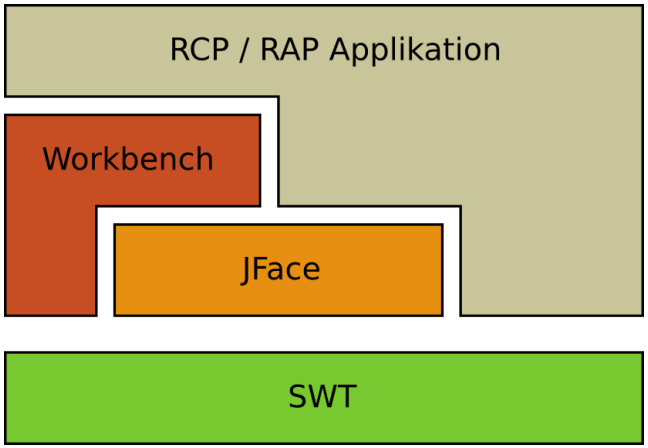
- Module – encapsulation and declaration of dependencies
- Life Cycle – API for life cycle management
- Service Registry – providing functionality to other bundles
- Security layer – limit bundle functionality to pre-defined capabilities



the Eclipse OSGi implementation is provided by the Equinox project

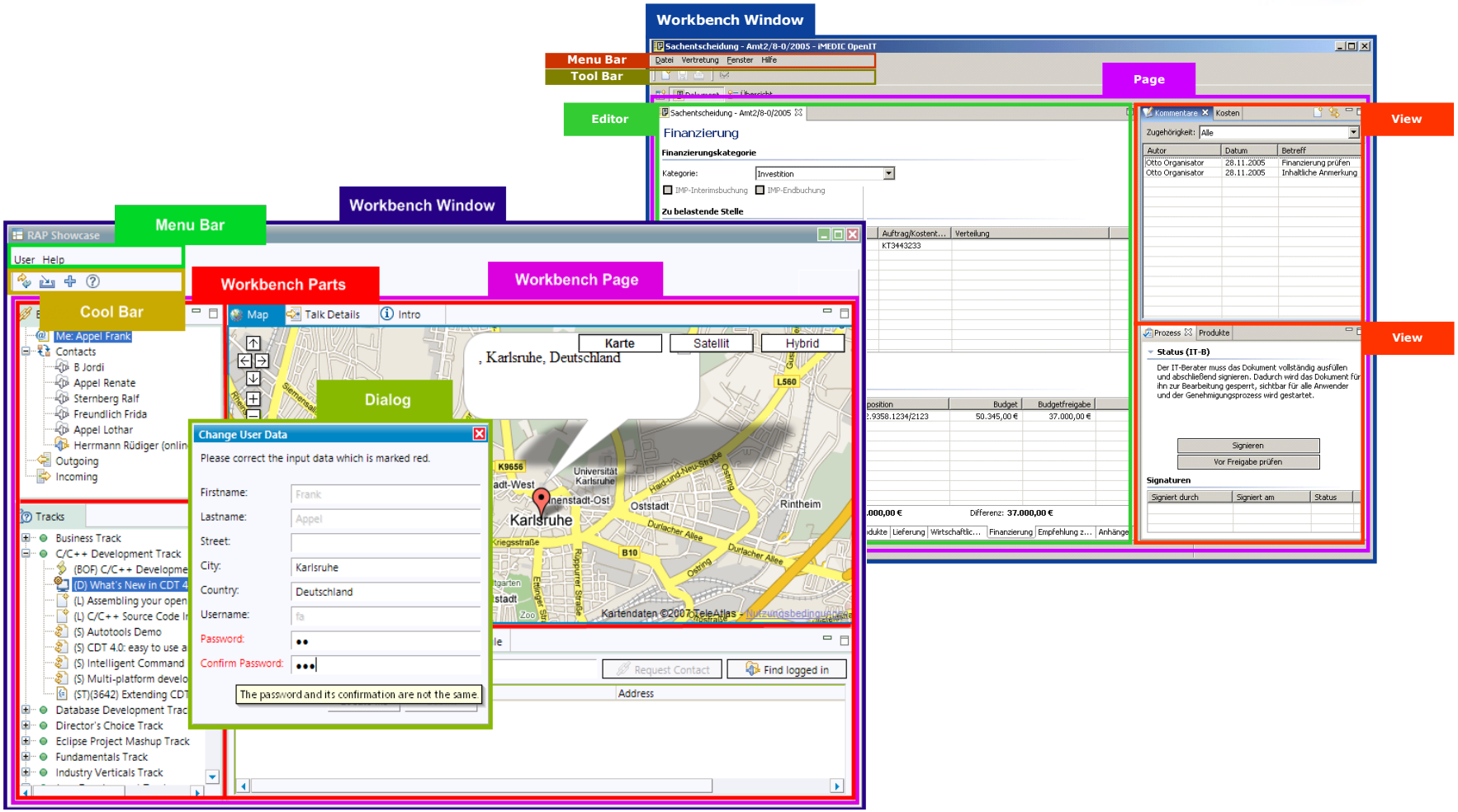
On the surface

Contribution to a powerful UI Concept



- Standard Widget Toolkit (SWT)
  - delivers native widget functionality for the Eclipse platform in an operating system independent manner
- JFace
  - sits on top of SWT and provides classes for handling common UI programming tasks
- Workbench
  - is responsible for the presentation and coordination of the user interface

Best of both worlds



Select a point of view

Problem Cases

Differences between RCP and RAP

- RAP runs in a multi-user environment
  - one OSGi instance for all sessions in RAP
  - singletons are shared between sessions
  - no implicit thread to session assignment
  - resources (images, colors und fonts) are shared

- thin-client architecture
  - API limitations (no GC, no MouseMove events)

Agenda

Basics

Setup

Dependencies

Extensions

API Differences

Lift Off

API Differences II

Multi-User Environment

Hand tools

Download

- Java Runtime Environment

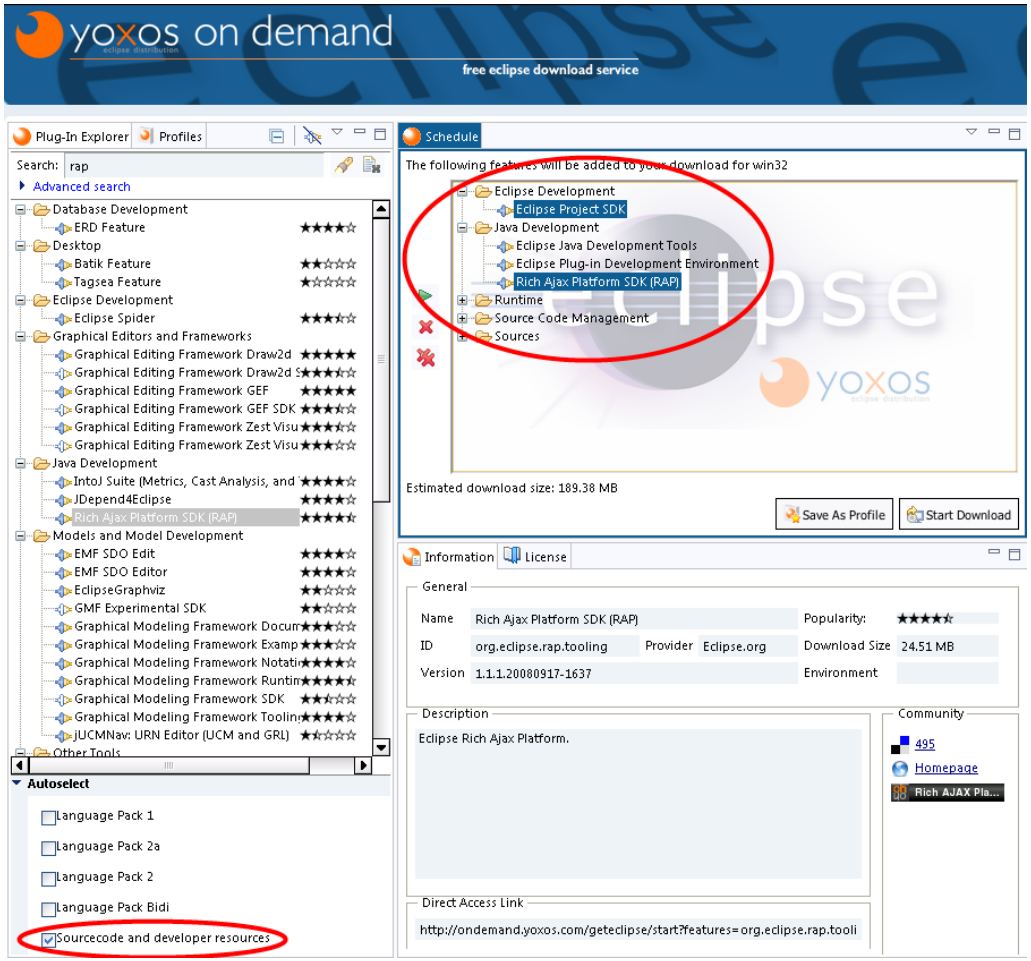
  http://www.java.com/de/download/
- Eclipse SDK

  http://www.eclipse.org/downloads/
- RAP SDK

  http://www.eclipse.org/rap/downloads/

Eclipse Distributions z.B.

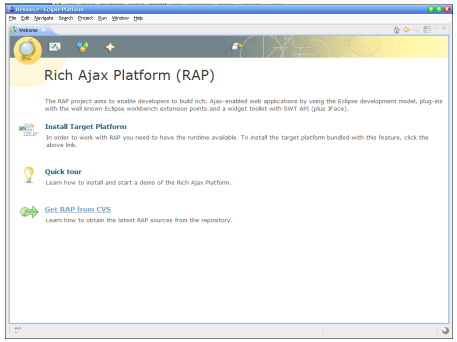
http://ondemand.yoxos.com/

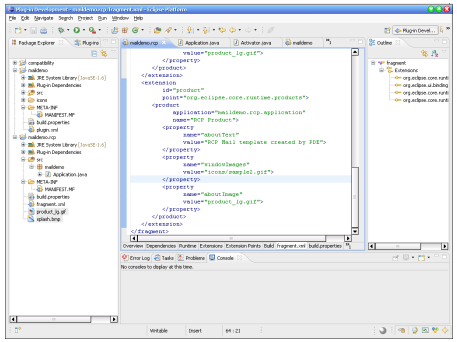


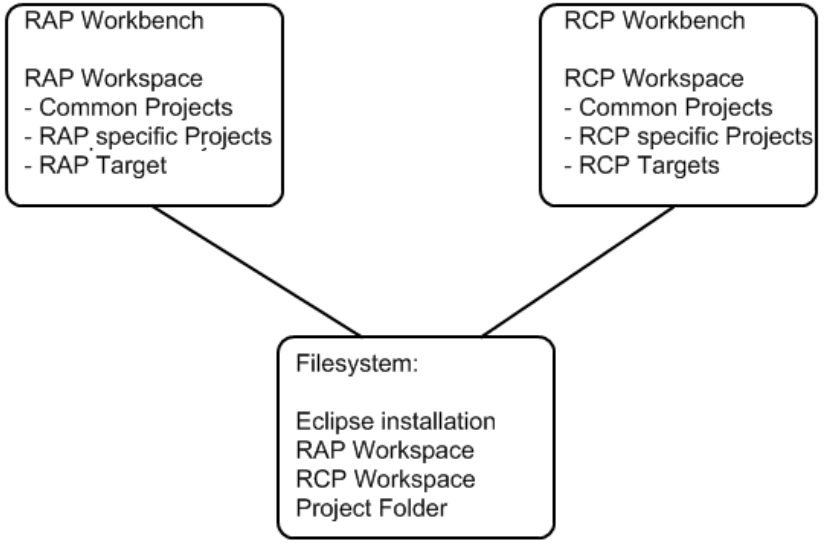
Workplace

2 Workbench Instances

- RAP and RCP need different targets
- switching a target is time-consuming because the complete workspace is recompiled



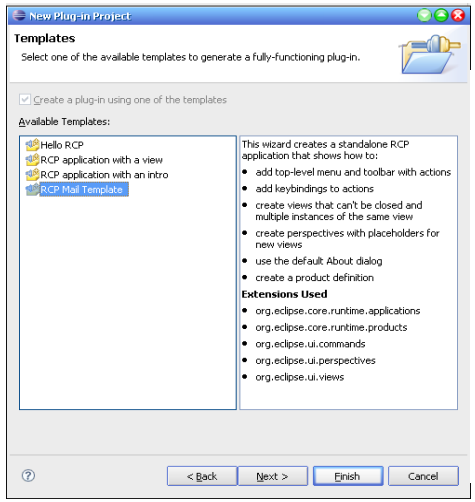


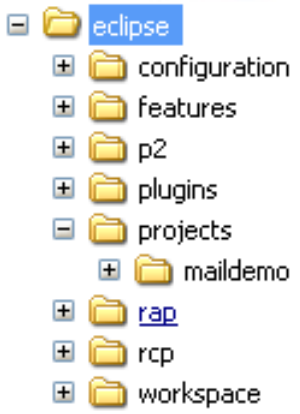


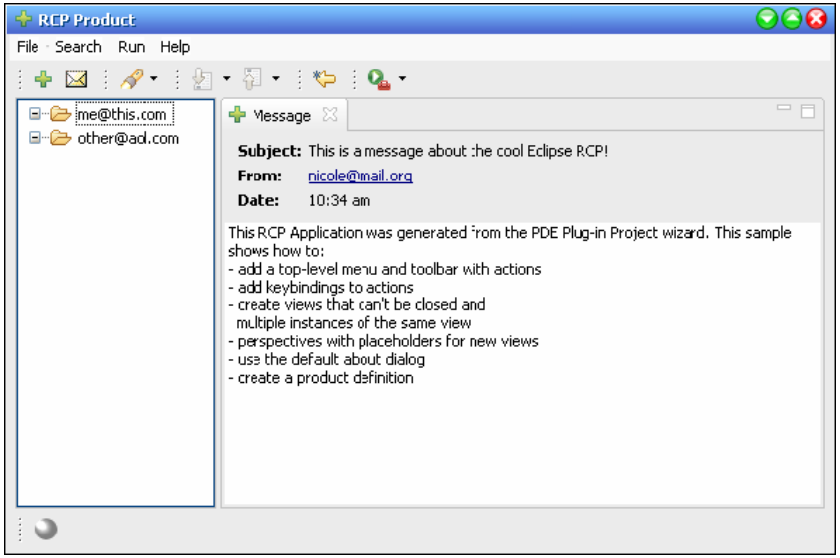
The Example Application

RCP Mail Demo

- created by using the new plug-in project wizard in the RCP workbench
- filed in a common projects folder
- created as Rich Client Application
- runs immediately



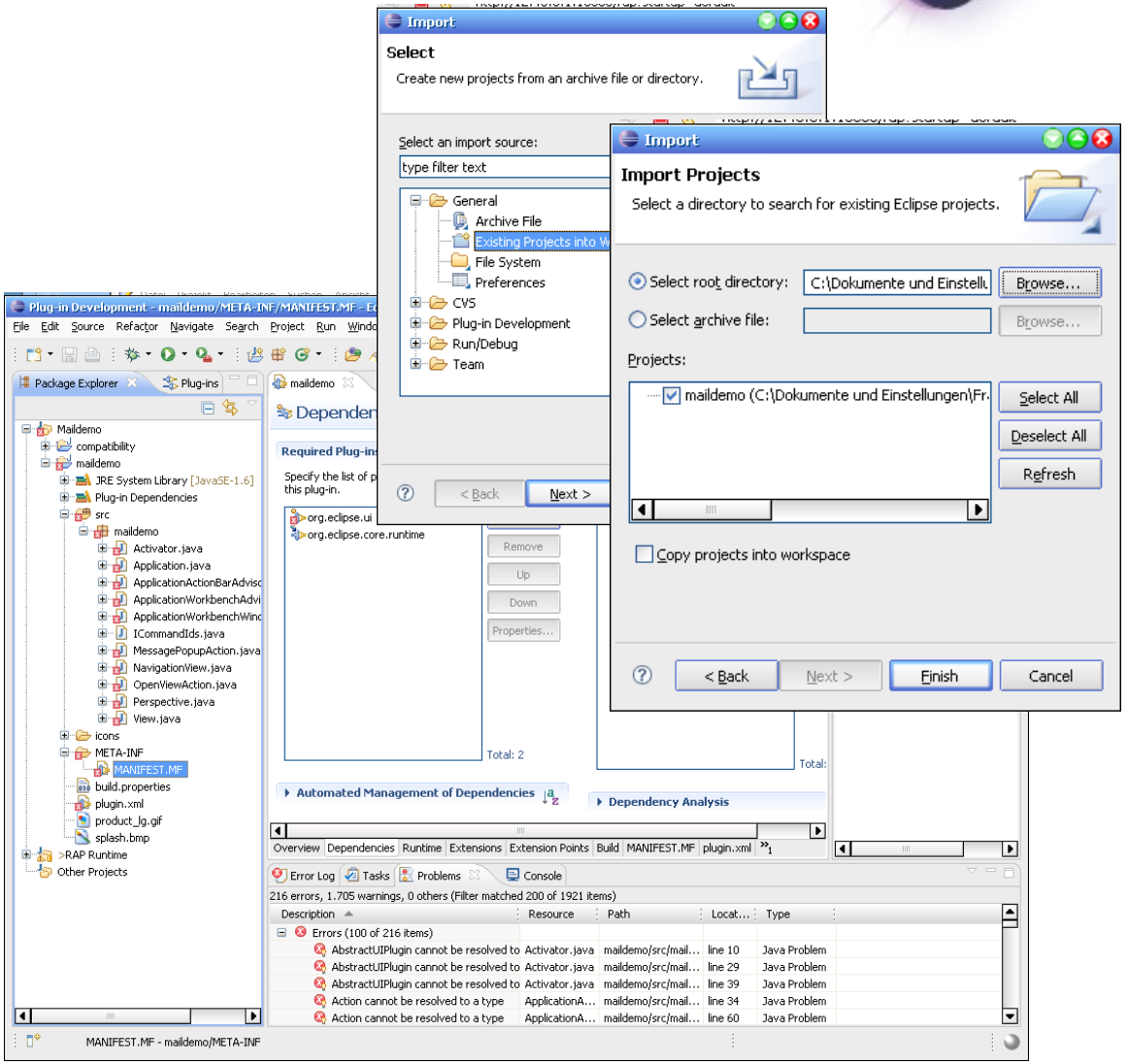




Import to the RAP Development Environment

RAP Mail Demo

- import using the import project wizard
- after import 216 error markers
- step by step conversion to support both runtimes



Agenda

Basics

Setup

Dependencies

Extensions

API Differences

Lift Off

API Differences II

Multi-User Environment

Dependencies

The problem of different UI libraries

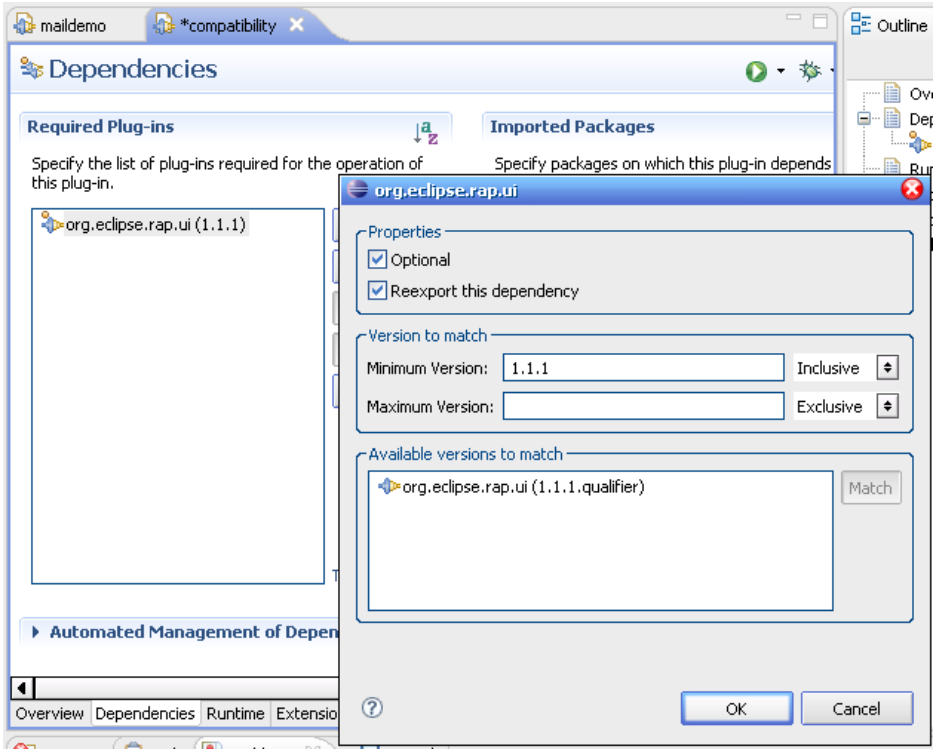
possible solutions:

- package import
  - OSGi specification section 3.13.2
  - problems caused by split-packages
- optional dependencies on both library versions
  - warnings caused by missing bundle references
  - UI abstraction layer

Dependencies

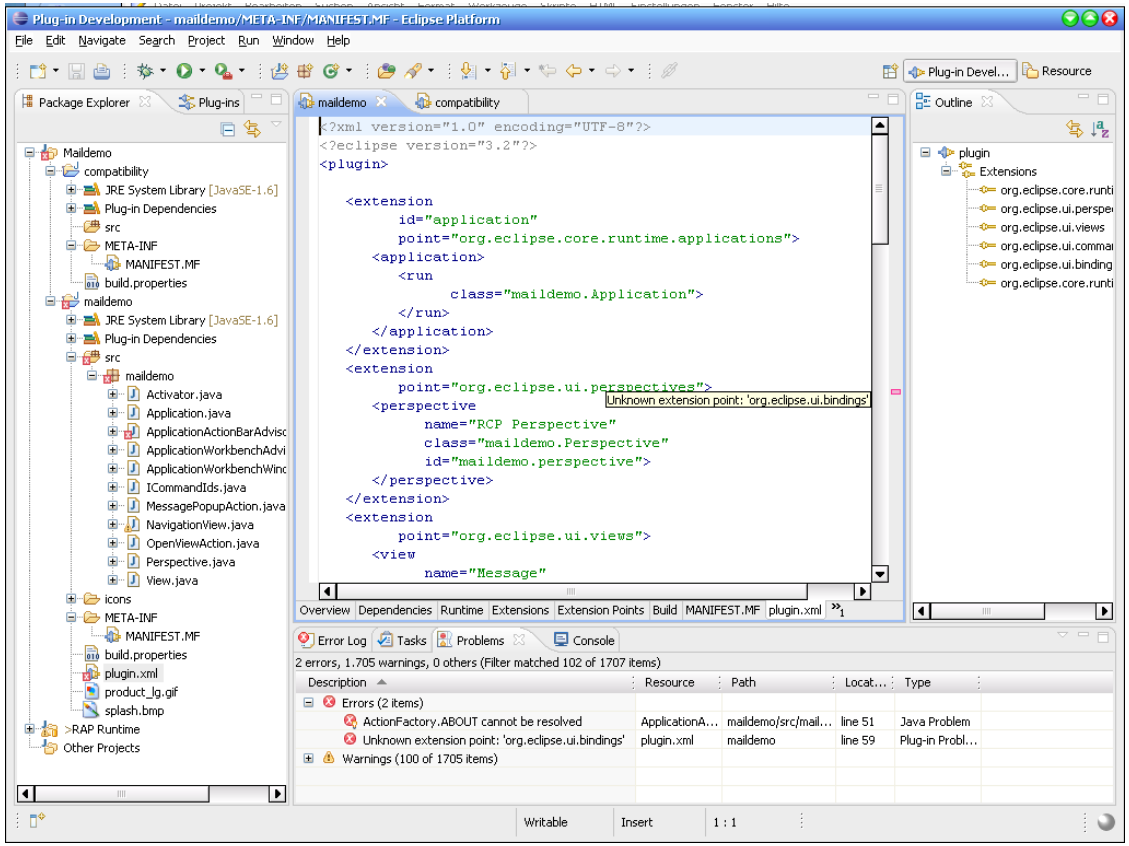
The compatibility plug-in

- location in projects folder
- import into both workspaces
- list of required bundles
  - org.eclipse.rap.ui
  - org.eclipse.ui
- properties
  - 'Optional'
  - 'Reexport this dependency'



Dependencies

RAP workspace after switching the UI dependencies



Agenda

Basics

Setup

Dependencies

Extensions

API Differences

Lift Off

API Differences II

Multi-User Environment

Extensions

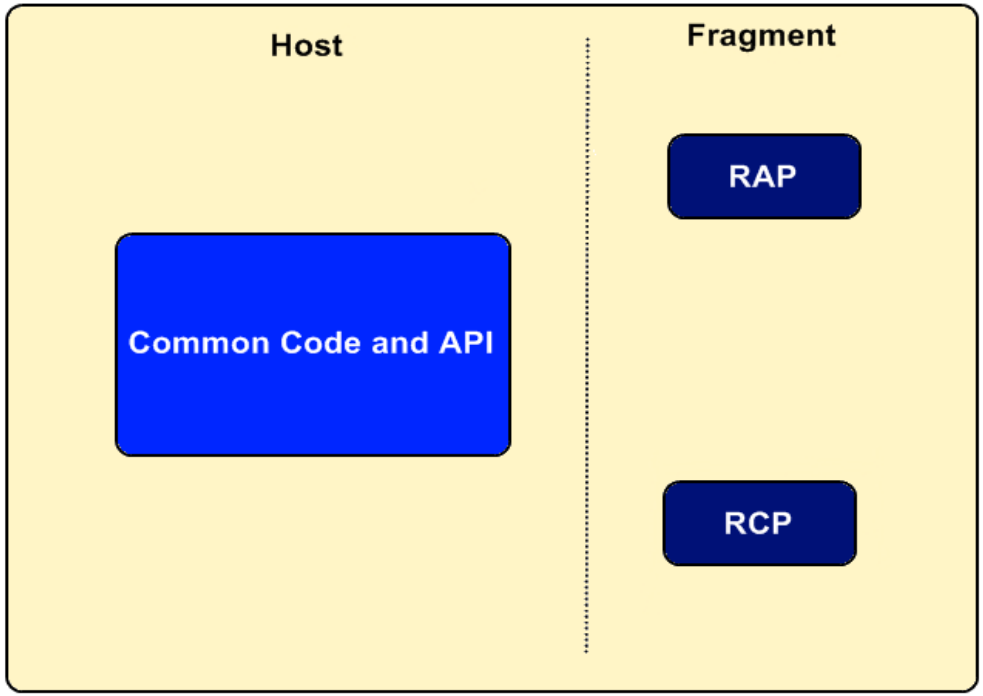
The problem of different Extension-Points

- not all RCP E-Ps are available in RAP
  - e.g. bindings, helpSupport …
- additional RAP E-Ps for web specific requirements
  - e.g. entrypoint, phaselistener …

Extensions

Fragment Solution

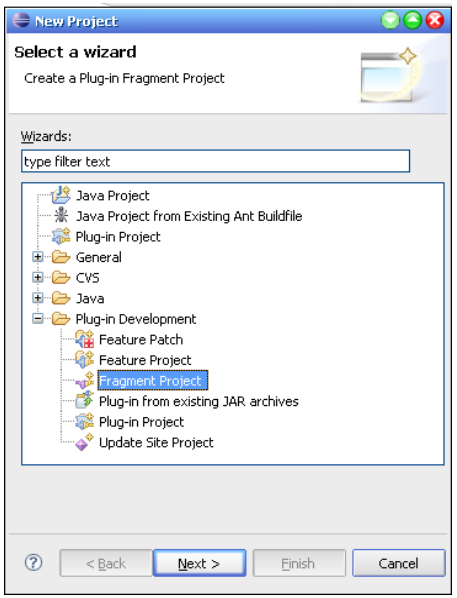
- two fragments per plug-in
  - one for RAP specifics
  - one for RCP specifics
- at runtime, only the plug-in that fits the environment will be installed
- platform specific E-P contributions are moved into the corresponding fragment
- bundle structure stays intact

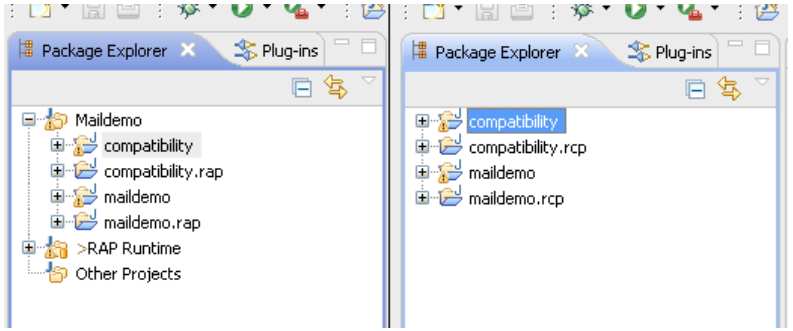


Extensions

Creation of the Fragment Projects

- using the new project wizard
  - fragment project
  - all fragments are filed in the projects folder
- the following fragments are created
  - compatibility.rap
  - compatibility.rcp
  - maildemo.rap
  - maildemo.rcp
- each workspace contains only the relevant fragments

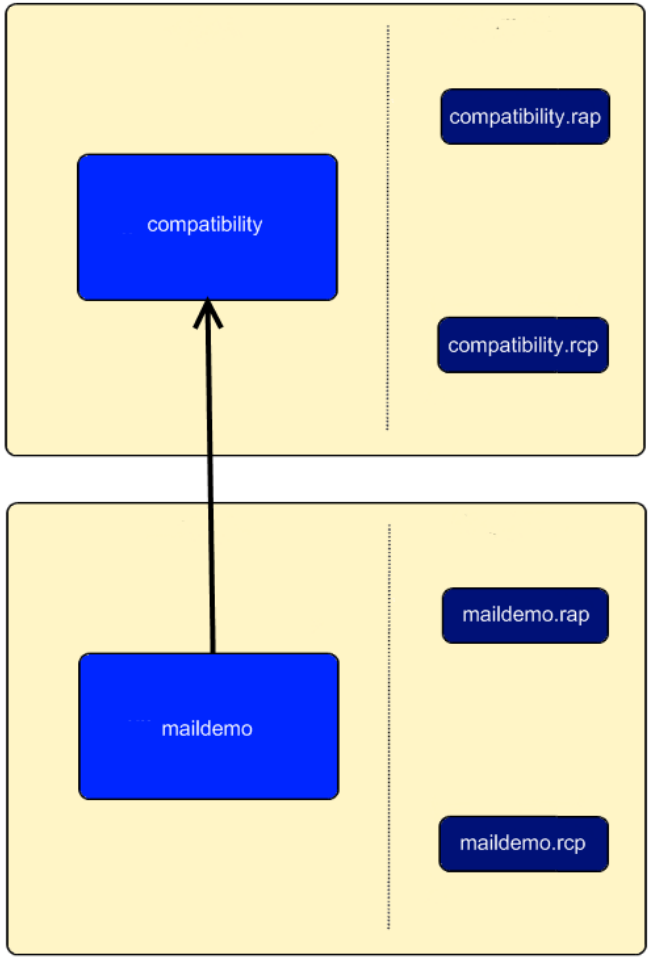




Extensions

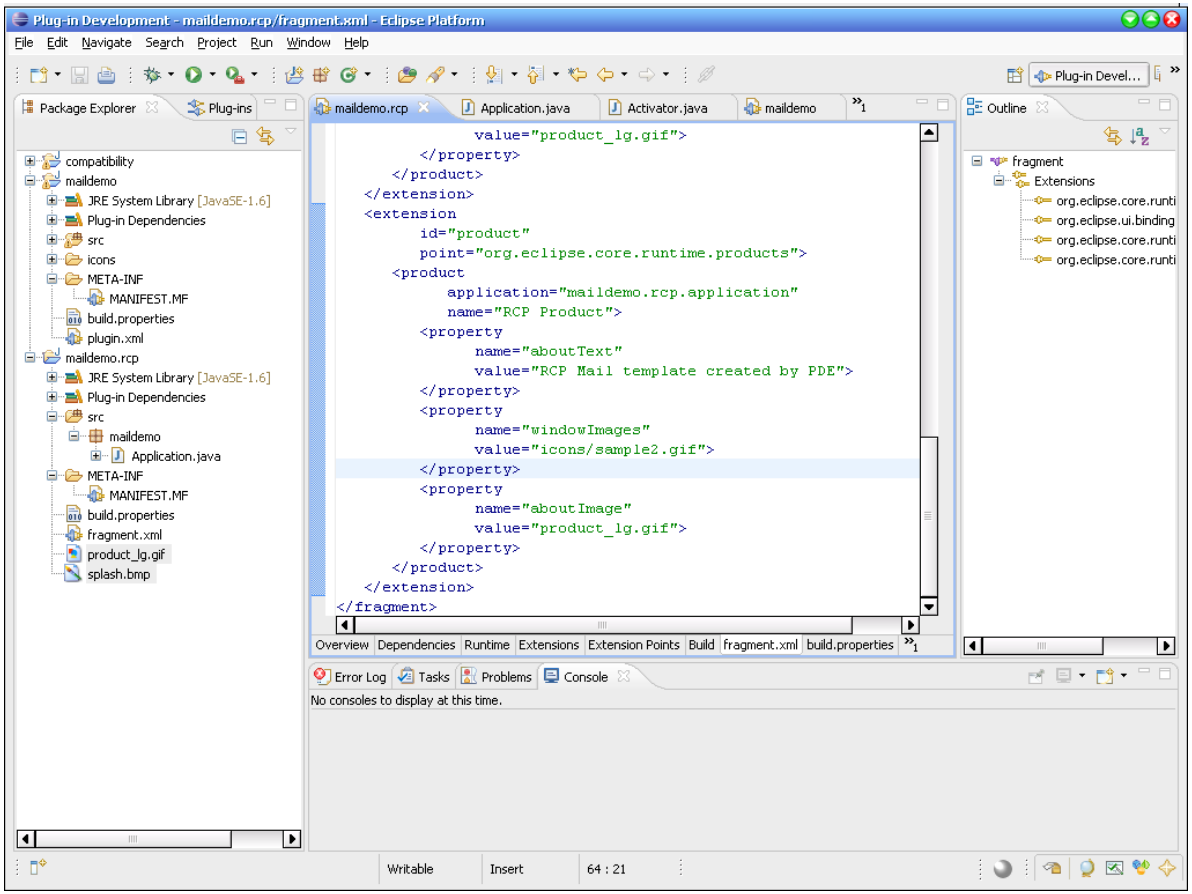
Creation of the Fragment Projects

- using the new project wizard
  - fragment project
  - all fragments are filed in the projects folder
- the following fragments are created
  - compatibility.rap
  - compatibility.rcp
  - maildemo.rap
  - maildemo.rcp
- each workspace contains only the relevant fragments



Extensions

RCP workspace after moving E-Ps into fragment.xml



Agenda

Basics

Setup

Dependencies

Extensions

API Differences

Lift Off

API Differences II

Multi-User Environment

API Differences

The problem of different APIs

- not all RCP APIs are available in RAP
  - e.g. GC, MouseMove Events, FileDialog …
- additional RAP APIs for web specific requirements
  - e.g. PhaseListener, ISessionStore …

API Differences

The problem of different APIs

solution:

- abstract type in host-bundle, that encapsulates the problem
- type implementation in the fragment, that platform dependent, solves the problem
- loading the platform specific implementation at runtime by means of reflection

API Differences

Example 'About' Action

the last compile error in the RAP workspace is caused by the missing about action of the ActionFactory.

encapsulate the problem by using an ActionFactoryFacade type:

```
exitAction = ActionFactory.QUIT.create(window);
register(exitAction);

aboutAction = ActionFactoryFacade.createAboutAction(window);
register(aboutAction);
```

API Differences

Example 'About' Action II

implementation of ActionFactoryFacade:

```
public abstract class ActionFactoryFacade {
    private final static ActionFactoryFacade IMPL;
    static {
        IMPL = (ActionFactoryFacade) ImplementationLoader.newInstance(ActionFactoryFacade.class);
    }

    public static IWorkbenchAction createAboutAction( final IWorkbenchWindow window ) {
        return IMPL.createAboutActionInternal( window );
    }

    abstract IWorkbenchAction createAboutActionInternal(IWorkbenchWindow window);
}
```

API Differences

Example 'About' Action III

implementation of ImplemenationLoader:

```
public class ImplementationLoader {

    public static Object newInstance(final Class type) {
        String name = type.getName();
        Object result = null;
        try {
            result = type.getClassLoader().loadClass(name + "Impl").newInstance();
        } catch (Throwable throwable) {
            String txt = "Could not load implementation for {0}";
            String msg = MessageFormat.format(txt, new Object[] { name });
            throw new RuntimeException(msg, throwable);
        }
        return result;
    }
}
```

API Differences

Example 'About' Action IV

platform specific implementations:

RAP

```
public class ActionFactoryFacadeImpl extends ActionFactoryFacade {

    private class AboutAction extends Action implements IWorkbenchAction {
        private IWorkbenchWindow window;
        public AboutAction(IWorkbenchWindow window) {
            this.window = window;
            setId( "about" );
            setText("About RAP MailDemo");
            setToolTipText("About RAP MailDemo");
        }
        public void dispose() {
            window = null;
        }
        public void run() {
            String title = "About Message";
            String msg = "This is the about Message of the RAP Mail Demo";
            MessageDialog.openInformation(window.getShell(), title, msg );
        }
    }

    IWorkbenchAction createAboutActionInternal(IWorkbenchWindow window) {
        return new AboutAction(window);
    }
}
```

RCP

```
public class ActionFactoryFacadeImpl extends ActionFactoryFacade {

    IWorkbenchAction createAboutActionInternal(IWorkbenchWindow window) {
        return ActionFactory.ABOUT.create(window);
    }
}
```

Agenda

Basics

Setup

Dependencies

Extensions

API Differences

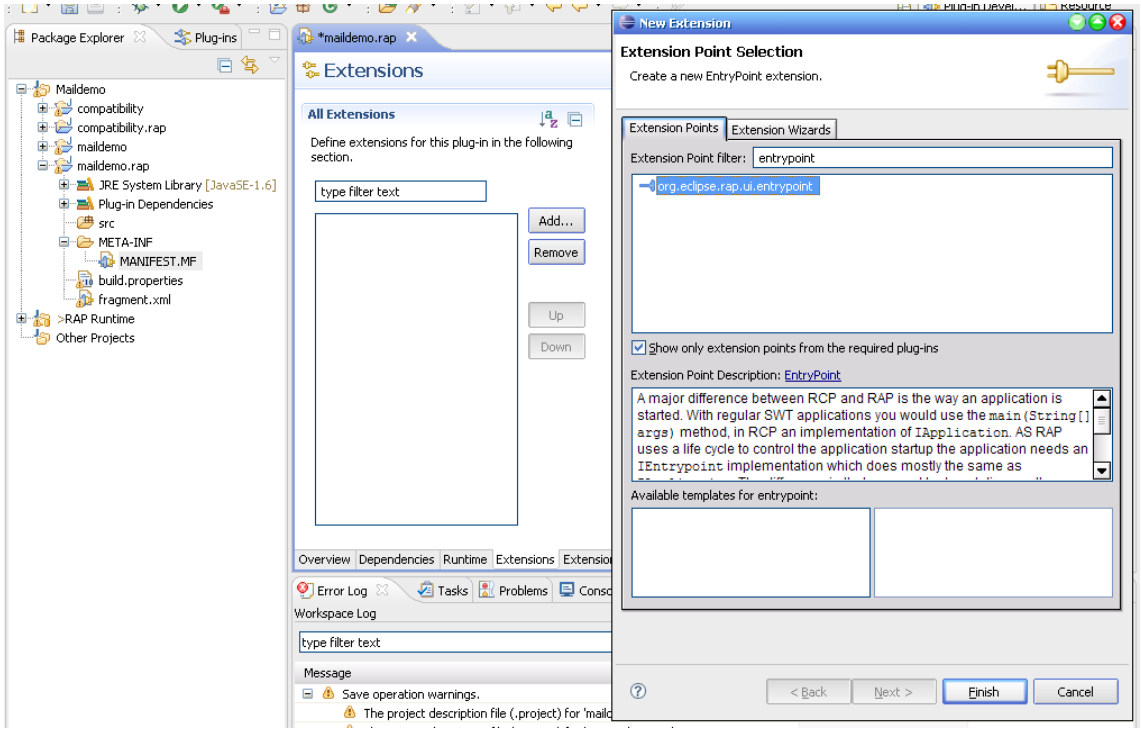
Lift Off

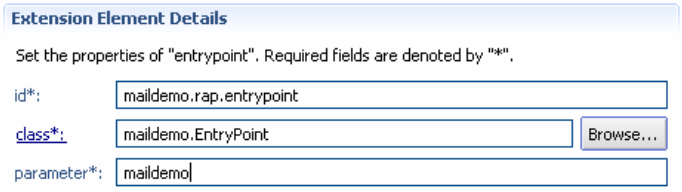
API Differences II

Multi-User Environment

Lift Off

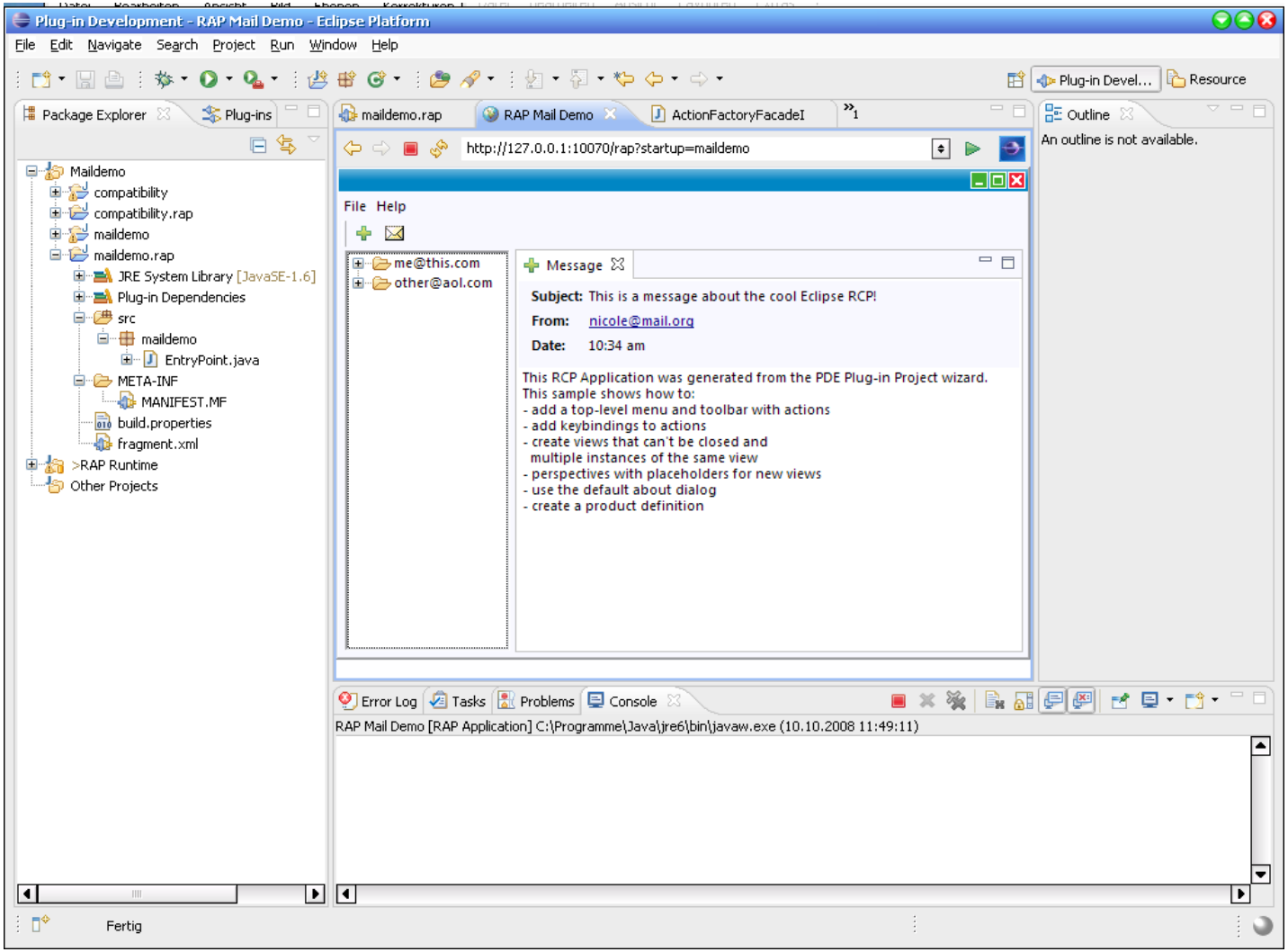
Start-up help






```
public class EntryPoint implements IEntryPoint {

    public int createUI() {
        Display display = PlatformUI.createDisplay();
        return PlatformUI.createAndRunWorkbench(display, new ApplicationWorkbenchAdvisor());

    }

}
```

Lift Off



Agenda

Basics

Setup

Dependencies

Extensions

API Differences

Lift Off

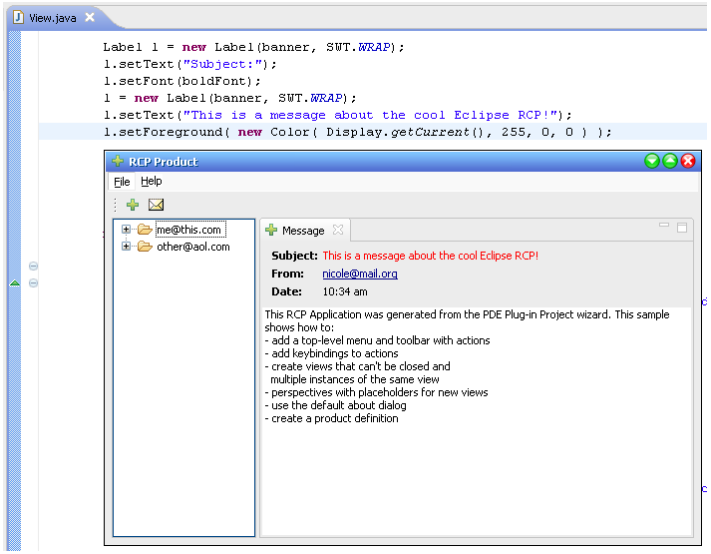
API Differences II

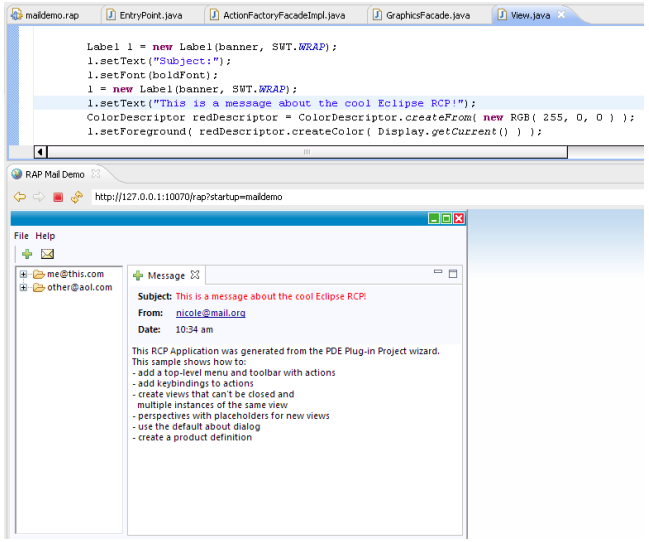
Multi-User Environment

API Differences

Resources in RAP are different from RCP

- no public constructor
- no dispose
- shared between sessions
- differences are resolved at JFace layer





Agenda

Basics

Setup

Dependencies

Extensions

API Differences

Lift Off

API Differences II

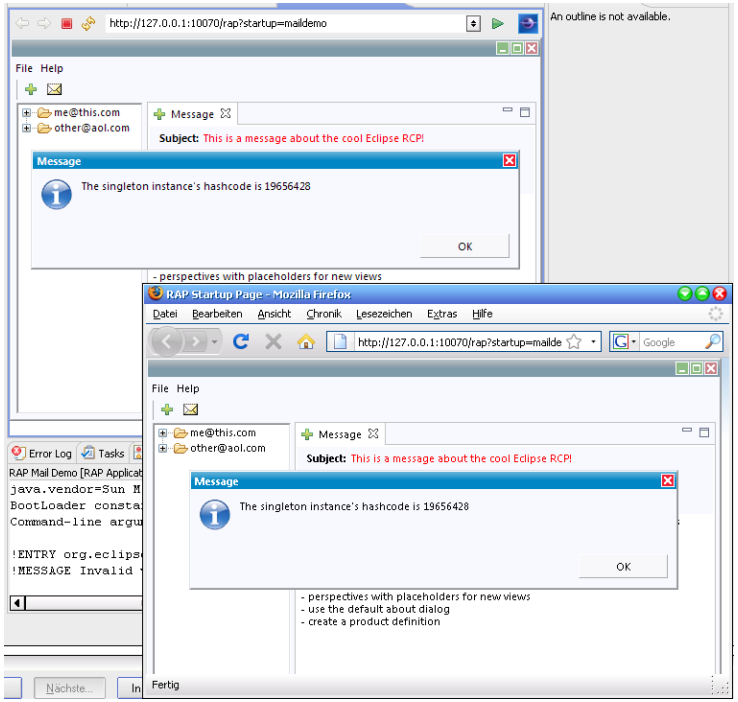
Multi-User Environment

Multi-User Environment

Singletons

- classical singletons exist in application scope
- in RAP, most of the time, session scope is desirable

```
public class MySingleton {

    private static MySingleton _instance;

    private MySingleton() {
        // prevent instance creation
    }

    public static synchronized MySingleton getInstance() {
        if( _instance == null ) {
            _instance = new MySingleton();
        }
        return _instance;
    }
}

singletonAccess = new Action("Access Singleton") {
    public String getId() {
        return "singletonAccess";
    }
    public void run() {
        String hashCode = String.valueOf(MySingleton.getInstance() .hashCode());
        String msg = "The singleton instance's hashcode is " + hashCode;
        MessageDialog.openInformation(window.getShell(), "Message", msg);
    }
};
register(singletonAccess);
```



Multi-User Environment

Singletons II

implementation in the host bundle:

```
public class MySingleton {

    private final static ISingletonProvider PROVIDER;
    static {
        PROVIDER = (ISingletonProvider) ImplementationLoader.newInstance(MySingleton.class);
    }

    public static MySingleton getInstance() {
        return (MySingleton) PROVIDER.getInstanceInternal();
    }

    MySingleton() {
        // prevent instance creation
    }
}
```

```
public interface ISingletonProvider {
    Object getInstanceInternal();
}
```

fragment implementation:

RAP

```
public class MySingletonImpl implements ISingletonProvider {

    public Object getInstanceInternal() {
        return SessionSingletonBase.getInstance(MySingleton.class);
    }
}
```

RCP

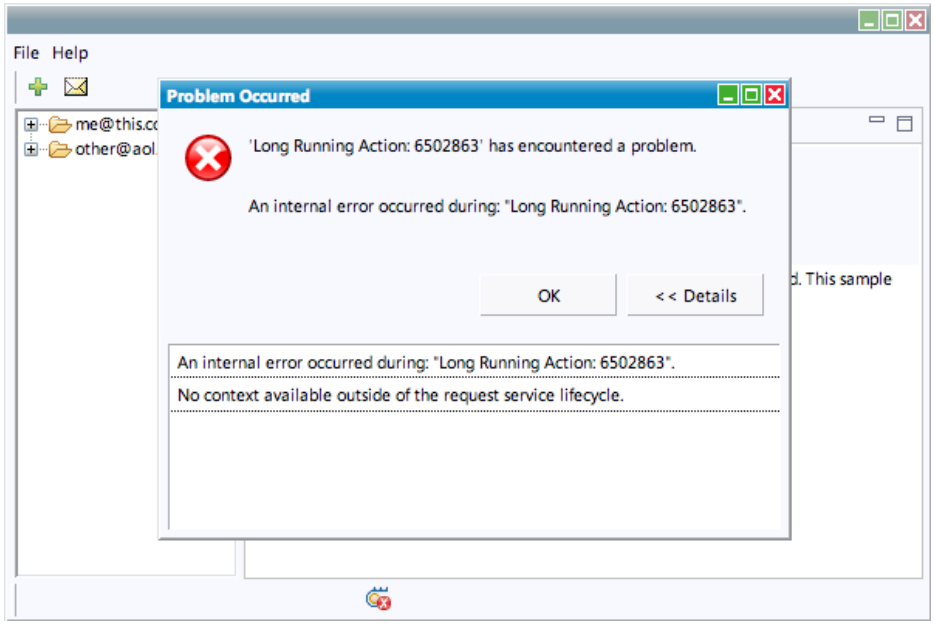
```
public class MySingletonImpl implements ISingletonProvider {

    private static MySingleton instance;

    public synchronized Object getInstanceInternal() {
        if( instance == null ) {
            instance = new MySingleton();
        }
        return instance;
    }
}
```

Multi-User Environment

Jobs

jobs can’t implicitly access session-singletons

```
Job job = new Job("Long Running Action:") {
    protected IStatus run(final IProgressMonitor monitor) {
        IStatus result = Status.OK_STATUS;
        monitor.beginTask("Number counting", TASK_AMOUNT);
        for (int i = 0; i < TASK_AMOUNT; i++) {
            if (monitor.isCanceled()) {
                monitor.done();
                result = Status.CANCEL_STATUS;
            }
            int done = i % TASK_AMOUNT;
            String singleton = String.valueOf(MySingleton.getInstance().hashCode());
            monitor.subTask("work done [" + singleton + "]: (" + done + "%)");
            monitor.worked(1);
            try {
                Thread.sleep(200);
            } catch (InterruptedException e) {
                // TODO Auto-generated catch block
                e.printStackTrace();
            }
        }
        monitor.done();
        return result;
    }
};
job.setName(job.getName() + " " + job.hashCode());
job.setUser(true);
job.schedule();
```

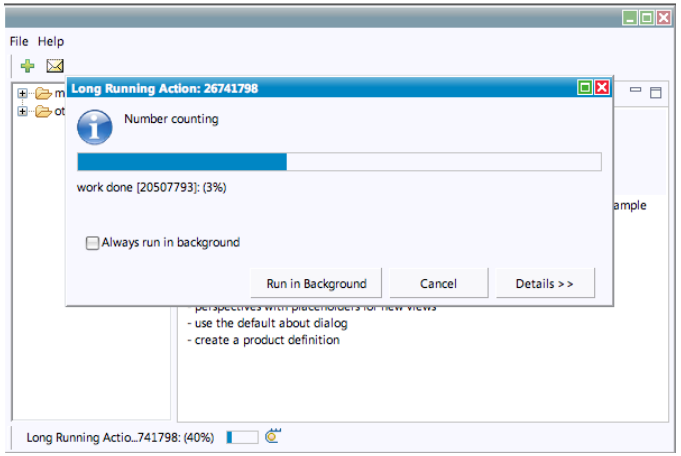


Multi-User Environment

Jobs II

implementations in the host bundle:

```
JobRunnable runnable = new JobRunnable() {
    public IStatus run(final IProgressMonitor monitor) {
        IStatus result = Status.OK_STATUS;
        monitor.beginTask("Number counting", TASK_AMOUNT);
        for (int i = 0; i < TASK_AMOUNT; i++) {
            if (monitor.isCanceled()) {
                monitor.done();
                result = Status.CANCEL_STATUS;
            }
            int done = i % TASK_AMOUNT;
            String singleton = String.valueOf(MySingleton.getInstance().hashCode());
            monitor.subTask("work done [" + singleton + "]: (" + done + "%)");
            monitor.worked(1);
            try {
                Thread.sleep(200);
            } catch (InterruptedException e) {
                // TODO Auto-generated catch block
                e.printStackTrace();
            }
        }
        monitor.done();
        return result;
    }
};
Job job = JobFactory.createJob(Display.getCurrent(), "Long Running Action:", runnable);
job.setName(job.getName() + " " + job.hashCode());
job.setUser(true);
job.schedule();
```




```
public abstract class JobFactory {
    private final static JobFactory IMPL;
    static {
        IMPL = (JobFactory) ImplementationLoader.newInstance(JobFactory.class);
    }

    public static Job createJob( final Display display, final String name, final JobRunnable runnable) {
        return IMPL.createJobInternal(display, name, runnable);
    }

    abstract Job createJobInternal( Display display, String name, JobRunnable runnable);
}
```

```
public interface JobRunnable {
    IStatus run(IProgressMonitor monitor);
}
```

Get RAP - http://eclipse.org/rap

Demos

See some demos here

Downloads

Get the latest RAP release

The RAP project enables developers to build rich, Ajax-enabled Web applications by using the Eclipse development model, plug-ins with the well known Eclipse workbench extenstion points, JFace, and a widget toolkit with SWT API (using **qooxdoo** for the client-side presentation). The project has graduated from incubation and released its 1.0 release.

Learn more ...

More Information

- http://www.eclipse.org/rap - RAP project page
- http://wiki.eclipse.org/RAP - RAP project wiki
- http://www.qooxdoo.org - qooxdoo js library

Questions?

info@innoopract.com