Creating Platforms Using Eclipse Equinox

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CTO, EclipseSource

Modern application development and deployment

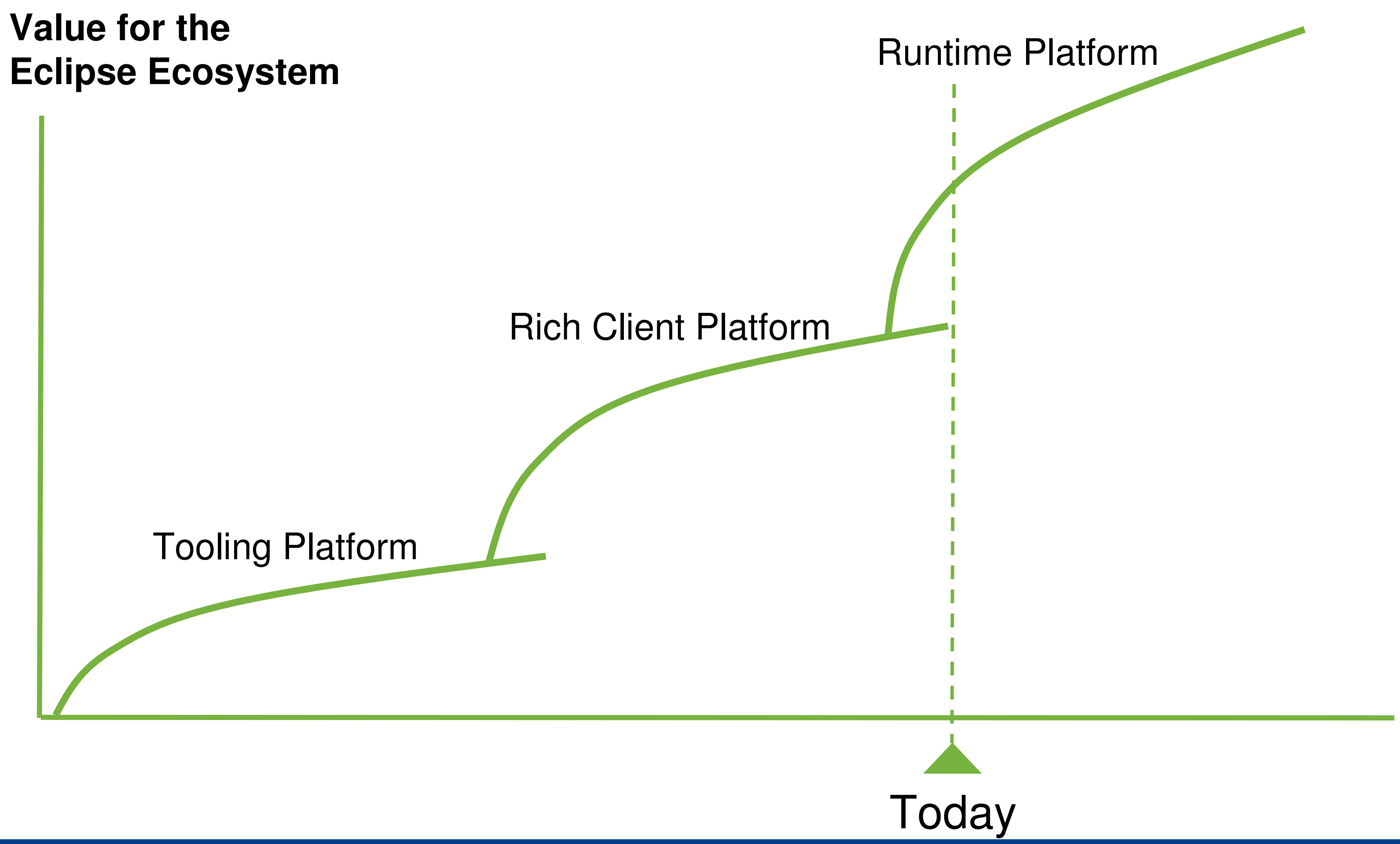
Current Issues	Reason
Component models vary across tiers and platforms	• MS .Net == MS platforms • Java ME, SE and Java EE imply different component models on embedded devices, desktops and server
New type of applications	• SaaS, web 2.0, mashups and social networks require new approaches
Business Agility Demands IT Agility	• One size does not fit all
Improve integration of 3rd party software	• Different technology platforms make it difficult to integrate with customers and partners

Platforms

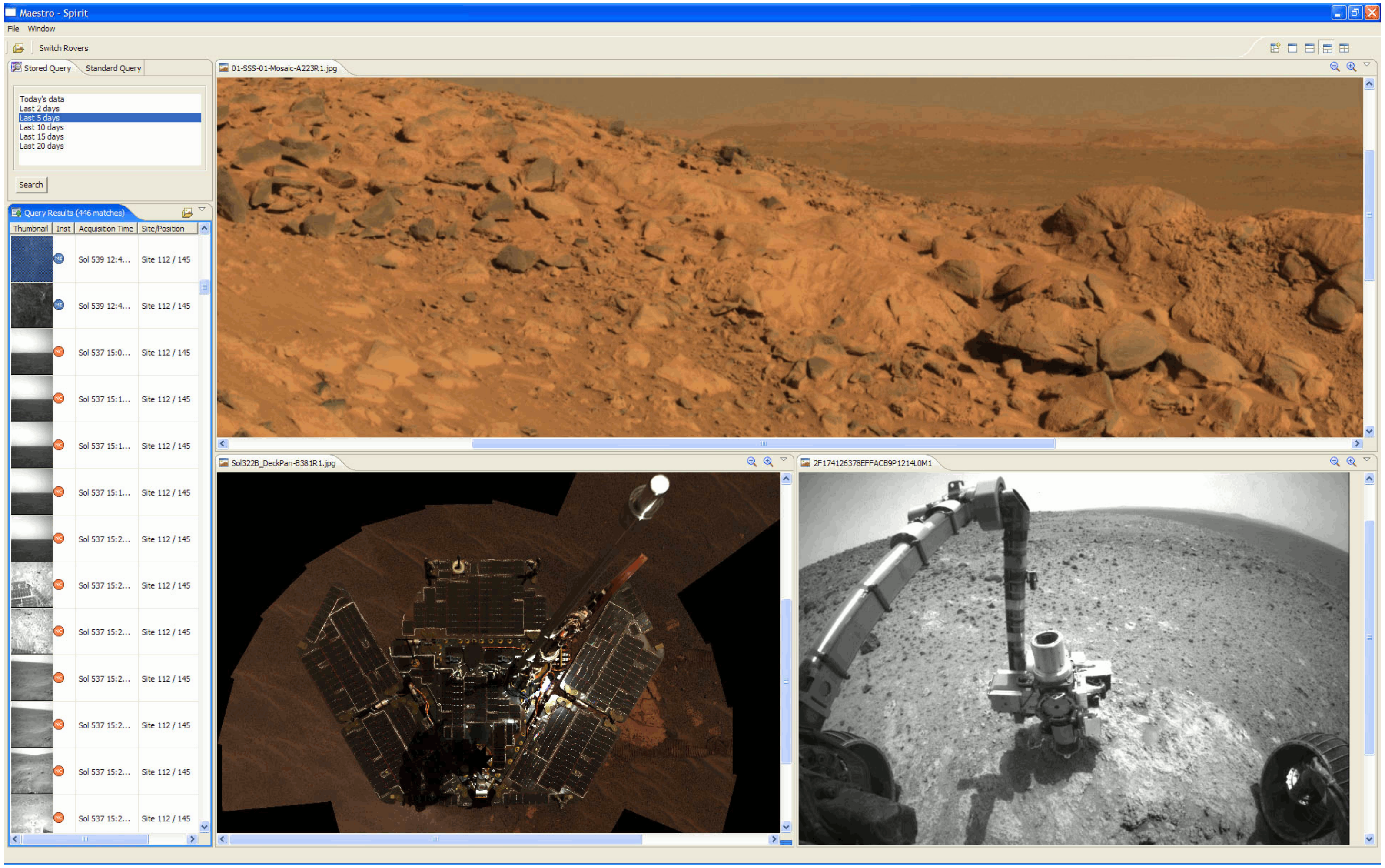
Enabling the Unexpected

EclipseSource

The Evolution of Eclipse Platforms



NASA Maestro/Ensemble


Maestro - Spirit
File
Window
Switch Rovers
Stored Query
Standard Query
Search
01-SSS-01-Mosaic-A223R1.jpg
Sol322B_DeckPan-B381R1.jpg
2F174126378EFFACB9P1214L0M1

Today's data
Last 2 days
Last 5 days
Last 10 days
Last 15 days
Last 20 days

Query Results (446 matches)

Thumbnail	Inst	Acquisition Time	Site/Position
	MI	Sol 539 12:4...	Site 112 / 145
	MI	Sol 539 12:4...	Site 112 / 145
	NC	Sol 537 15:0...	Site 112 / 145
	NC	Sol 537 15:1...	Site 112 / 145
	NC	Sol 537 15:1...	Site 112 / 145
	NC	Sol 537 15:1...	Site 112 / 145
	NC	Sol 537 15:2...	Site 112 / 145
	NC	Sol 537 15:2...	Site 112 / 145
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	NC	Sol 537 15:2...	Site 112 / 145
	NC	Sol 537 15:2...	Site 112 / 145
	NC	Sol 537 15:2...	Site 112 / 145

On the power of adopting a platform

“Since adopting the [platform], our team has been able to retire thousands of lines of code from our old program in favor of features provided by the [platform].”

On the power of building your own platform

“[The platform] has also become the centerpiece for a new consortium of operations software development teams”

“…we will see more [platforms] built around the [our platform] in the future as other organizations decide to pool their resources and share the responsibility for things that their programs have in common.”

Even in Banking!

“…they needed to produce a generalized platform in which this and other new applications could be extended, reused and shared”

“The result was [JPMorgan’s] One Bench, a platform for developing and delivering custom banking applications”

Components

On the power of componentization

“… now we can safely pick and choose only those plug-ins that a particular customer needs rather than forcing everyone to use a monolithic “one size fits all” program”

“Death of the Stack”

“[Birth of] Stackless Stacks”

EclipseSource

Equinox powers Componentization

- Equinox powers Eclipse
- Small, performant OSGi framework implementation
- Collection of service implementations
  - Standard OSGi services
  - Eclipse services (e.g., Extension Registry)
- Server side infrastructure
- Provisioning infrastructure
- Security infrastructure

Runtime Community at Eclipse.org

A brief history of Equinox

- Introduced in Eclipse 3.0 (2003) as OSGi-based runtime for Eclipse
- Seeded with IBM “SMF” code-base
- Team co-developed OSGi R4 spec
  - Facilitate Eclipse use
  - Reference implementation for OSGi R4.x + JSR 291
- Widespread adoption as the complete, supported, industrial strength framework implementation

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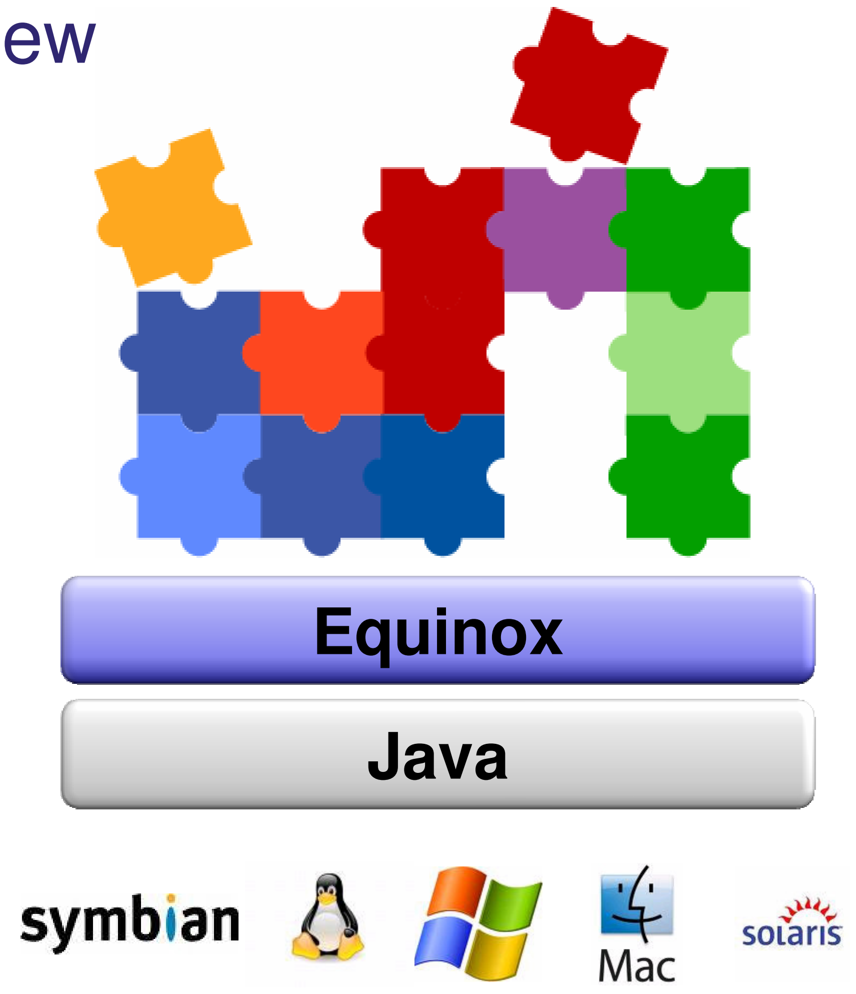
System View



🟥 Yours

🟩 3rd Party

🟦 Eclipse

Write Once, Run Anywhere?

- Perhaps true across machines
- Ironically not true across Java™ "editions"
- Java ME, SE and EE have different programming models
  - Midlets, Applets, Servlets, EJBs, …
- The same program does not have a hope of running everywhere

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The OSGi Component Model

- Bundles are typically JAR files
  - Java classes, Resources, Files, Metadata
- Bundle metadata declaratively defines
  - Java packages exported
  - Dependencies on bundles and Java packages
  - Bundle classpath
  - Bundle lifecycle
- Framework manages dependencies and lifecycle
  - Explicitly supports dynamic scenarios

Example Bundle Metadata

```
Bundle-SymbolicName: org.eclipse.equinox.registry
Bundle-Version: 3.2.100.v20060918
Bundle-Name: Eclipse Extension Registry
Bundle-Vendor: Eclipse.org

Bundle-ClassPath: .

Bundle-Activator: org.eclipse.core.internal.registry.osgi.Activator

Import-Package: javax.xml.parsers,
 org.xml.sax,
 org.osgi.framework;version=1.3
Require-Bundle:
 org.eclipse.equinox.common;bundle-version="[3.2.0,4.0.0)"
Bundle-RequiredExecutionEnvironment: J2SE-1.3

Export-Package: org.eclipse.equinox.registry
```

Identification

Execution

Lifecycle

Prerequisites

Capabilities

Enterprise Java Dominance

POWERED BY SAP NetWeaver

OPEN http://GlassFish.dev.java.net

IBM WebSphere

bea weblogic

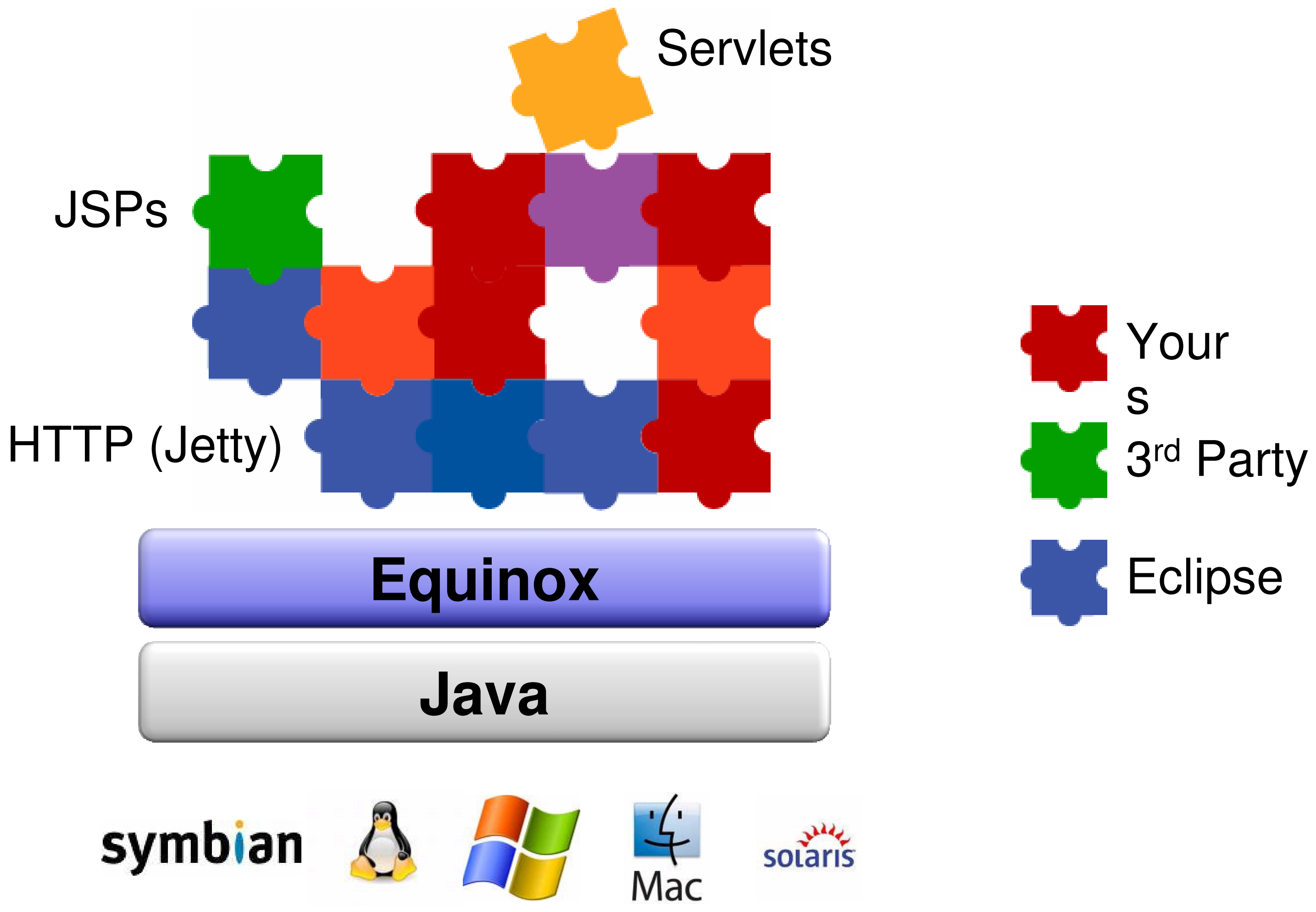
infiniflow

spring source

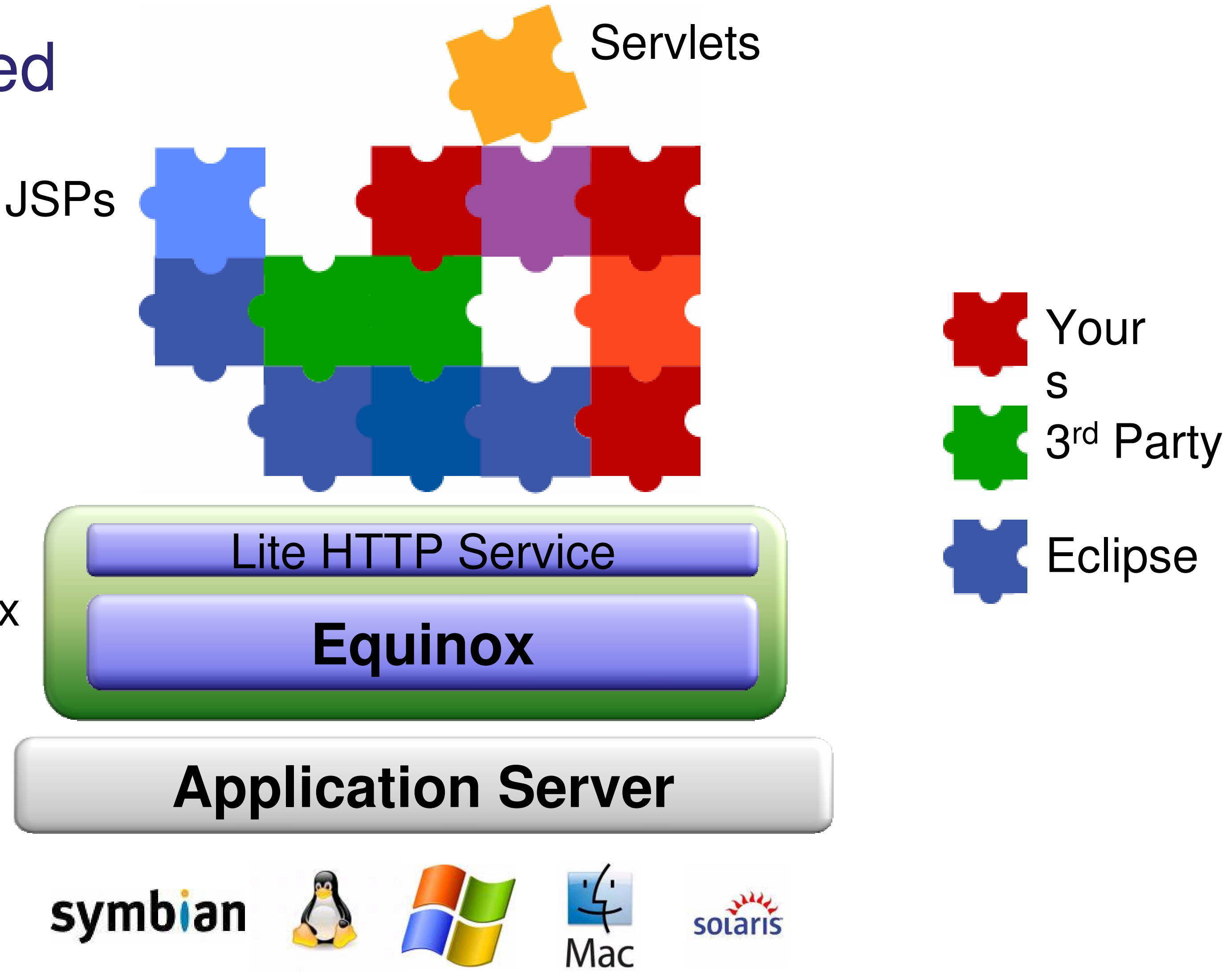
JBoss™

Ref: http://www.osgi.org/wiki/uploads/News/2008_09_16_worldwide_market.pdf

Solo

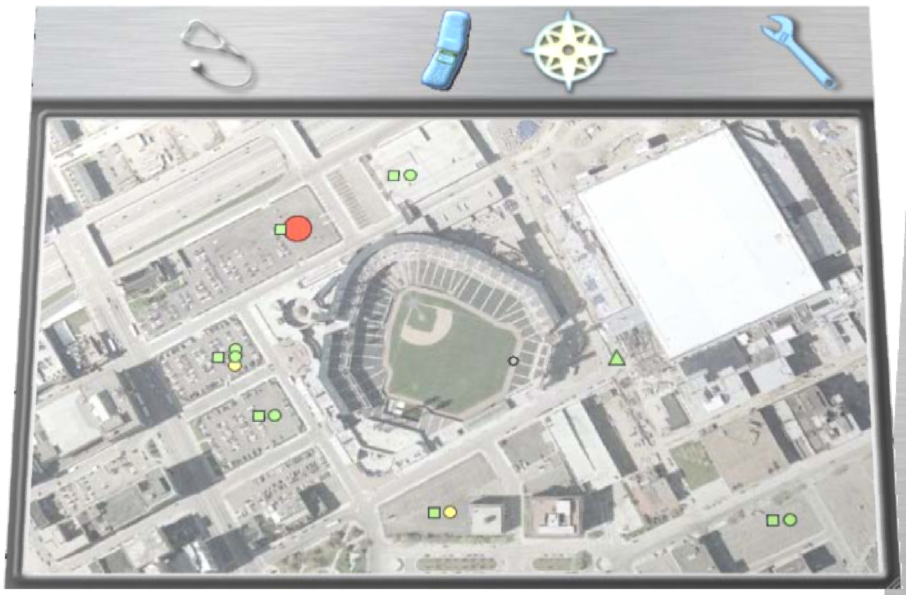

Servlets
JSPs
HTTP (Jetty)
Equinox
Java
Your
s
3rd Party
Eclipse
symbian
Mac
solaris

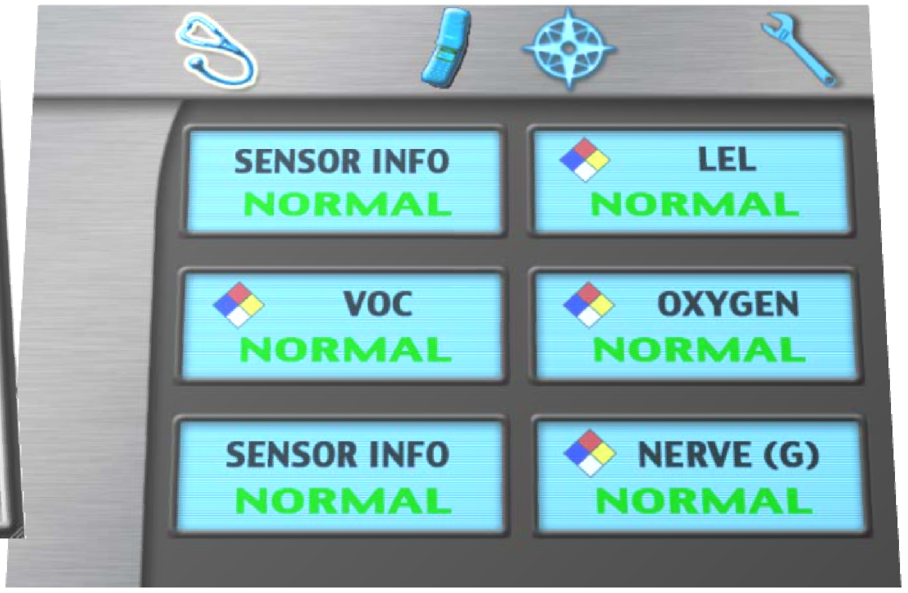
Embedded


Servlets
JSPs
Your
s
3rd Party
Eclipse
Thin
Equinox
WAR
Lite HTTP Service
Equinox
Application Server
symbian
Mac
solaris

Demo

But I thought it was for cars?





A Look Under the Covers

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Separation of Concerns

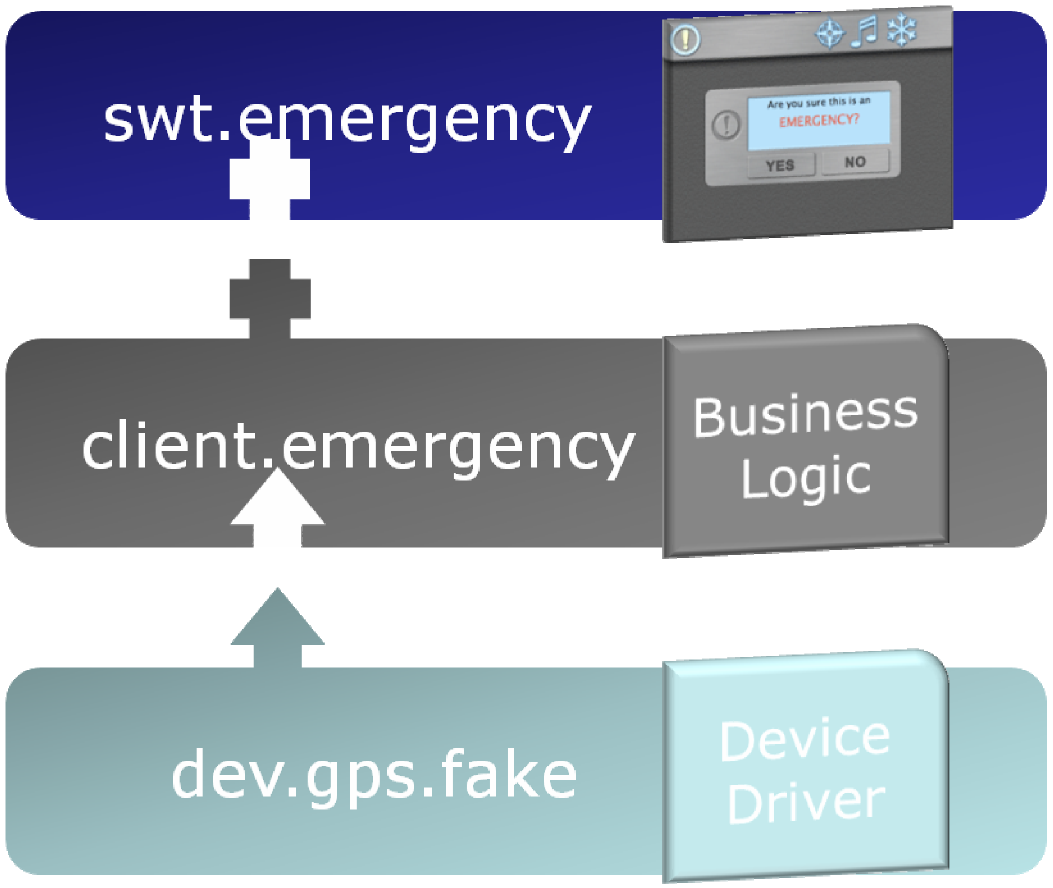
Component.java

```
protected void activate(ComponentContext context) {
  this.context = context;
  HttpService http = (HttpService) context.locateService("http");
  IControlCenter center = (IControlCenter) context.locateService("controlCenter");
  HttpServlet servlet = new EmergencyServlet(center);
  http.registerServlet(getAlias(), servlet, null, httpContext);
}
protected void deactivate(ComponentContext context) {
  HttpService http = (HttpService) context.locateService("http");
  http.unregister(getAlias());
}
```

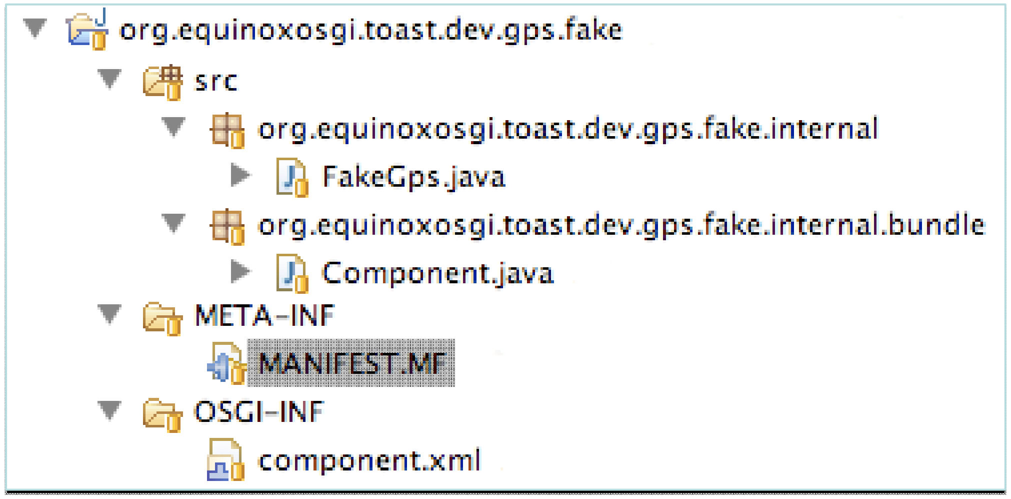
EmergencyServlet.java

```
public EmergencyServlet(IControlCenter center) {
  this.center = center;
}
< … Business Logic …>
```

Services Examples



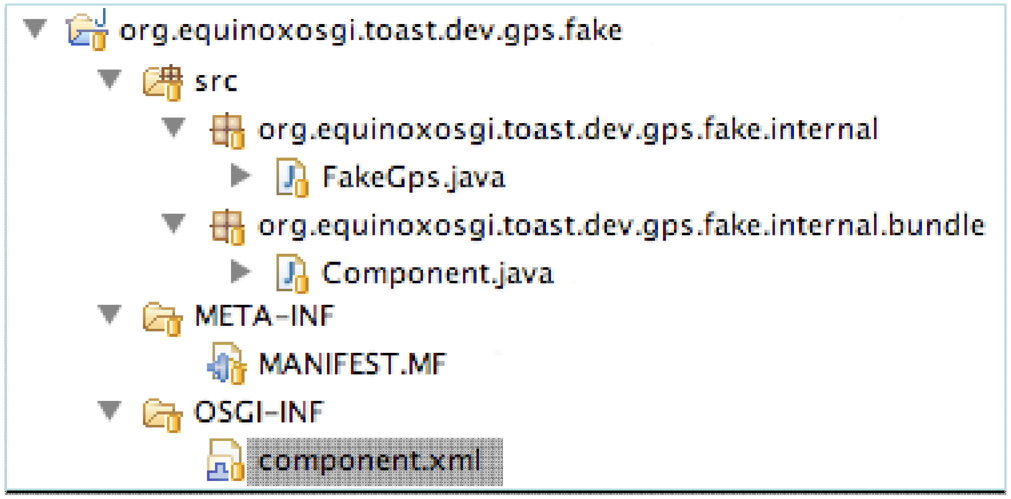
Providing a Service


```
▼ org.equinoxosgi.toast.dev.gps.fake
    ▼ src
        ▼ org.equinoxosgi.toast.dev.gps.fake.internal
            ▶ FakeGps.java
        ▼ org.equinoxosgi.toast.dev.gps.fake.internal.bundle
            ▶ Component.java
    ▼ META-INF
          MANIFEST.MF
    ▼ OSGI-INF
          component.xml
```

MANIFEST.MF
Bundle-Name: Toast Fake Gps Plug-in
Bundle-SymbolicName: org.equinoxosgi.toast.dev.gps.fake
Bundle-Version: 1.0.0
Service-Component: OSGI-INF/component.xml
Import-Package: org.equinoxosgi.toast.dev.gps

dev.gps.fake

Providing a Service



```
org.equinoxosgi.toast.dev.gps.fake
  src
    org.equinoxosgi.toast.dev.gps.fake.internal
      FakeGps.java
    org.equinoxosgi.toast.dev.gps.fake.internal.bundle
      Component.java
  META-INF
    MANIFEST.MF
  OSGI-INF
    component.xml
```

component.xml

```
<component name="org.equinoxosgi.toast.dev.gps.fake">
  <implementation class=
   "org.equinoxosgi.toast.dev.gps.fake.internal.FakeGps"/>
  <service>
    <provide interface="org.equinoxosgi.toast.dev.gps.IGps"/>
  </service>
</component>
```

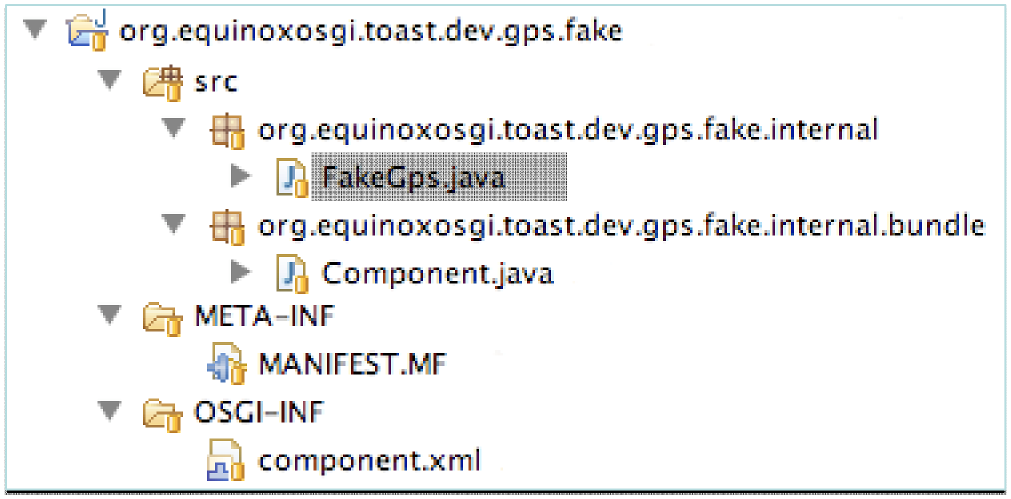
dev.gps.fake

EclipseSource

Providing a Service

FakeGps.java

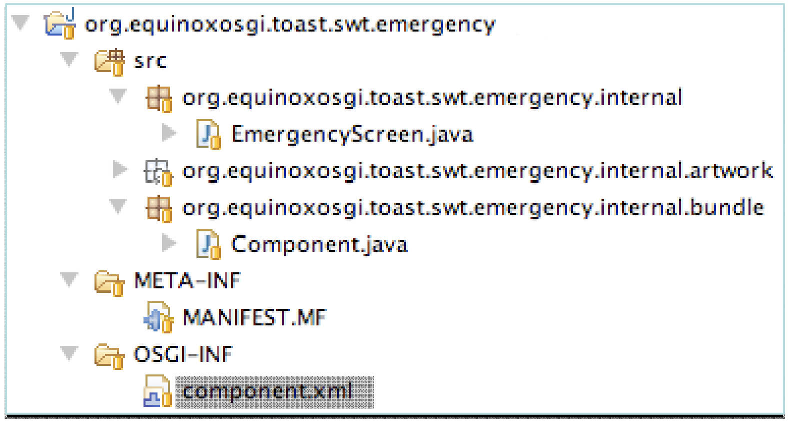
```
public class FakeGps implements IGps {
  public int getLatitude() {
    return 3888746;
  }

  public int getLongitude() {
    return -7702192;
  }
}
```



```
▼ org.equinoxosgi.toast.dev.gps.fake
    ▼ src
        ▼ org.equinoxosgi.toast.dev.gps.fake.internal
            ▶ FakeGps.java
        ▼ org.equinoxosgi.toast.dev.gps.fake.internal.bundle
            ▶ Component.java
    ▼ META-INF
        MANIFEST.MF
    ▼ OSGI-INF
        component.xml
```

dev.gps.fake

Requiring a Service

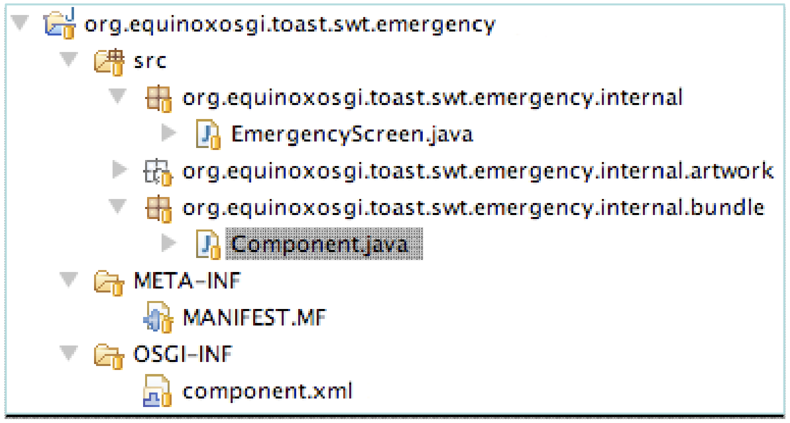

```
org.equinoxosgi.toast.swt.emergency
  src
    org.equinoxosgi.toast.swt.emergency.internal
      EmergencyScreen.java
    org.equinoxosgi.toast.swt.emergency.internal.artwork
    org.equinoxosgi.toast.swt.emergency.internal.bundle
      Component.java
  META-INF
    MANIFEST.MF
  OSGI-INF
    component.xml
```

component.xml

```
<component name="org.equinoxosgi.toast.swt.emergency">
  <implementation class="org.equinoxosgi.toast.swt.emergency.internal.bundle.Component"/>
  <reference
    name="emergency"
    interface="org.equinoxosgi.toast.client.emergency.IEmergencyMonitor"/>
  <reference
    name="shell"
    interface="org.equinoxosgi.crust.shell.ICrustShell"/>
</component>
```

swt.emergency

Requiring a Service


```
org.equinoxosgi.toast.swt.emergency
  src
    org.equinoxosgi.toast.swt.emergency.internal
      EmergencyScreen.java
    org.equinoxosgi.toast.swt.emergency.internal.artwork
    org.equinoxosgi.toast.swt.emergency.internal.bundle
      Component.java
  META-INF
    MANIFEST.MF
  OSGI-INF
    component.xml
```

Component.java

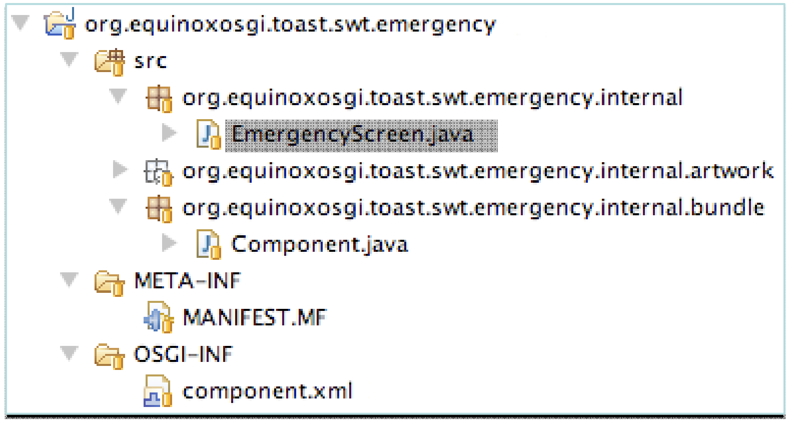
```
public class Component {
  private EmergencyScreen screen;

  protected void activate(ComponentContext context) {
    ICrustShell crustShell =
     (ICrustShell) context.locateService("shell");
    IEmergencyMonitor monitor =
     (IEmergencyMonitor) context.locateService("emergency");
    screen = new EmergencyScreen();
    screen.bind(crustShell, monitor);
  }

  protected void deactivate(ComponentContext context) {
    screen.unbind();
    screen = null;
  }
}
```

swt.emergency

Requiring a Service

EmergencyScreen.java

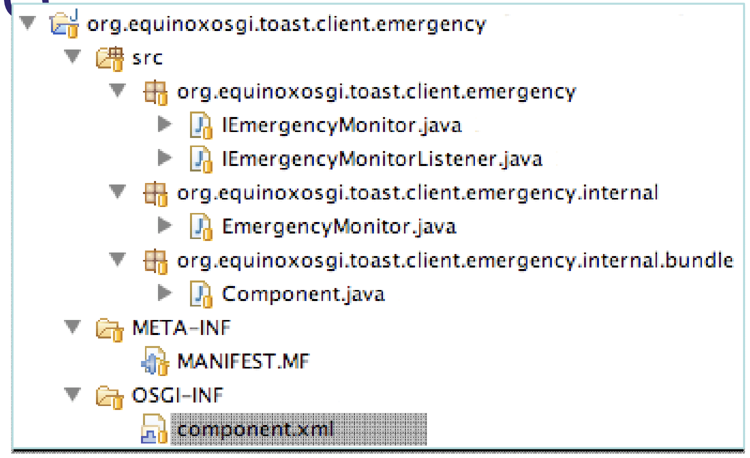
```
public class EmergencyScreen {
  private IEmergencyMonitor monitor;
  private ICrustShell crustShell;

  public void bind(ICrustShell crustShell, IEmergencyMonitor monitor) {
    this.crustShell = crustShell;
    this.monitor = monitor;
    crustShell.installScreen(…);
    monitor.addListener(this);
  }

  public void unbind() {
    monitor.removeListener(this);
    crustShell.uninstallScreen(…);
}
< … Business logic … >
```



```
org.equinoxosgi.toast.swt.emergency
  src
    org.equinoxosgi.toast.swt.emergency.internal
      EmergencyScreen.java
    org.equinoxosgi.toast.swt.emergency.internal.artwork
    org.equinoxosgi.toast.swt.emergency.internal.bundle
      Component.java
  META-INF
    MANIFEST.MF
  OSGI-INF
    component.xml
```

swt.emergency

Requiring & Providing a Service


```
org.equinoxosgi.toast.client.emergency
  src
    org.equinoxosgi.toast.client.emergency
      IEmergencyMonitor.java
      IEmergencyMonitorListener.java
    org.equinoxosgi.toast.client.emergency.internal
      EmergencyMonitor.java
    org.equinoxosgi.toast.client.emergency.internal.bundle
      Component.java
  META-INF
    MANIFEST.MF
  OSGI-INF
    component.xml
```

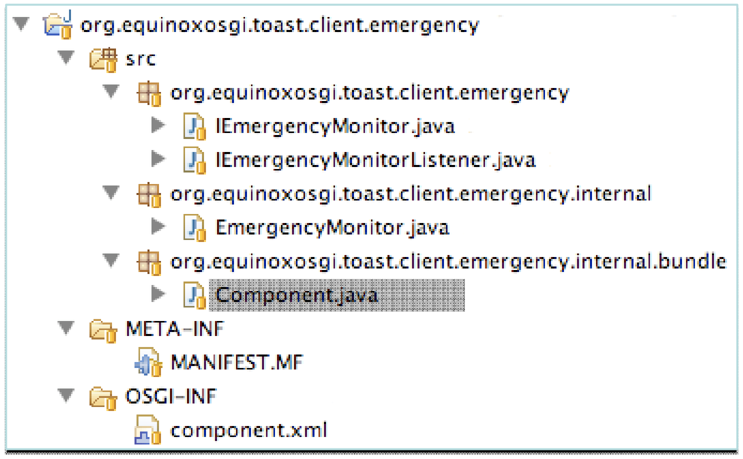
component.xml

```
<component name=
   "org.equinoxosgi.toast.client.emergency">
  <implementation class= "org.equinoxosgi.toast.client.emergency.internal.bundle.Component"/>
  <service>
    <provide interface="org.equinoxosgi.toast.client.emergency.IEmergencyMonitor"/>
  </service>
  <reference
    name="gps"
    interface="org.equinoxosgi.toast.dev.gps.IGps"/>
  <reference
    name="airbag"
    interface="org.equinoxosgi.toast.dev.airbag.IAirbag"/>
</component>
```

Requiring & Providing a Service

Component.java

```
public class Component implements IEmergencyMonitor {
  private EmergencyMonitor monitor;
  protected void activate(ComponentContext context) {
    IGps gps = (IGps) context.locateService("gps");
    IAirbag airbag = (IAirbag) context.locateService("airbag");
    monitor = new EmergencyMonitor();
    monitor.bind(gps, airbag);
  }
  protected void deactivate(ComponentContext context) {
    monitor.unbind();
  }
  public void emergency() {
    monitor.emergency();
  }
  public void addListener(IEmergencyMonitorListener listener) {
    monitor.addListener(listener);
  }
  public void removeListener(IEmergencyMonitorListener listener) {
    monitor.removeListener(listener);
  }
}
```



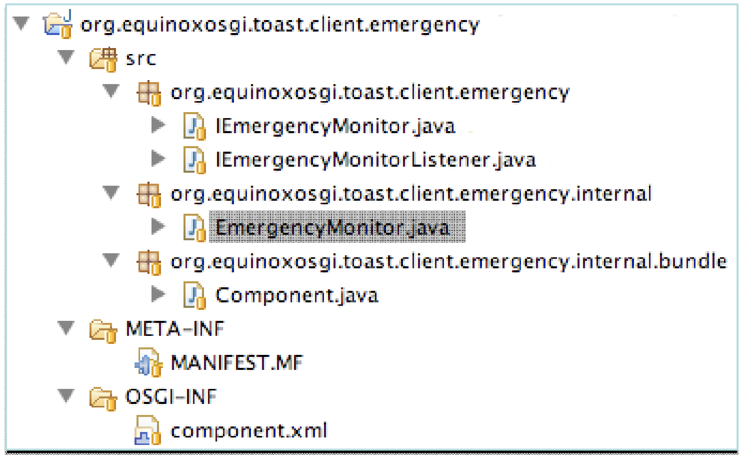
```
▼ org.equinoxosgi.toast.client.emergency
  ▼ src
    ▼ org.equinoxosgi.toast.client.emergency
      ▶ IEmergencyMonitor.java
      ▶ IEmergencyMonitorListener.java
    ▼ org.equinoxosgi.toast.client.emergency.internal
      ▶ EmergencyMonitor.java
    ▼ org.equinoxosgi.toast.client.emergency.internal.bundle
      ▶ Component.java
  ▼ META-INF
      MANIFEST.MF
  ▼ OSGI-INF
      component.xml
```

EclipseSource

Requiring & Providing a Service

EmergencyMonitor.java

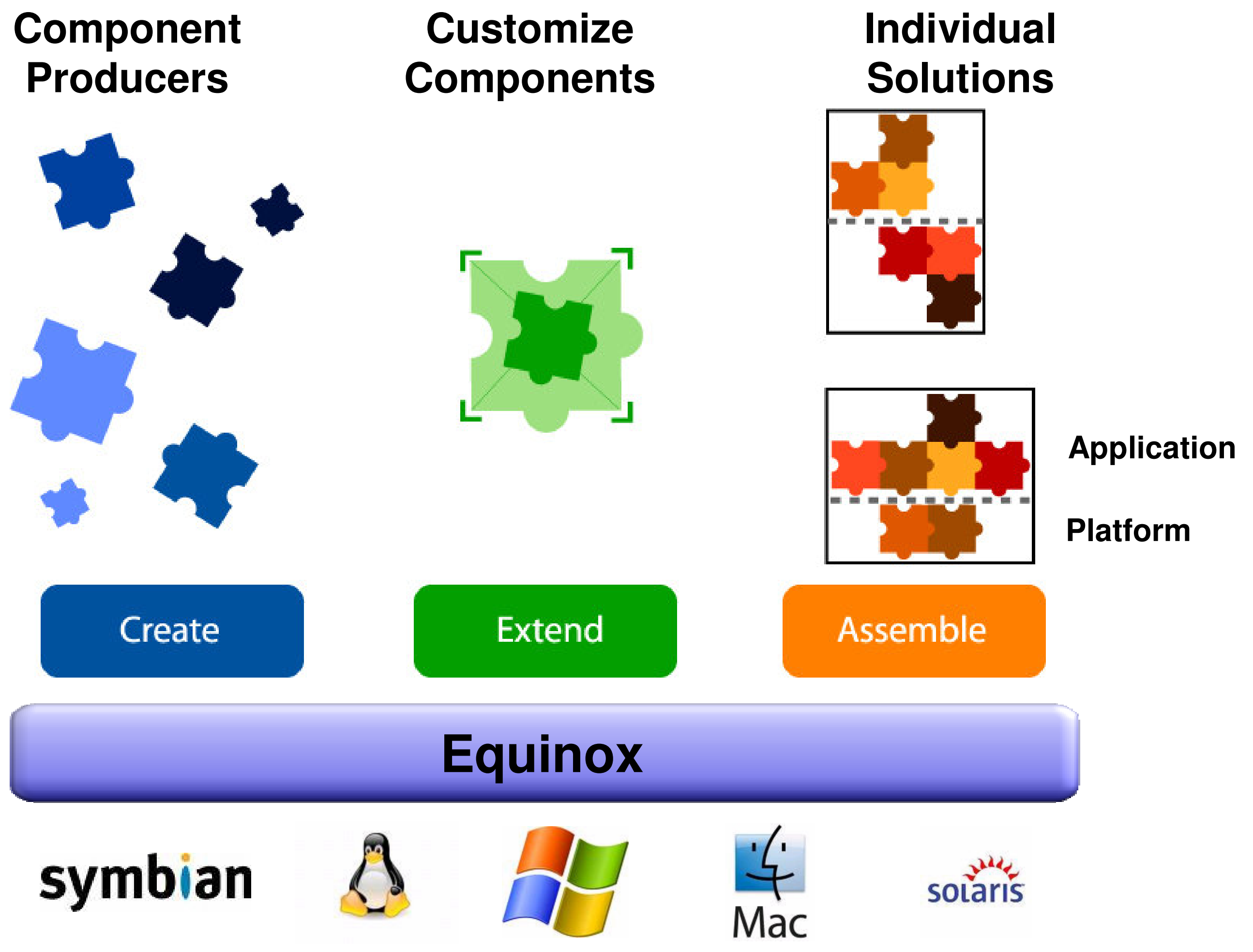
```
public class EmergencyMonitor implements IAirbagListener, IEmergencyMonitor {
  private IGps gps;
  private IAirbag airbag;

public void setGps(IGps gps) {
    this.gps = gps;
}
public void setAirebag(IAirbag airbag) {
   this.airbag = airbag;
}
public void activate() {
   airbag.addListener(this);
}
public void deactivate() {
    airbag.removeListener(this);
}
< … Business logic … >
```



```
▼ org.equinoxosgi.toast.client.emergency
  ▼ src
    ▼ org.equinoxosgi.toast.client.emergency
      ▶ IEmergencyMonitor.java
      ▶ IEmergencyMonitorListener.java
    ▼ org.equinoxosgi.toast.client.emergency.internal
      ▶ EmergencyMonitor.java
    ▼ org.equinoxosgi.toast.client.emergency.internal.bundle
      ▶ Component.java
  ▼ META-INF
      MANIFEST.MF
  ▼ OSGI-INF
      component.xml
```

Broader Implications

Component Oriented Development and Assembly



EclipseSource

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Zend The php Company · VTT · TROLLTECH · INGRES · INTALIO

Wrap-up

- Equinox is a platform for building platforms
- Platforms
  - Promote innovation that matters to you
  - Leave the “gorp” to others
- Equinox in the runtime space is real

- Stop coercing monolithic of-the-shelf stacks
- Start designing and assembling stacks just for you