OSGi Subsystems
from theory to practice

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SpringSource/VMware
Software rots
modularity helps
but ...
A clean design
without enforcement
works fine for a while
then starts to decay
and soon
the rot sets in
and spreads
and worsens
until the original design
has gone.
OSGi Subsystems to the rescue
Subsystem:
identified
manageable
optionally scoped
group of bundles
subsystems
spec

OSGi Subsystems

@glynnormington
subsystems
reference
implementation
subsystems
reference
implementation
Now some theory
and practice
followed by

• getting started
• the future
Theory
Subsystem Types
Feature Subsystems

Scoping:
• None
Notation

A depends on B

- bundle
- package
- capability
- service
Feature Subsystems

Scoping:
• None
Application Subsystems

```java
int x;
{
    int y;
}
```
Application Subsystems

Scoping:
• No exports
• Automatic imports
Composite Subsystems

Configurable scoping
Practice
Subsystem Types
Feature Subsystems

Useful for:

- Grouping dependencies
- Sharing infrastructure
- Avoiding uses constraint failures
Application Subsystems

Useful for top layer of the system

Avoid duplicating contents

- Reduces sharing
- Complicates update
- Leads to resolution errors
Composite Subsystems

Useful for special infrastructure

Not for general use

• Complex
• Can duplicate infrastructure
  • extenders
  • management bundles
Theory

Subsystem Content and Dependencies
Subsystem Content

- *By value* in a subsystem archive
  or
- *By reference* to a repository
Dependencies

- Subsystem content dependencies
- Installed from repository
Practice
Subsystem Content and Dependencies
Subsystem Content (by value)

- Easy to deploy
- Limits sharing
- Harder to update
Repository Content

- Convenient during development
- Avoids bloat
- Generally preferable
Theory

Nested Subsystems
Nested Subsystems

- So far all subsystems have been children of the ‘root’ subsystem
Nested Subsystems

- Unlimited nesting
- Sharing determined by the child
Practice
Nested Subsystems
Nested Subsystems

- Features useful for grouping other subsystems
Nested Subsystems

- Nested features useful for logical grouping
Nested Subsystems

- Nested applications useful for scoping
Regions

Region, group of bundles:
  • scoped subsystems
  • root subsystem

Directed graph; arcs are filters

Region context bundle
Getting Started
Aries Subsystems

on Virgo kernel

https://github.com/glyn
Feature

Subsystem-SymbolicName: hello.feature.subsystem
Subsystem-Type: osgi.subsystem.feature
Subsystem-Content: hello
Application

Subsystem-SymbolicName: hello.application.subsystem
Subsystem-Type: osgi.subsystem.application
Subsystem-Content: hello
Composite

Subsystem-SymbolicName: hello.composite.subsystem

Subsystem-Type: osgi.subsystem.composite

Subsystem-Content: hello;version="[1,1]"

Import-Package: org.osgi.framework
Nested Subsystem

Subsystem-SymbolicName: hello.nested.composite.subsystem

Subsystem-Type: osgi.subsystem.composite

Subsystem-Content: hello;version="[1,1]", hello.application.subsystem; type="osgi.subsystem.application"; version="[0,0]"

Import-Package: org.osgi.framework
Region Digraph

- kernel
- user region
  - application
  - composite
  - nested composite
  - application

OSGi Subsystems
Alternatives
Technology Stack

Aries Subsystems

Virgo Kernel

Equinox region bundle
<table>
<thead>
<tr>
<th>Standard</th>
<th>Virgo Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature</td>
<td>Unscoped plan</td>
</tr>
<tr>
<td>Application</td>
<td>Scoped plan or PAR</td>
</tr>
<tr>
<td>Composite</td>
<td>User region</td>
</tr>
<tr>
<td>Nesting</td>
<td>Nested plans</td>
</tr>
<tr>
<td>Repository</td>
<td>Repository</td>
</tr>
</tbody>
</table>
Equinox Region Support

- org.eclipse.equinox.region
- RegionDigraph service
- Persistence
- JMX mxbeans
Back to software rot
Subsystems
guide evolution
and discourage rot.
The Future
Future Work Items

Spec topics

• Extenders
• Weaving and dynamic imports
• Service dependency determination
• Thread context class loaders
• Config Admin

Tooling support
Thanks

John Ross - Aries Subsystems
Graham Charters - Subsystems spec
OSGi R5 Enterprise Specification

http://www.osgi.org/Download/Release5

Aries

http://aries.apache.org/

Aries Subsystems on Virgo Kernel

https://github.com/glyn

Virgo

http://www.eclipse.org/virgo

Equinox Region Bundle

git://git.eclipse.org/gitroot/equinox/rt.equinox.bundles.git
Questions?