Very Important Bundles

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OSGi Bundles

- Even though this depends on the architecture and dependencies, OSGi has proven that bundles increase the assembly possibilites

  - Rich meta-data, enforced resolving, ...

- E.g. copy & paste files to enhance the runtime features („VB-feeling" on module level)

  - Console (test, debug, ...)

- Bundles can improve the development process

  - Some bundles make it easy, some hard...

Good Bundles

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Logging

Good Bundles: Logging

- Problem

  – Your application + frameworks use different logging APIs, e.g. log4j, commons logging, ...

- Solution

  – PAX Logging

  – 2 bundles: pax-logging-api & pax-logging-service

  – 8 logging APIs

  – Redirects to LogService & log4j

  – Configuration Admin support

Good Bundles

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Web Development

Good Bundles: Web Development

- Problem
  - HttpService is simply not enough
- Solution
  - PAX Web
  - Whiteboard pattern (service registry)
  - Extender pattern (web.xml)
  - Support for filters and JSP
  - Configuration Admin support

Good Bundles

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Remoting

Good Bundles: Remoting

- Problem

  - You want to expose some of your services as endpoints

  - You want to access endpoints via services

- Solution

  - Apache CXF Distributed OSGi

  - <u>Single</u> bundle distribution!

  - Export endpoint

    - service.exported.interfaces = *

  - Import Endpoint

    - /OSGI-INF/remote-service/remote-services.xml

Good Bundles

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Dependency Injection /
Service Interaction

Good Bundles: DI

- Problem
  - You want dependency injection
- Solution
  - Declarative Services
    - No full DI support, mostly for dealing with services
  - Peaberry
    - Google Guice add-on, Java based DSL
  - Apache Felix iPOJO
    - Sophisticated, a bit challenging
  - Spring Dynamic Modules
    - Spring add-on

Good Bundles

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Framework Tooling

Good Bundles: Framework Tooling

- Problem

  - The console is nice, but sometimes a bit annoying

  - `Install file: /home/user/dev/workspace/app/.../bundle.jar`

  - Track EventAdmin events

- Solution

  - Apache Felix Web Console

  - Basic setup requires only one bundle

  - Works with Felix/Equinox/...

Good Bundles: Framework Tooling

Bundles   Configuration   Event Admin   Licenses   Log Service   OSGi Repository   System Information

Bundle information: 8 bundles in total - all 8 bundles active.

Id	Name	Version	Symbolic Name	Status	Actions
7	Apache Felix Configuration Admin Service	1.0.10	org.apache.felix.configadmin	Active	▪ ⟳ ⏏
3	Apache Felix Web Management Console	1.2.10	org.apache.felix.webconsole	Active	▪ ⟳ ⏏
4	OPS4J Pax Logging - API	1.3.0	org.ops4j.pax.logging.pax-logging-api	Active	▪ ⟳ ⏏
5	OPS4J Pax Logging - Service	1.3.0	org.ops4j.pax.logging.pax-logging-service	Active	▪ ⟳ ⏏
6	OPS4J Pax Web - Service	0.6.0	org.ops4j.pax.web.pax-web-service	Active	▪ ⟳ ⏏
2	OSGi Release 4.0.1 Services	3.1.200.v20070605	org.eclipse.osgi.services	Active	▪ ⟳ ⏏
1	OSGi Release 4.0.1 Utility Classes	3.1.300.v20080303	org.eclipse.osgi.util	Active	▪ ⟳ ⏏
0	OSGi System Bundle	3.4.3.R34x_v20081215-1030	org.eclipse.osgi; singleton:=true	Active	▪ ⟳ ⏏

Browse... - Start ☐ - Start Level 1   Install or Update   Refresh Packages

Bundle information: 8 bundles in total - all 8 bundles active.
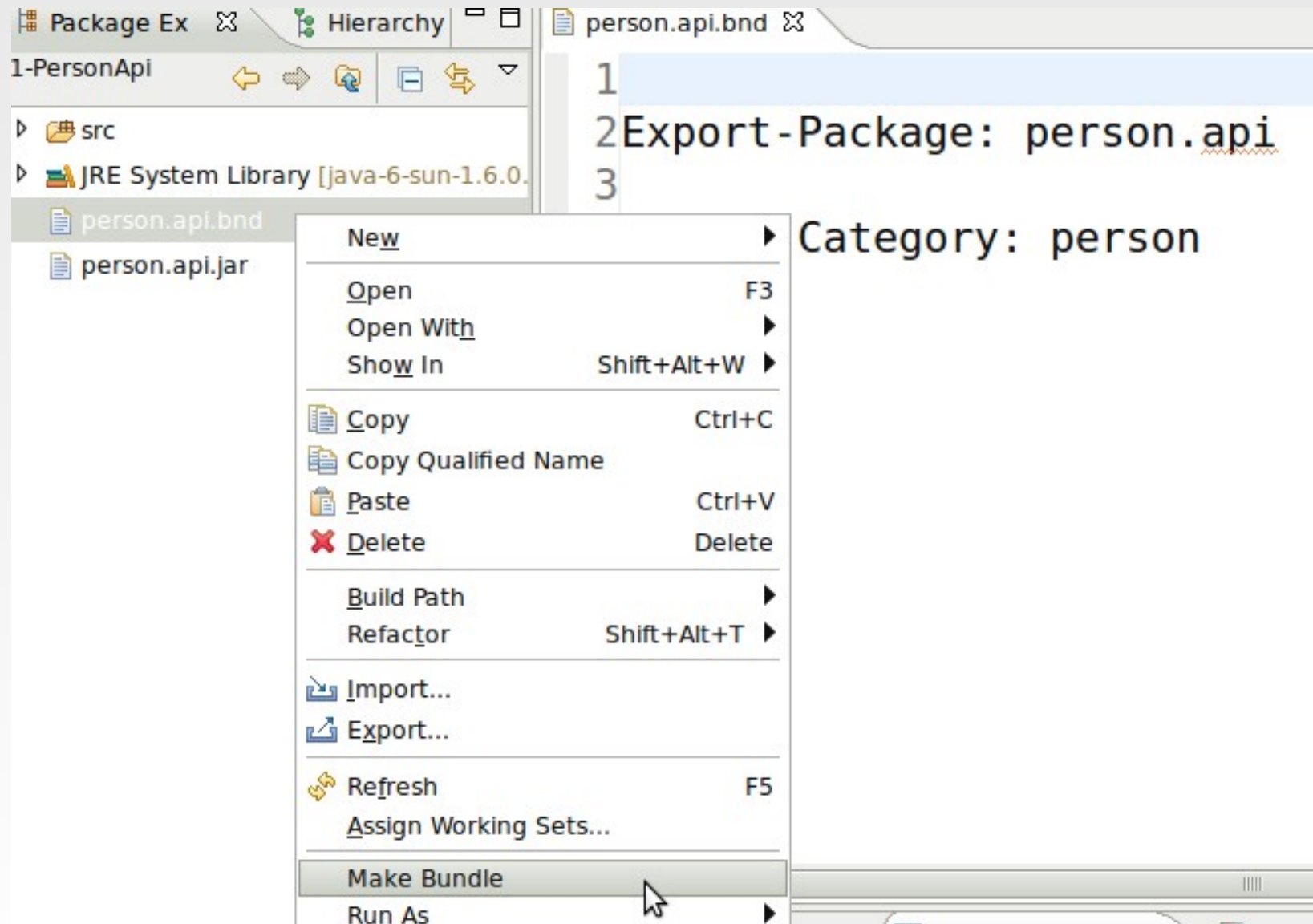
Good Bundles

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Bundle Tooling

Good Bundles: Bundle Tooling

- Problem
  - Create bundles for quick tests
  - Manifest reading
  - Library wrapping
  - ...
- Solution
  - Peter Kriens' BND

Good Bundles: Bundle Tooling

Good Bundles: Bundle Tooling

```
[MANIFEST person.service.soap.jar]
Bnd-LastModified                    1242294256177
Bundle-Activator                    person.service.soap.Activator
Bundle-Category                     person
Bundle-ManifestVersion              2
Bundle-Name                         person.service.soap
Bundle-SymbolicName                 person.service.soap
Bundle-Version                      0
Created-By                          1.6.0_10 (Sun Microsystems Inc.)
Import-Package                      org.osgi.framework,person.api
Manifest-Version                    1.0
Private-Package                     person.service.soap
Tool                                Bnd-0.0.281

[IMPEXP]
Import-Package
  org.osgi.framework
  person.api

[USES]
person.service.soap                 org.osgi.framework
                                    person.api

[USEDBY]
org.osgi.framework                  person.service.soap
person.api                          person.service.soap
```

Better Modularity with Bundles

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Dependencies

- Writing bundles does not automatically imply that dependency problems are avoided

- Require-Bundle is just as bad as „new Service()"

  - Only on a different level

  - Rely on Import-Package, let the resolver do the rest

  - Be open for future modifications

- Provide whiteboard / extender pattern implementation where reasonable

Bundle Granularity

- Common practive, e.g. Maven
  - Divide you build into several modules
  - Each module will result in a JAR

- Maven-bundle-plugin
  - Add OSGi metadata

- Ship bundles
  - User happy?

Bundle Granularity

Build	Bundle	User's POV 🙁
core1.jar core2.jar	core1.jar core2.jar	} mandatory
protocolA1.jar protocolA2.jar protocolA3.jar	protocolA1.jar protocolA2.jar protocolA3.jar	} either this
protocolB1.jar protocolB2.jar	protocolB1.jar protocolB2.jar	} or this

Bundle Granularity

Build	**Bundle**	**User's POV**
core1.jar core2.jar	core.jar	mandatory
protocolA1.jar protocolA2.jar protocolA3.jar	protocolA.jar	either this
protocolB1.jar protocolB2.jar	protocolB.jar	or this

Summary

- Bundles are so much better than plain JARs

- Bundles are deliveries for your users

- Granularity during development is different from granularity for deployments

- Embed your dependencies if they do not provide a value for your user

  - Bundle-Classpath is your friend

- Avoid Require-Bundle & DynamicImport-Package

THANK YOU!

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- http://www.flickr.com/photos/jessicafm/2767435428

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