OSGi Best Practices

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Context

- Client apps using:
  - Swing, Hibernate, JDO, JDBC, JNI, SOAP, a lot of Apache stuff, JUnit, FIT, Spring DM, Jetty, CICS-Adaptor, …
- Server apps using:
  - JDO, Hibernate, SOAP, REST, Tomcat, Spring DM, CICS-Adaptor, HTTP, a lot of custom libs, Memcached
- Eclipse platforms and frameworks including:
  - Equinox, IDE, RCP, p2 and various RT projects
- OSGi expert groups
- Educating and mentoring people in the real world

Don’t program OSGi

Program your application

- Use POJO
- Keep your business logic clean
- Programming practices to make gluing easy
- Dependency injection to allow composition
- Separation of concerns

- Benefits
  - Delay packaging decisions
  - Increased deployment flexibility

Separate concerns

- Creation
  - Zero-arg constructors
  - Light-weight construction
- Initialization
  - Enable setter injection
  - Support clearing if that makes sense
  - Defer work to lifecycle
- Lifecycle
  - Startup and shutdown
  - Restrict context required by lifecycle
  - Handle dynamics

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Solutions composed of POJOs

- Bundle POJOs as needed
- Glue together using
  - Use Declarative Services
  - iPOJO
  - BluePrint Services
  - …
- Use insulating layers to keep OSGi out of your code

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Structure matters

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Dependencies

***Managing dependencies* within large systems is one of the most critical success factors for healthy object-oriented business applications**

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What kind of dependencies?

- Dependencies between:
  - Individual classes and interfaces
  - Packages
  - Subsystems/Modules
- Dependencies of what kind?
  - Uses
  - Inherits
  - Implements

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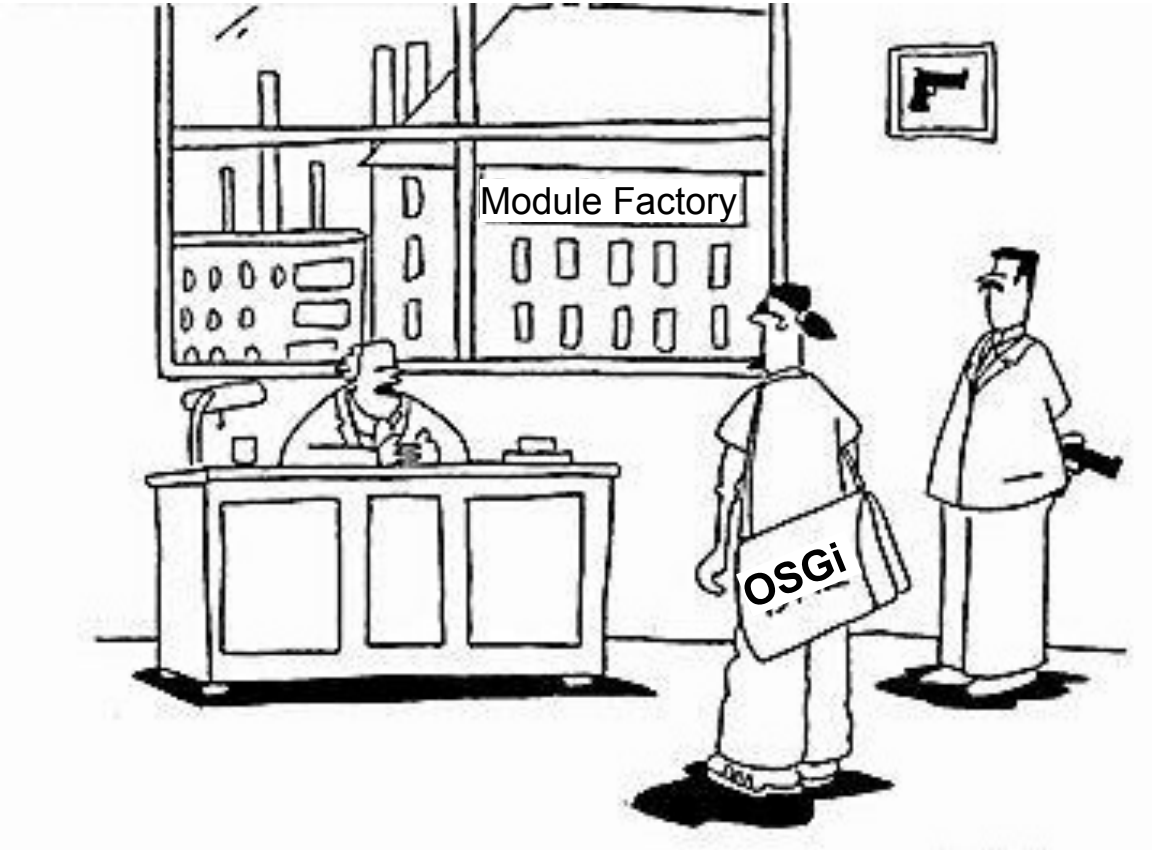
Don’t shoot the messenger



Around here our policy is to shoot the messenger!

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“Low coupling, high cohesion”
Not just a nice idea

OSGi makes you think
about dependencies

It does not create them!

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Observations when using OSGi

- Design flaws and structural problems often have a limited scope
  - Problems remain within single bundles
  - No wide-spreading flaws

Take just what you need

Import-Package vs. Require-Bundle

- Require-Bundle
  - Imports all packages of the bundle, including re-exported bundle packages
- Import-Package
  - Import just the package you need

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The Consequences

- Require-Bundle
  - Defines a dependency on the producer
  - Broad scope of visibility
- Import-Package
  - Defines a dependency on what you need
  - Doesn't matter where it comes from!

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When to use what?

- **Prefer using Import-Package**
  - Lighter coupling between bundles
  - Less visibilities
  - Eases refactoring
- Require-Bundle only when necessary:
  - Higher coupling between bundles
  - Use only for very specific situations:
    - split packages

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Version management

- Version number management is essential
- Depending on a random version is pointless
- Failing to manage version numbers undermines consumers

- Import-Package ➔ package version management
- Require-Bundle ➔ bundle version management

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Keep Things Private

API

- API is a contract with between producer and consumer
  - Prerequisites
  - Function
  - Consequences
  - Durability
- Key to effective modularity

Bundle API

- What should you export from a bundle?
- The easy way:
  - Blindly export everything
- That is a really bad idea:
  - No contract was defined
  - Consumers have no guidance
  - Broad visibility
  - High coupling between components

Producers: Think about your APIs

- Export only what consumers need
  - Less is more
  - Think about the API of a component
  - API design is not easy
- Don’t export anything until there is a good reason for it
  - Its cheap to change non-API code
  - Its expensive to change API code

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Consumers: Think about what you're doing

- Stay in bounds
- If you can't do something, perhaps
  - Use a different component
  - Use the component differently
  - Work with the producer to cover your use-case

Informed Consent

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Composing

Structuring Bundles

Just having bundles is not enough

You still need an architectural view

You still need additional structures

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Your Bundles shouldn't end up like this

Go! Get some structure!

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Guidelines

- Bundle rules in the small
  - Separate UI and core
  - Separate client and server and common
  - Separate service implementations and interfaces
  - Isolate connectors
- Bundle rules in the mid-size
  - Access to resources via services only
  - Access to backend systems via services only
  - Technology-free domain model

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Guidelines

- Bundle rules in the large
  - Separate between domain features
  - Separate between applications / deliverables
  - Separate between platform and app-specific bundles
- Don’t be afraid of having a large number of bundles
  - Mylyn
  - Working Sets
  - Platforms
- Cohesive packaging eases refactoring

Products

- Group bundles to form different products
  - Different clients
  - Different server-side apps
- Easy to deploy different apps, but not for free
- You need:
  - Minimal bundle dependencies
  - Pluggability (adding stuff from outside)

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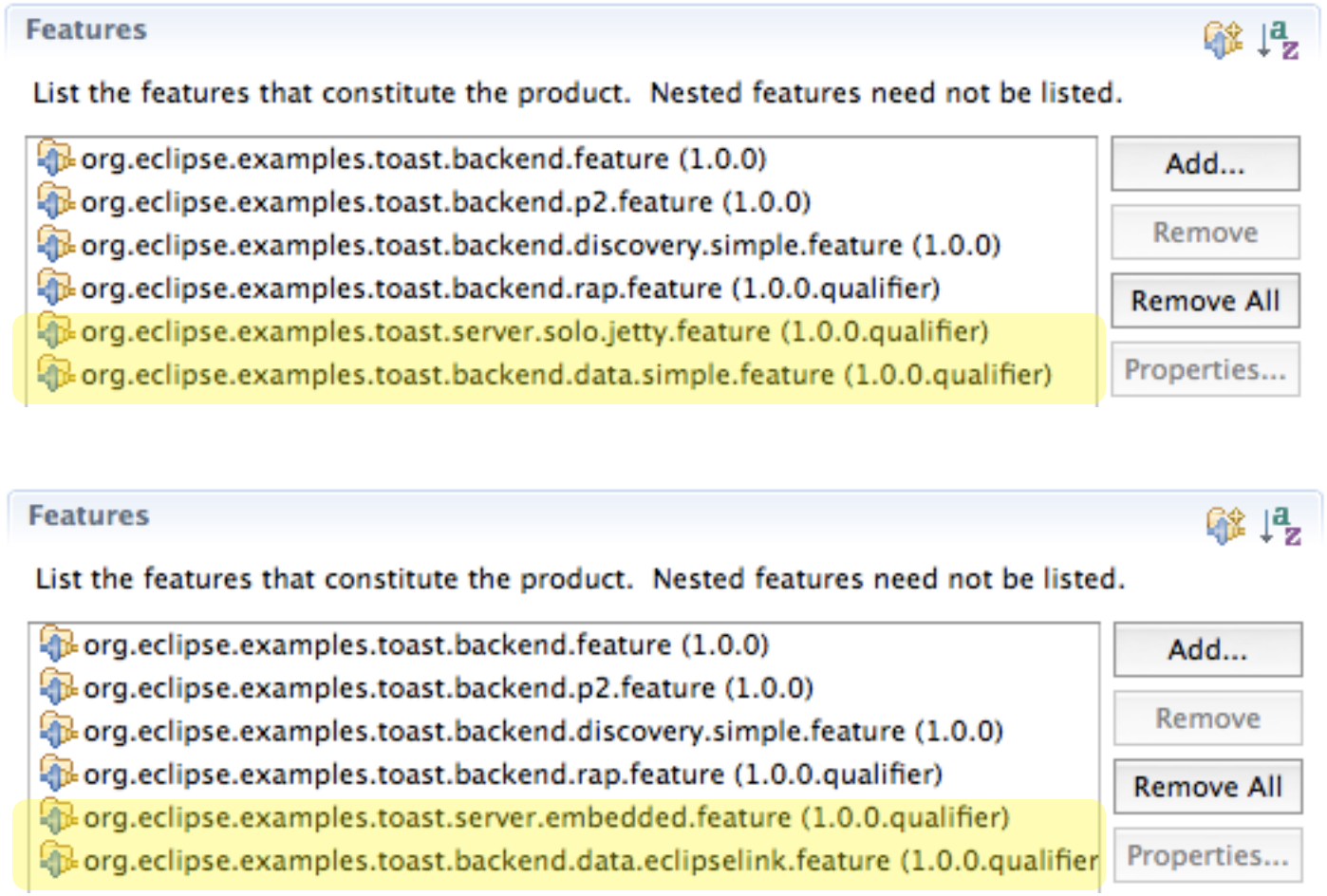
Features for Macro-level Modularity



Conclusions

Looking back

- Large OO systems grow over years
- **Its easy and fast to add/change features**

- OSGi is a major reason…
- But why?

OSGi leds us to…

- Thinking about structure all the time
  - Avoids mistakes early (before the ugly beast grows)
  - Less and defined dependencies
  - No broken windows
- Good separation of concerns
- Dependency injection & pluggable architecture
  - Easy to add features without changing existing parts
- Many small frameworks
  - Better than few overall ones

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Conclusions

Never without OSGi

You will love it

You will hate it

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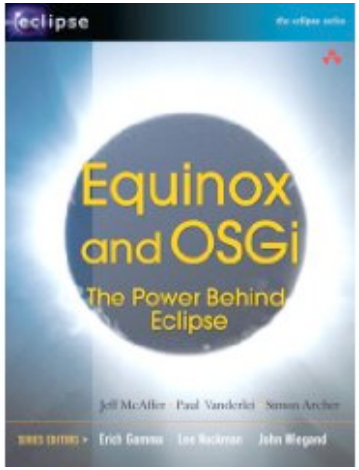
In the end its your best friend

Sources of more information



OSGi and Equinox book
http://equinoxosgi.org

Toast @ Eclipse
http://wiki.eclipse.org/Toast

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