Polyglot OSGi

or, "How to sneak your favorite language into the enterprise!"

Matt Stine

Your Speaker

- Matt Stine
  http://www.mattstine.com
  Twitter: mstine
  Email: matt.stine@gmail.com
  Phone: 901-214-JAVA

- Software Development
  Manager by Day

- JVM Language Enthusiast
  by Night

polyglot

Many Languages

From Ancient Greek πολύγλωττος (poluglōttos), "'many-tongied, polyglot'"), from πολύς (polus), "'many'") + γλῶττα (glōtta), "'tongue, language'")

Polyglot Programming

We are entering a new era of software development. For most of our (short) history, we've primarily written code in a single language...but I'm beginning to see a time where even the core language...will cease its monoculture...applications of the future will take advantage of the polyglot nature of the language world...it's all about choosing the right tool for the job and leveraging it correctly...the times of writing an application in a single general purpose language is over.

- Excerpts from: Neil Ford, "Polyglot Programming"
http://memeagora.blogspot.com/2006/12/polyglot-programming.html

The Golden Hammer Anti-pattern

Using the same tool, product, or technique to solve every problem

The Golden Hammer Anti-pattern

Using the same tool, product, or technique to solve every problem

Java

You're doing it already...

You're doing it already...

- SQL

You're doing it already…

- SQL

- JavaScript

You're doing it already...

- SQL

- JavaScript

- XML

You're doing it already…

- SQL

- JavaScript

- XML

- HTML

You're doing it already...

- SQL

- JavaScript

- XML

- HTML

- Ant/Maven

Adoption of additional languages is driven by critical mass being reached in an area of business or technical demand.

Drivers

- SQL

- JavaScript

- XML

- HTML

- Ant/Maven

Drivers

- SQL

- JavaScript

- XML

- HTML

- Ant/Maven

- Data Management in RDBMS

Drivers

- SQL

- JavaScript

- XML

- HTML

- Ant/Maven

- Data Management in RDBMS

- Web 2.0/Ajax

Drivers

- SQL

- JavaScript

- XML

- HTML

- Ant/Maven

- Data Management in RDBMS

- Web 2.0/Ajax

- Data interchange

Drivers

- SQL

- JavaScript

- XML

- HTML

- Ant/Maven

- Data Management in RDBMS

- Web 2.0/Ajax

- Data interchange

- Web 1.0

Drivers

- SQL

- JavaScript

- XML

- HTML

- Ant/Maven

- Data Management in RDBMS

- Web 2.0/Ajax

- Data interchange

- Web 1.0

- Build configuration

Drivers?
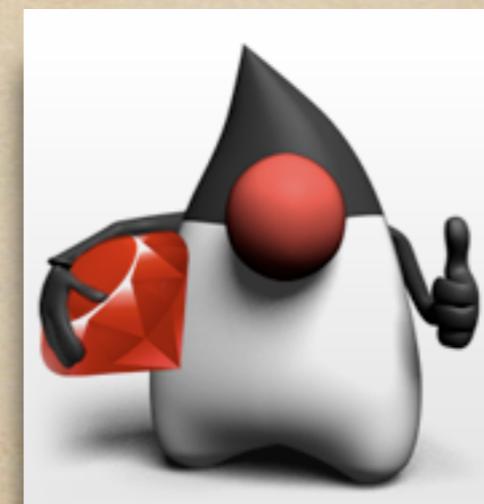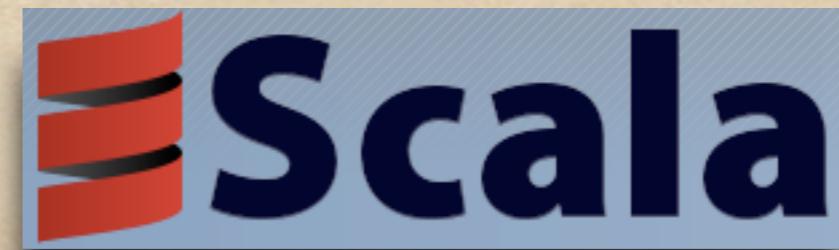
Polyglot Drivers

Polyglot Drivers

- Concurrency/Multi-core Hardware

Polyglot Drivers

- Concurrency/Multi-core Hardware

- Framework Availability

Polyglot Drivers

- Concurrency/Multi-core Hardware

- Framework Availability

- Special purpose language constructs/libraries

Polyglot Drivers

- Concurrency/Multi-core Hardware

- Framework Availability

- Special purpose language constructs/ libraries

- Essence over Ceremony

# Polyglot Drivers

- Concurrency/Multi-core Hardware

- Framework Availability

- Special purpose language constructs/ libraries

- Essence over Ceremony

- Testing

Polyglot Drivers

- Concurrency/Multi-core Hardware

- Framework Availability

- Special purpose language constructs/ libraries

- Essence over Ceremony

- Testing

- The JVM Itself

OSGi

- The Dynamic Module System for Java
- Enables the composition of applications from highly cohesive, loosely coupled modules

OSGi Architecture

Application/Bundles

Services

Service Registry

Lifecycle

Modules

Security

OSGi Platform

Java Virtual Machine

Operating System

Hardware

Java Platform
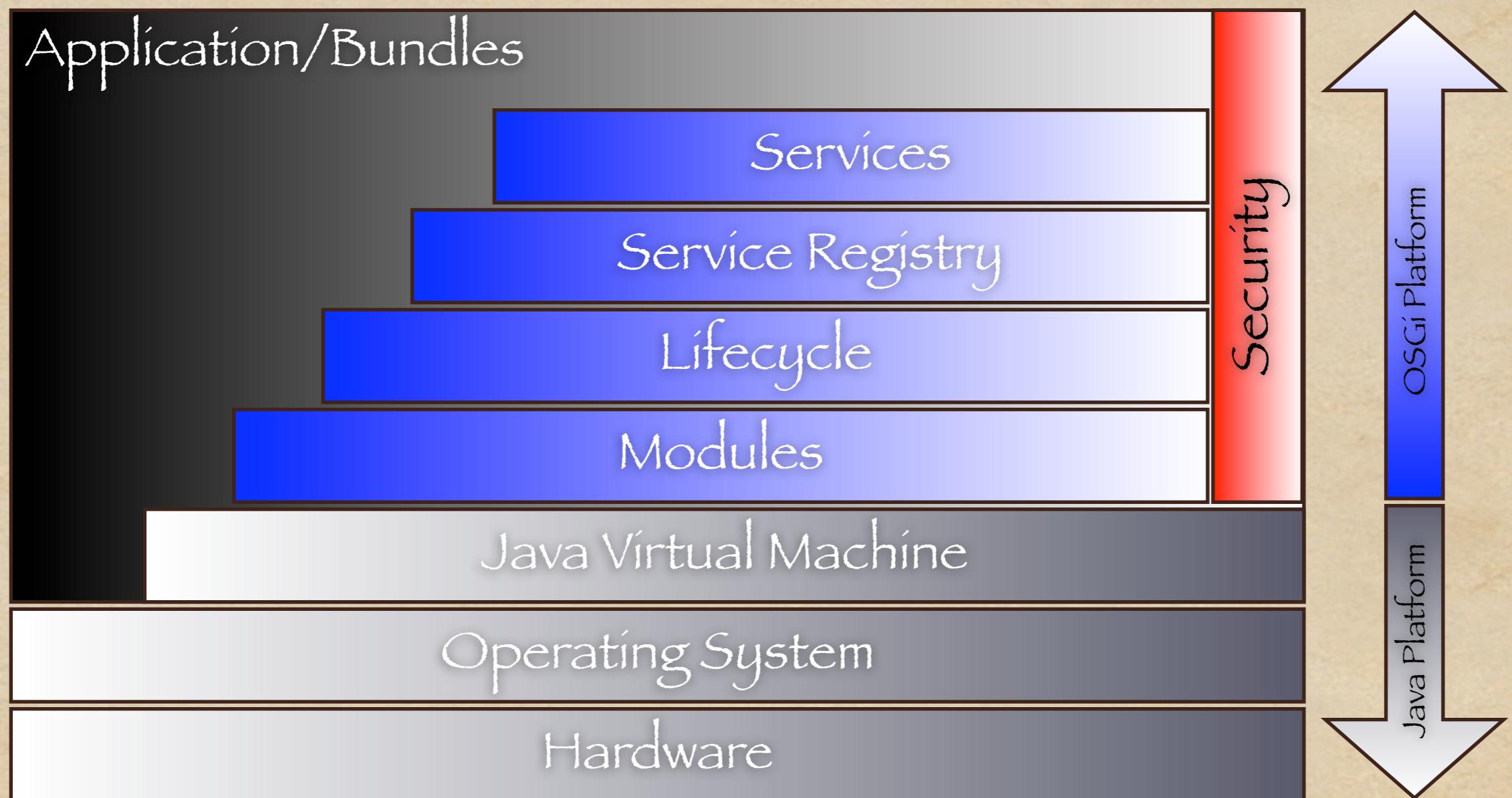
Inspired by Modular Java (Craig Walls), page 16

SOA in a JVM!
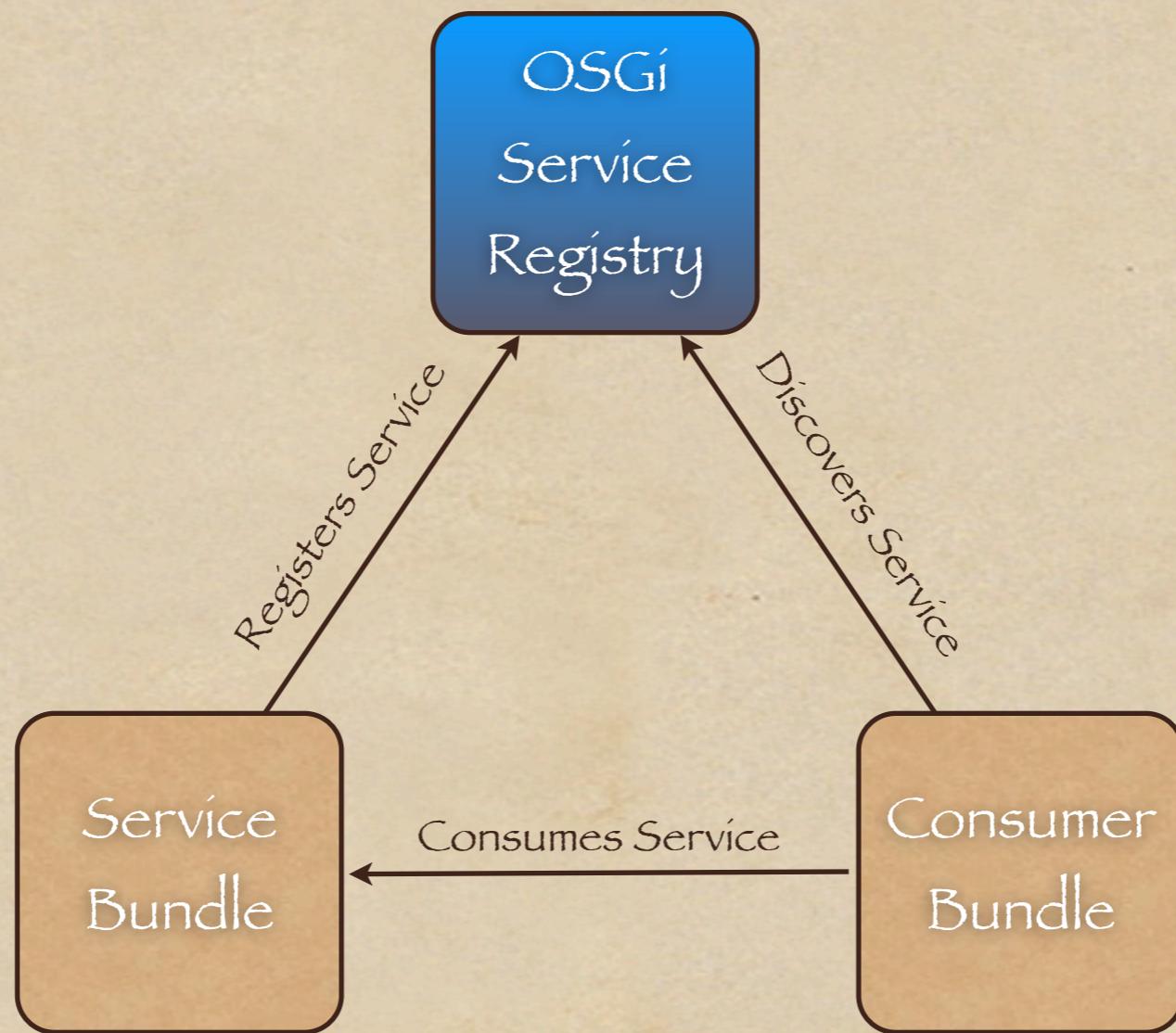
OSGi Service Registry

Service Bundle

Consumer Bundle

Registers Service

Discovers Service

Consumes Service

Inspired by Modular Java (Craig Walls), page 17

Modularity...how?

- Encapsulation

- Service Registry

- Versioning

- Dynamism/Lifecycle
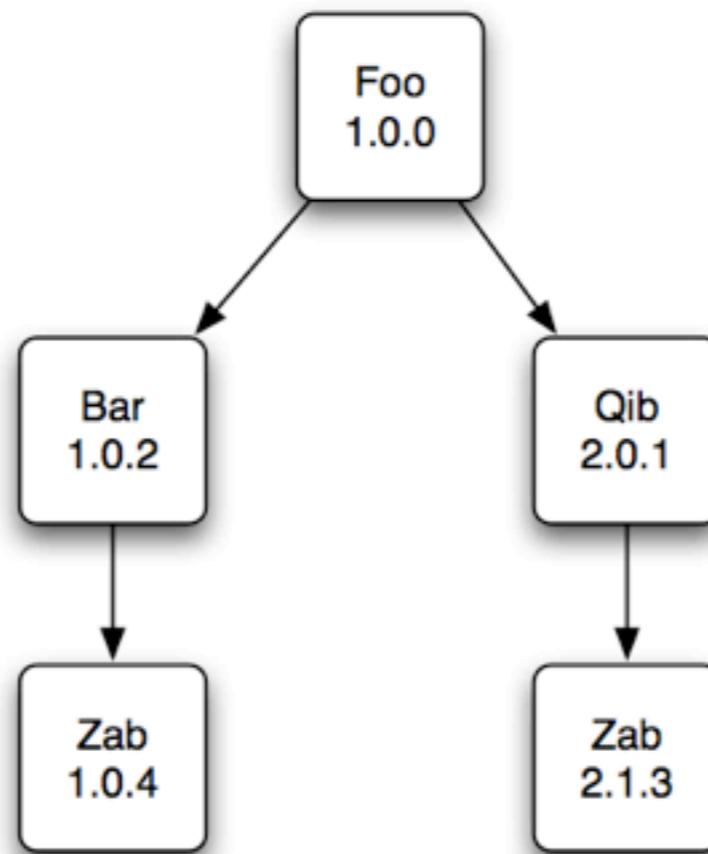
- Strong-Naming

Figure 1.4: Multiple versions of a bundle can be installed into OSGi at the same time.

Modularity...how?

- Encapsulation

- Service Registry

- Versioning

- Dynamism/Lifecycle

- Strong-Naming

OSGi Implementations

Equinox

PAX Tools for OSGi
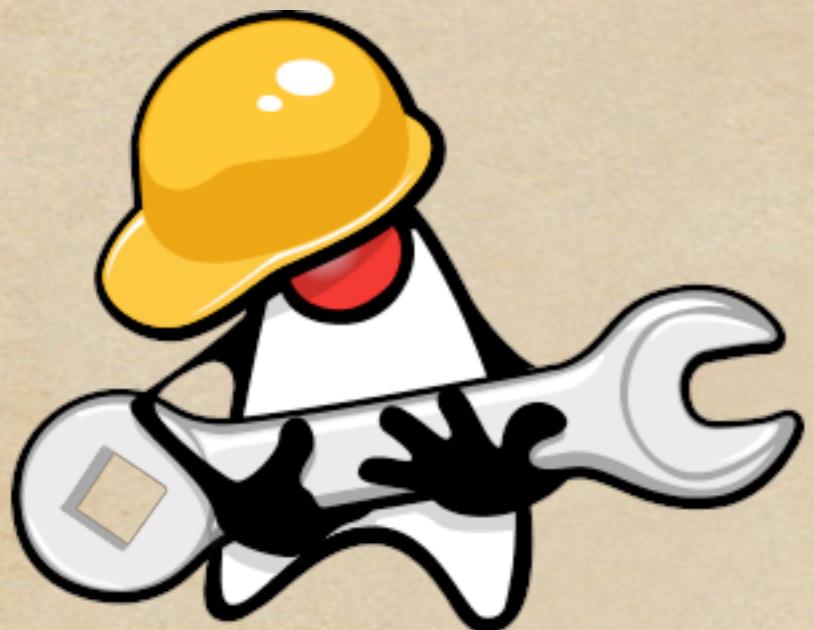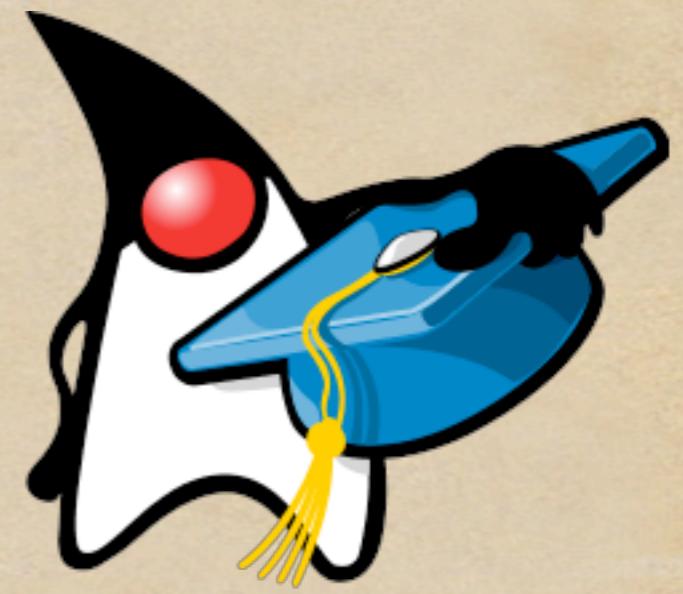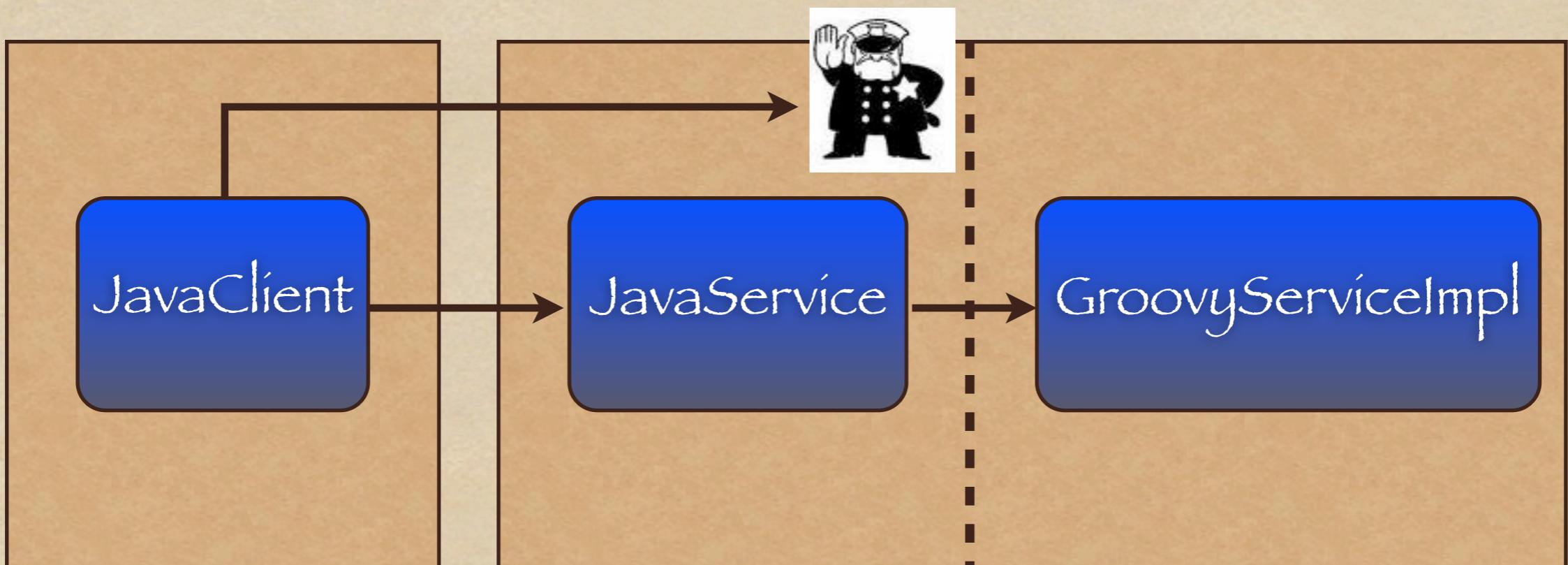
# Why Polyglot OSGi?
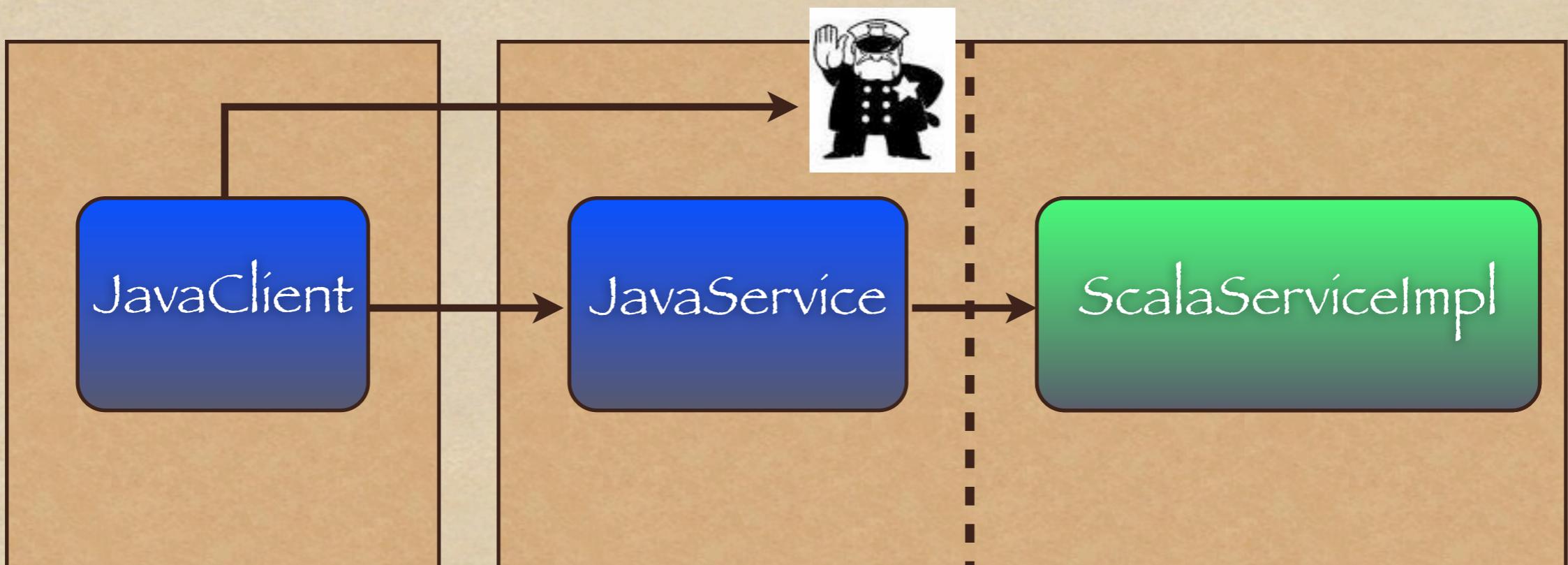
Why Polyglot OSGi?
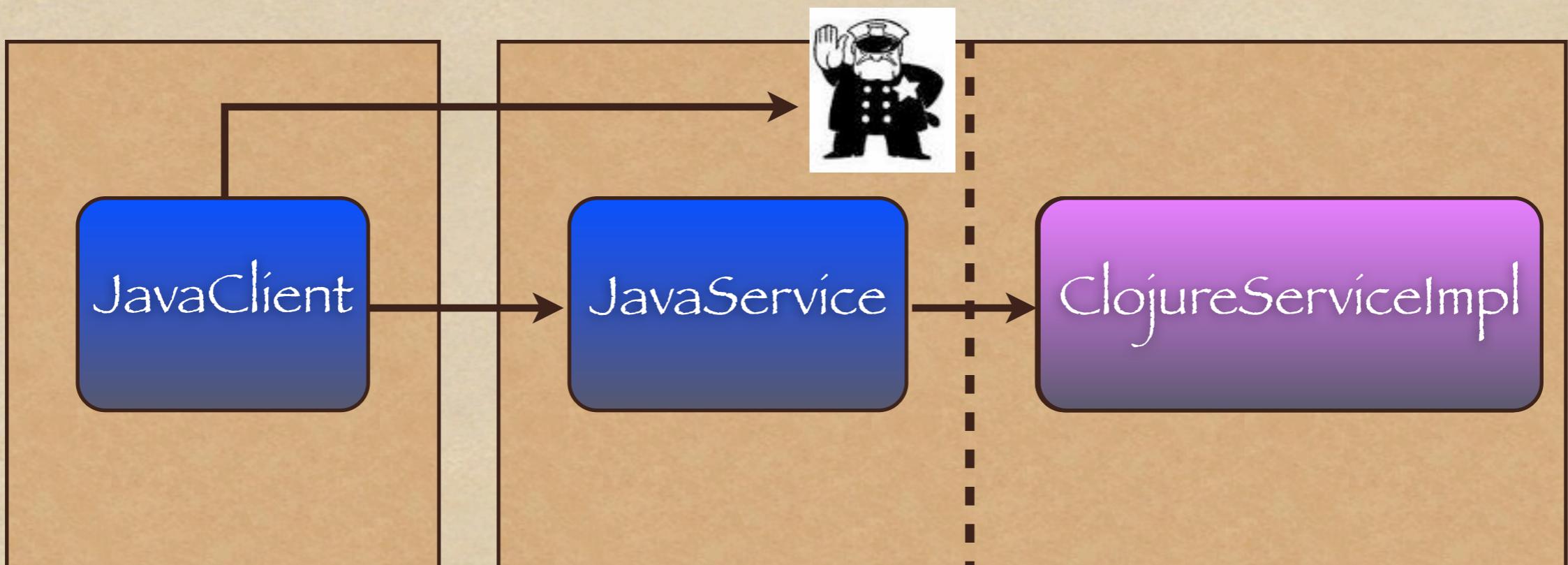
Why Polyglot OSGi?
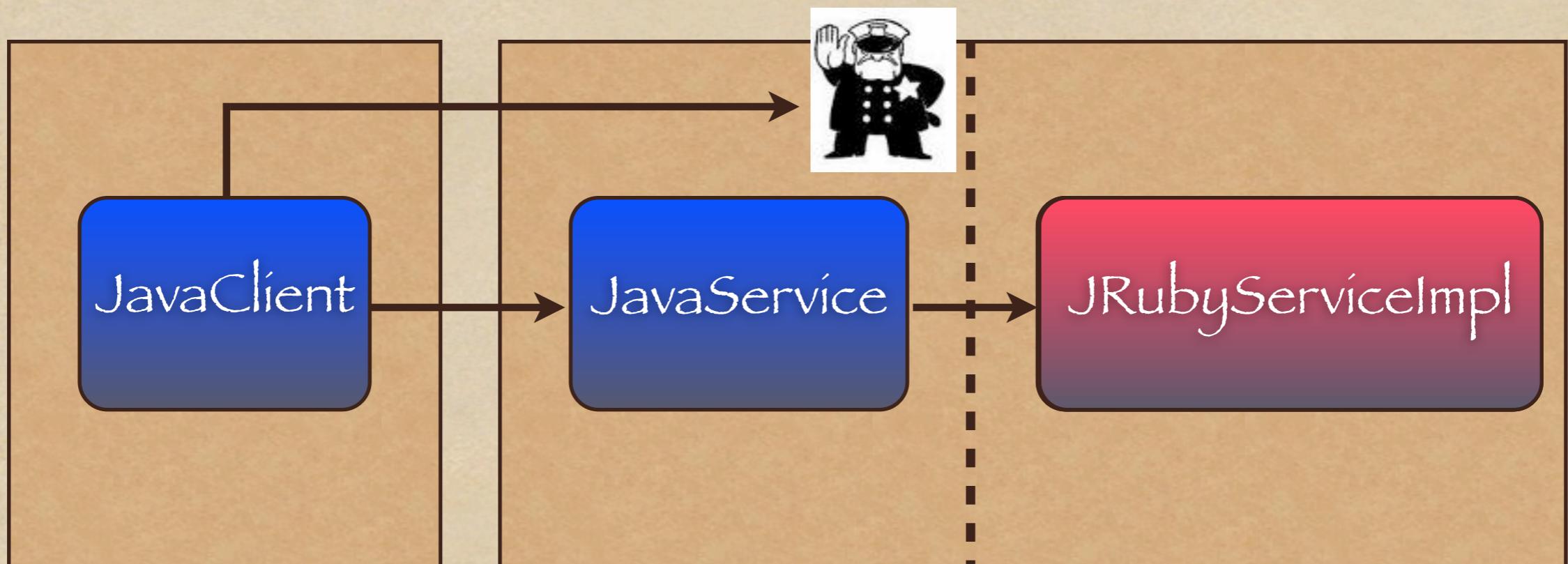
Why Polyglot OSGi?

Polyglot OSGi Pros

- Manage Risk

- Encapsulation

- Decoupled Architecture

- Java = JVM Lingua Franca

Polyglot OSGi Cons

- Constant Java translation at boundary

- Less idiomatic code

- Language / OSGi mismatch
  (Classloader h3ll)

- Not a silver bullet for large teams with
  few polyglots

A Polyglot OSGi Vending Machine

- Valid Actions:

    - NICKLE, DIME, QUARTER, DOLLAR - insert money

    - COIN RETURN - returns all inserted money

    - SERVICE - a service person opens the machine and sets the available change and items

    - GET-A, GET-B, GET-C - select item A ($.65), B ($1), or C ($1.50)

A Polyglot OSGI Vending Machine

- Valid Responses:
    - NICKLE, DIME, QUARTER – return coin
    - A, B, C – vend item A, B, or C
- Track state:
    - available items (count, price, selector)
    - available change (# of nickles, dimes, quarters, dollars available)
    - currently inserted money

A Polyglot OSGi Vending Machine

- Example Traces:

  - Buy B with exact change:

    Q, Q, Q, Q, GET-B

    -> B

  - Add change, hit coin return:

    Q, Q, COIN-RETURN

    -> Q, Q

  - Buy A without exact change (return $.35)

    DOLLAR, GET-A

    -> A, Q, D

Why this spec?

- Simple to understand, yet...
- ...demonstrates reasonable complexity one might find in a real application
- Algorithms suitable for showcasing language features

Goals

- Implement a Java interface contract for the spec

- Test-drive a Java implementation

- Use tests as a contract to implement in:

    - Groovy

    - Scala

    - Clojure

- Build a Spring MVC application to exercise different vending machines

Java Contract, Tests, Implementation

Groovy Implementation

Scala Implementation

Scala Gotchas

- Scala in Maven Central is NOT an OSGi Bundle!

- Can download from http://scala-lang.org.

- Swap it out manually…

- …however…

- won't work with Maven anymore!

- Use Groovy script to swap out Scala jars.

Clojure Implementation

Clojure Gotchas

- Clojure also not available as an OSGi bundle!

- Use Pax Construct to embed in bundle for Clojure implementation.

- Mixed experiences out there with trying to share a common Clojure bundle.

- OGEE Project (http://ogeesource.org)

Clojure Gotchas

- Not OSGi related, but…

- Maven Clojure Plugin won't seem to compile Clojure first, so if your Java code depends on Clojure code…

- Must run "mvn clojure:compile" first

Spring MVC Web Implementation

That's all folks!

Please fill out your evaluations!