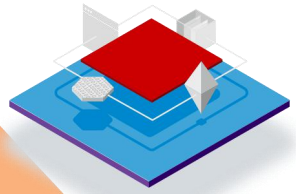


Red Hat Fuse - 7.x

A Distributed, Cloud-native Integration Platform

– Avadhut

Course Structure

- **Part – 4 : Fuse in Action**

- Introduction to Fuse-7.x
- Fuse sub-systems
- Management HawtIO
- Deployment strategies

Red Hat Fuse Practicals

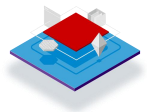
Management using HawtIO and CLI

What is HawtIO

- ✓ A modular web console for managing your Java stuffs
- ✓ Composed of a collection of plug-ins, each of which is an AngularJS module
- ✓ HawtIO has lot of plug-ins such as JMX, JVM, OSGi, Logs, ActiveMQ, Apache
- ✓ Camel and Spring Boot
- ✓ Designed by considering micro-services strategy in enterprise applications
- ✓ Cloud ready
- ✓ Available at port number 8181 for Red Hat Fuse

Red Hat Fuse

HawtIO Monitoring



Red Hat Fuse

CLI & Karaf in Action**

Karaf Commands

Enables/disables dynamic-import for a given bundle
bundle:dynamic-import <bundle-id|

Locates a specified class in any deployed bundle
bundle:find-class <class_name|

Displays OSGi headers of a given bundles
bundle:headers <bundle-id|

Displays detailed information of a given bundles
bundle:info <bundle-id|

Installs one or more bundles
osgi:install <mvn:group-id/artifact-id/version|
bundle:install <mvn:group-id/artifact-id/version|

karaf@root()| bundle:install mvn:com.kodtodya.practice/osgi-demo-example/0.0.1-SNAPSHOT

Lists all installed bundles
bundle:list <bundle-id|

Karaf Commands

```
# Load test bundle lifecycle
    bundle:load-test

# Refresh bundles
    bundle:refresh <bundle-id|

# Displays OSGi requirements of a given bundles
    bundle:requirements <bundle-id|

# Restarts bundles
    bundle:restart <bundle-id|

# Lists OSGi services per Bundle
    bundle:services <bundle-id|

# Gets or sets the start level of a bundle
    bundle:start-level <bundle-id| <start-level|

# Bundle start|stop|status
    bundle:start|stop|status <bundle-id|
```


Karaf Commands

 # Uninstall bundle

```
bundle:uninstall <bundle-id|
```

 # Watches and updates bundles

```
bundle:watch <bundle-id|
```

 # These are some sample commands

Please do refer below URL for more karaf commands and details:

https://access.redhat.com/documentation/en-us/red_hat_fuse/7.2/html-single/apache_karaf_console_reference/

Red Hat Fuse

Implementation of OSGi in Production**

OSGi Best Practices

Learn how to prevent common mistakes and build robust, reliable, modular, and extendable systems using OSGi™ technology

OSGi Best Practices

Portable Code - Problem

- You compile your code using source level 1.3 on a Java 5 platform compiler, assuming you are safe to run on older VMs
- But then it fails to run when you deploy to a Java platform 1.3 or CDC/Foundation 1.0 environment
- It turns out that despite your 1.3 source level, you were still linked to new parts in the Java 5 class library

java.lang.NoSuchMethodError: java.lang.StringBuffer: method append(Ljava/lang/StringBuffer;)Ljava/lang/StringBuffer; not found

OSGi Best Practices

Portable Code – Best Practice

Compile your code against the minimum suitable class libraries

- OSGi specification defines Execution Environments (EE)
  - OSGi Minimum—Absolute minimum, suitable for API design
  - Foundation—Fairly complete EE, good for most applications; Used for Eclipse
  - JAR files available from OSGi website
- Java platforms are backward compatible so you should always compile against the lowest version you are comfortable with
  - New features are good, but there is a cost!
  - At least think about this

OSGi Best Practices

Proper Imports – Problems

- You develop and test your bundles on an OSGi Service Platform that you have configured yourself
- Your colleague tries these bundles on another OSGi Service Platform and complains of a **ClassNotFoundError** in your bundles

OSGi Best Practices

Proper Imports

Problem

Code:

```
import org.osgi.framework.*;
import javax.xml.parsers.*;

public class Activator implements BundleActivator {
 public void start(BundleContext ctxt) {
    SAXParserFactory factory =
       SAXParserFactory.newInstance();
    SAXParser parser = factory.newSAXParser();
    ...
 }
}
```

Manifest:

```
Import-Package: org.osgi.framework
```

Missing an import for javax.xml.parsers in the manifest

OSGi Best Practices

Proper Imports

Best Practice

- Do not assume that everything in the Java Runtime Environment (JRE) will be available to your bundle
  - Only java.* packages are reliably available from the boot class path.
- Your bundle must import all packages that it needs
  - Except: java.* does not need to be imported
- Why?
  - Enables bundles to provide substitute implementations of JRE implementation release software version packages.
- The `org.osgi.framework.bootdelegation` system property may be set differently on different configurations, so you should never rely on its setting

OSGi Best Practices

Minimize Dependencies

Problem

- You find an interesting bundle and want to use it
- You install it in an OSGi framework
- You find it has dependencies on other bundle
- So you find and install those bundles
- Those bundles end up depending on still other bundles …
  - Ad nauseum …

OSGi Best Practices

Minimize Dependencies

Best Practice

- Use `Import-Package` instead of `Require-Bundle`
  - Require-Bundle can have only one provider—the named bundle
  - Import-Package can have many providers
  - Allows for more choices during resolving
  - Has a lower fan out, which gain adds up quickly
- Use version ranges
  - Using precise version numbers gives the dependency resolver less choice
- Design your bundles
  - Don't put unrelated things in the same bundle
  - Low coupling, high cohesion

OSGi Best Practices

Hide Implementation Details

Problem

- You wrote a bundle that has a public API and associated implementation code
  - This implementation code defines public classes because it needs to make cross-package calls and references
- You exported all the packages in your bundle
- In the future, you release an update to the bundle with the same public API but a vastly different implementation
- You then get an angry call because you broke some customer's code
  - And you told them not to use the implementation packages …

OSGi Best Practices

Hide Implementation Details

Best Practice

- Put implementation details in separate packages from the public API
  - **`org.example.foo`** - exported API package
  - **`org.example.foo.impl`** - private implementation package
- Do not export the implementation packages
  - Export and/or import the public details while keeping the implementation details private
  - **`Export-Package: org.example.foo; version=1.0`**

OSGi Best Practices

Avoid Class Loader Hierarchy Dependencies

Problem

- You are designing a multimedia system and want to allow other bundles to provide plugin codecs
- Your design requires them to pass names of the codec classes which you load via `Class.forName`
  - Either by method call or configuration file
- This design works in a traditional tree based class loader model since the multimedia system's class loader has visibility to the codec classes
- However, in an OSGi environment, the multimedia system gets `ClassNotFoundErrors` since it does not have visibility to the codec classes

OSGi Best Practices

Avoid Class Loader Hierarchy Dependencies

Best Practice

- Better to use a safe OSGi model like services or the Extender Model to have bundles contribute codecs
  - More dynamic, you can add new services on the fly by installing bundles
- Workaround for using **`Class.forName`**
  - Use **`DynamicImport-Package: *`** and have the contributing bundles export their codec package
  - This may work but can result in unintended side effects since your bundle may import packages it did not expect

OSGi Best Practices

Avoid OSGi Framework API Coupling

Problem

- You wrote your code and packaged it in a bundle
- Your code publishes an OSGi service for other bundles to use and also uses services provided by other bundles
- Your code uses the OSGi service layer API in quite a number of classes and is now coupled to the OSGi API
- You no longer can easily use your code in a non-OSGi environment

OSGi Best Practices

Avoid OSGi Framework API Coupling

Best Practice

- Write your code as POJOs (Plain Old Java Objects)
- Program against interfaces, not concrete classes
- Isolate the use of OSGi API to a minimal number of classes
- Let these coupled classes inject dependencies into the POJOs
- Make sure none of your domain classes depend on these OSGi coupled classes
- Use an OSGi ready IoC container like Declarative Services or Spring OSGi to express these dependencies in a declarative form
  - Let the IoC containers handle all of the OSGi API calls

OSGi Best Practices

Thread Safety

Problem

- You develop a bundle and test it extensively
- However when deployed in the field with a set of other bundles, your bundle fails with exceptions in strange places
- Ultimately your realize that these other bundles are triggering events
  - Which your bundle receives and processes
  - But the events are being delivered on many different threads
- Time to consult a concurrency expert…

OSGi Best Practices

Thread Safety

Best Practice

- In an OSGi environment, framework callbacks to your bundle can occur on many different threads simultaneously
- Your code must be thread-safe!
  - Callbacks are likely running on different threads and can occur really simultaneously
  - Do not hold any locks when you call a method and you do not know the implementation, they might call back to bite you
  - Java platform monitors are intended to protect low level data structures; use higher level abstractions with time outs for locking entities
  - In multi-core CPUs, memory access to shared mutable state must always be synchronized

Let's revise

- Part – 4 : Fuse Installation and CLI

- Fuse Installation/Fuse on EAP installation
- Management HawtIO
- Understanding CLI/Karaf container in Action
- Implementation of OSGi in production

** Commands to interact with Karaf

Questions ?

https://kodtodya.github.io/talks/

Thank you..!!!

LinkedIn, GitHub, GitLab, Twitter: @kodtodya

https://kodtodya.github.io/talks/