

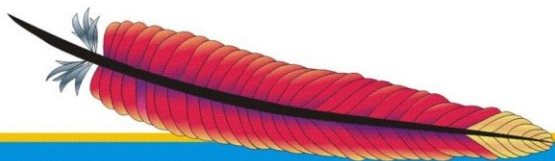
Scripting your Java Application with BSF 3.0

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ApacheCon EU 09



About

- Senior Developer at Day
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- <http://blog.meschberger.ch>
- Apache Projects:
 - Sling
 - Felix
 - Jackrabbit



Contents

- Scope
- BSF 3.0
- Scripting for the Java™ Platform
- OSGi Framework
- Demo



Scope

- Scripting for the Java™ Platform
- Using BSF 3
- *Not* using BSF 2 API
- Example: Apache Sling



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About BSF

- Bean Scripting Framework
- <http://jakarta.apache.org/bsf/>
- Timeline
 - 1999 Sanjiva Weerawarana, IBM
 - 2002 Subproject of Jakarta (Version 2.3)
 - 2006 BSF 2.4
 - 2007 BSF 3.0 beta2
 - 2009 BSF 3.0 beta3 (right now!)



BSF 3.0

- Java Scripting API (JSR-223)
- Stable
- Beta due to TCK issues



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Scripting for the Java™ Platform

- JSR-223
- Approved November 2006
- Builds on BSF 2.4 and BeanShell
- Included in Java 6
- BSF 3.0 for Java 1.4 and Java 5



Three Steps for Scripting

1. Get the ScriptEngineManager

```
ScriptEngineManager mgr = new  
    ScriptEngineManager();
```

2. Get the ScriptEngine

```
ScriptEngine eng =  
    mgr.getEngineByExtension („js“);
```

3. Evaluate the Script

```
Object result = eng.eval („'Hello World'“);
```



Demo 1

- Scripting in Three Steps
 - Sample0.java
 - Call Class from Command Line



Main API

- `javax.script.ScriptEngineManager`
 - Manages `ScriptEngineFactory`
 - Provides access to `ScriptEngine`
 - Manages Global Scope
- `javax.script.ScriptEngineFactory`
 - Registered with `ScriptEngineManager`
 - Creates `ScriptEngine`
- `javax.script.ScriptEngine`
 - Evaluates Scripts



Helper API

- `javax.script.Bindings`
 - Variable Binding between Scripts and App.
- `javax.script.ScriptContext`
 - Context for evaluating Scripts
 - Bindings (Scopes)
 - Input/Output
- `javax.script.ScriptException`
 - Thrown on Script Execution Errors



Advanced API

- `javax.script.Invocable`
 - Optionally implemented by `ScriptEngine`
 - Allows calling functions in scripts
- `javax.script.Compilable`
 - Optionally implemented by `ScriptEngine`
 - Allows precompiling scripts
 - Generates `CompiledScript`
- `javax.script.CompiledScript`
 - Generated by `Compilable.compile()`



Issues

- Missing Lifecycle Support
 - ScriptEngineFactory can only be added
 - Cleanup of ScriptEngineManager only on GC
- Missing API
 - ScriptEngineManager.unregisterXXX()
 - ScriptEngineManager.destroy()
 - ScriptEngineFactory.destroy()
- META-INF/services
 - ClassLoader Dependency



Script Language Support

- Implement 2 Interfaces
 - ScriptEngineFactory
 - ScriptEngine
- Register
 - Manually
 - ScriptEngineManager.registerEngineExtension()
 - ScriptEngineManager.registerEngineMimeType()
 - ScriptEngineManager.registerEngineName()
 - Automatically
 - META-INF/services/javax.scripting.ScriptEngineFactory



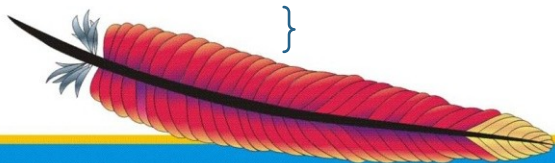
„Demo“ Script Engine Factory

```
public class DemoScriptEngineFactory
    implements ScriptEngineFactory {

    public ScriptEngine getScriptEngine() {
        return new DemoScriptEngine(this);
    }

    public List<String> getExtensions() {
        return Arrays.asList("demo");
    }

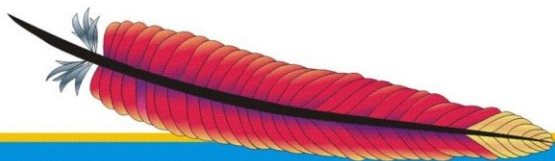
    // more methods not shown
}
```



„Demo“ Script Engine

```
public class DemoScriptEngine
    extends AbstractScriptEngine {

    public Object eval(String script,
        ScriptContext context) {
        return script;
    }
    // more methods not shown
}
```



„Demo“ Registration

META-INF/services/javafx.script.ScriptEngineFactory

```
ch.meschberger.demo.engine.DemoScriptEngineFactory
```

ScriptEngineManager.registerEngine*()

```
ScriptEngineManager mgr =  
    new ScriptEngineManager();  
mgr.registerEngineName(engineName,  
    new DemoScriptEngineFactory());
```



Demo 2

- Automatic Registration of „Demo“ Engine
 - Sample1.java
 - Call Class from Commandline
- Manual Registration of „Demo“ Engine
 - Sample2.java
 - Call Class from Commandline



Interaction

- Variable Bindings
 - Global Scope
 - Engine Scope
 - Runtime Scope
- Return Values



Demo 3

- Simple Script Executor
 - Sample4
 - Reads and executes `<lang>: <script>`
- Return Value From Script
- Global Scope – Shared Bindings
- Runtime Scope – Non-shared Bindings



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OSGi Quick Shot

The Framework forms the core of the OSGi Service Platform Specifications. It provides a general-purpose, secure, and managed Java framework that supports the deployment of extensible and downloadable applications known as *bundles*.

*OSGi Service Platform Core Specification, Release 4, Version 4.1,
The OSGi Alliance, April 2007*



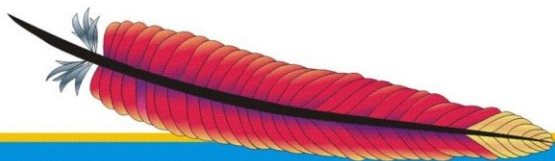
OSGi Layers

- Security Layer
 - Java 2 Security based
- Module Layer
 - Bundles and Classloaders
- Life Cycle Layer
 - Installation, Start, Stop, Uninstallation, ...
- Service Layer
 - Service Registry
- Actual Services



Sling and Java Scripting

- Provide BSF 3.0 API (Java 5 only)
- Manage ScriptEngineFactory
 - Create ScriptEngineManager
 - Update ScriptEngineManager
- Automatic Registration
 - META-INF/services/j.s.ScriptEngineFactory
 - ScriptEngineFactory services



ScriptEngine for Sling

- Create a Bundle
 - Export-Package: None required
 - Import-Package: javax.script plus required
 - DynamicImport-Package: *
- ClassLoader Issues
 - Create Bridging ClassLoader
 - http://wiki.eclipse.org/BundleProxyClassLoader_recipe
 - Set Thread's context ClassLoader



Sling, Java Scripting: Lifecycle

- Problem:
 - Lifecycle required for Cleanup
 - META-INF/services required for Interoperability
- Solution:
 - BundleActivator



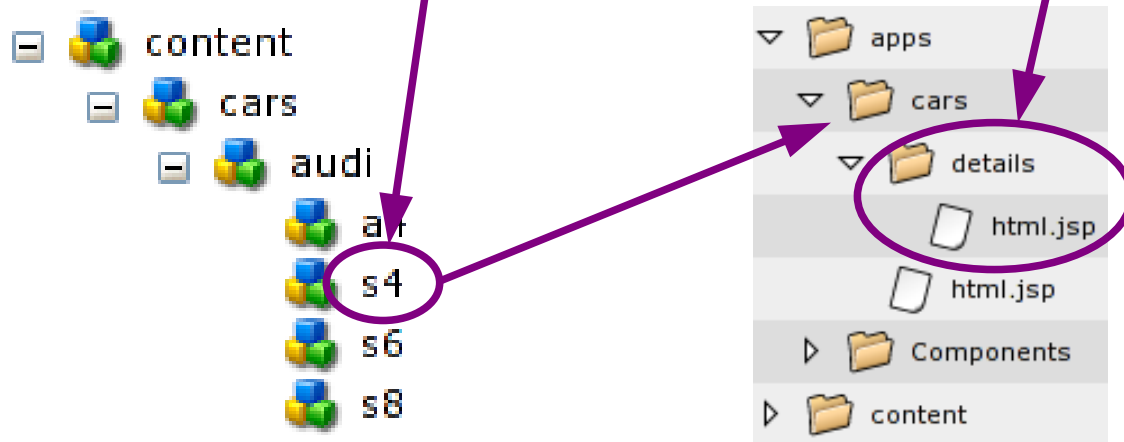
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How Sling finds Scripts

/content/cars/audi/s4.details.html



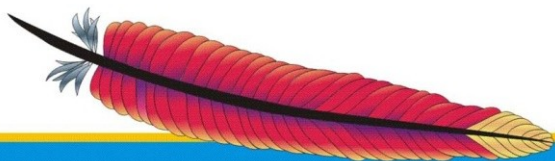
Demo: Sleep

- <http://sleep.dashnine.org/>
- Perl-like
- Provides ScriptEngineFactory with automatic registration
- ch.meschberger.demo.sleep
 - Downloads and Bundles Sleep



Demo 3

- Sling Running
- Web Console shows known Engines
- Show Scripts



Links

- <http://jakarta.apache.org/bsf/>
- <http://www.jcp.org/en/jsr/detail?id=223>
- <http://incubator.apache.org/sling/>
- <http://felix.apache.org/>
- <http://scripting.dev.java.net/>



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Questions ?



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Thank You !



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- Join the Sling Community at
 - <http://incubator.apache.org/sling>
 - <mailto:sling-dev@incubator.apache.org>

