# RFC 204 - Framework Extension Activators

Draft

9 Pages

## Abstract

The OSGi Core specification version 4 introduced framework extension bundles as a way to deliver optional parts of the Framework implementation. The OSGi Core specification version 4.2 and 4.3 introduced various framework hooks that allowed bundles on top of the framework to augment certain behaviors of the framework. For example, the service, bundle and resolver hooks together may be used to implement a scoping model for isolating groups of bundles with in the same framework. In many scenarios it is desired to have these hooks be available (registered) as early as possible to guarantee consistent behavior for the complete lifecycle of the framework. Currently there is no standard to ensure the hook implementations are available when a framework is initialized because hook implementations are registered as services by normal bundles which can only be activated after a framework has been initialized.

This RFC specifies extension bundle activators which can be used by a framework extension to hook into the initialization process of the framework, including the ability to register framework hook services.

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## 0.3 Feedback

This document can be downloaded from the OSGi Alliance design repository at https://github.com/osgi/design The public can provide feedback about this document by opening a bug at https://www.osgi.org/bugzilla/.

## 0.4 Table of Contents

## 0.5 Terminology and Document Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY" and "OPTIONAL" in this document are to be interpreted as described in 10.1.

```
Source code is shown in this typeface.
```

## 0.6 Revision History

The last named individual in this history is currently responsible for this document.

| Revision | Date | Comments |
|---|---|---|
| Initial | Aug 27 2013 | Thomas Watson, IBM tjwatson@us.ibm.com<br>Initial version |
| | Sept 4 2013 | Thomas Watson, IBM tjwatson@us.ibm.com<br>– Modified requirements based on CPEG feedback<br>– Added the technical section |
| | Sept 19 2013 | Thomas Watson, IBM tjwatson@us.ibm.com<br>– Removed mention of order for calling start methods. This is not mentioned for normal bundles<br>– Added an error event when stop method throws an exception<br>– Mentioned open bug for ongoing discussion of exceptions on start method. |

# 1 Introduction

The OSGi Core specification version 4 introduced framework extension bundles as a way to deliver optional parts of the Framework implementation. The OSGi Core specification version 4.2 and 4.3 introduced various framework hooks that allowed bundles on top of the framework to augment certain behaviors of the framework. For example, the service, bundle and resolver hooks together may be used to implement a scoping model for isolating groups of bundles with in the same framework. In many scenarios it is desired to have these hooks be available (registered) as early as possible to guarantee consistent behavior for the complete lifecycle of the framework. Currently there is no standard to ensure the hook implementations are available when a framework is initialized because hook implementations are registered as services by normal bundles which can only be activated after a framework has been initialized.

This RFC specifies extension bundle activators which can be used by a framework extension to hook into the initialization process of the framework, including the ability to register framework hook services.

# 2 Application Domain

The basic framework provides complete visibility for any bundle to any other bundle, service or capability. In certain use cases it is important to provide a notion of isolation or scope to a group of bundles. The Enterprise specification has defined subsystems as a standard way to isolate groups of bundles.

In environments that include an isolation model, such as subsystems, framework hooks are used extensively to provide the implementation of the isolation model. In order to provide a consistent behavior the framework hook service implementations must be registered before any operation occurs that requires isolation. For example, resolution operations, interactions with the service registry etc.

# 3 Problem Description

In order for framework hook service implementations to provide consistent behavior they must be registered with the service registry and available before any framework operations occur where they need to influence the behavior. For service and bundle hooks this is typically not an issue if the hook implementations are registered by a bundle at a very low start-level (for example start-level 1). This allows them to be available before any other normal bundles interact with the service registry or the set of installed bundles.

Resolver hooks participate in the resolve process of the framework. The specification allows resolution to occur at any time. Resolution may occur before even starting the first bundle (including the bundle that implements a

resolver hook). This implies that bundles implementing resolver hooks must do some kind of consistency check each time they come on line to see if the wiring has changed since the last time they were active. One way to do this would involve the resolve hook implementation persisting the complete wiring graph on shutdown and then comparing the graph to the current wiring graph on restart. This is likely to be complicated and an expensive operation.

Conceptually framework hook implementations extend the framework and can be considered part of the framework. In many cases it is desirable to make the hooks available as soon as the framework is initialized. One way to solve this issue is to introduce extension bundle activators which can be declared by a framework extension. This would allow the activator to be called during framework initialization to establish the framework hook as early as possible. It would also allow the framework hook to remain available as late as possible during the framework shutdown process.

# 4 Requirements

1. A framework extension must be able hook into the initialization process of the framework and gain access to the system bundle's context.
2. A bootclasspath extension must NOT be able to hook into the initialization process of the framework.
3. During the initialization process, if existing framework extensions are installed and require resolution then the resolve operation must be scoped to only include the system bundle and its fragments. This resolution operation must occur before allowing framework extensions to have access to the system bundle's context.
4. If a framework extension is allowed to be installed and resolve dynamically after framework initialization without a framework restart, then the extension bundle must have access to the system bundle's context as soon as the extension bundle is resolved (the current CT implies that dynamic resolution is required without a restart).
5. A framework extension must be able to hook into the the framework shutdown process. This must happen after all other bundles are stopped and before firing one of the FrameworkEvent.STOPPED events which Framework.waitForStop is listening for.
6. Uninstalling and updating a framework extension must NOT remove the extension from the framework shutdown process. The actual effects of update/uninstall do not take effect until the framework is shutdown.

# 5 Technical Solution

A new header is introduced for framework extensions to allow a bundle activator to be specified. The following sections will be merged into the Extension Bundles chapter (3.15)

## 5.1 Framework Extension Activator

A framework extension may hook into the Framework initialization and shutdown process by specifying an Extension Bundle Activator. The BundleActivator interface defines methods that the Framework invokes for Extension Bundle Activators when the Framework is initialized and shutdown.

To inform the OSGi environment of a fully qualified class name serving as its Extension Bundle Activator, a framework extension developer must declare an ExtensionBundle-Activator manifest header in the framework extension bundle's manifest file. The following is an example of an ExtensionBundle-Activator:

```
ExtensionBundle-Activator: com.acme.Activator
```

The class acting as an Extension Bundle Activator must implement the BundleActivator interface, be declared public, and have a public default constructor so an instance of it may be created with `Class.newInstance`.

Supplying an Extension Bundle Activator is optional and only valid for extensions of type framework.

### 5.1.1 Initialization

The last step during Framework initialization (Section 4.2.4) is to call each Extension Bundle Activator. The start method of each Extension Bundle Activator declared by resolved framework extensions is called to inform the framework extension of the initializing framework. While calling Extension Bundle Activator start methods the framework must be in the STARTING state and have a valid bundle context. ~~The order in which framework extension activators are called is not specified and should not be relied upon. [XXX Make it the same as normal bundles]~~ Any exception thrown by an extension bundle activator start method should result in a FrameworkEvent of type ERROR.

XXX – ERROR event not much value here unless the framework has built in logging of such errors, should we fail init? Equinox would log such errors to a log and continue framework init. I'm not a big fan of failing initialization because it puts the framework persistent storage area into an unlaunchable state with no way to recover except to use a clean launch. This will inevitably result a severe bug report when someone installs a bad extension into a product like Eclipse. Bug opened to discuss https://www.osgi.org/members/bugzilla/show_bug.cgi?id=2558.

During the initialization process a framework must attempt to resolve all installed framework extensions. All resolve operations that occur during initialization must be scoped to only include the system bundle and its fragments. This is necessary to avoid resolution operations which change the wiring of normal bundles before the Extension Bundle Activators are called.

### 5.1.2 Update and Uninstall

Unlike normal bundles, updating or uninstalling an extension bundle does not take effect at runtime until the framework is shutdown and restarted. The old content of the bundle must remain attached to the system bundle until the framework is shutdown. This extends to the Extension Bundle Activators that have had the start method called. All started Extension Bundle Activators must not have the stop method called until the framework is shutdown.

### 5.1.3 Installing

When a framework extension is installed a Framework may allow the extension to become resolved dynamically, without a Framework restart. If a framework extension is allowed to be installed and resolve dynamically after framework initialization, then the Extension Bundle Activator start method must be called as soon as the extension bundle is resolved. This must happen before the resolved bundle event is fired for the extension bundle.

### 5.1.4 Shutdown

Section 4.2.6 discusses the Framework shutdown process. Extension Bundle Activators are called during the shutdown process after all other bundles are stopped. The Extension Bundle Activator stop methods are called after the start-level moves to 0 and before disabling event handling. While calling Extension Bundle Activator stop methods the framework must be in the STOPPING state and have a valid bundle context. ~~[XXX – state error~~

~~condition if exception occurs~~]Any exception thrown by an extension bundle activator stop method should result in a FrameworkEvent of type ERROR.

The Framework must guarantee that if a BundleActivator.start method has executed successfully for a framework extension, that same BundleActivator object must be called with its BundleActivator.stop method when the framework is shutdown. After calling the stop method, that particular BundleActivator object must never be used again. Extension Bundle Activators that threw an exception during start must not be called on shutdown.

# 6 Data Transfer Objects

None for this RFC

# 7 Javadoc

None at this time. A constant will need to be defined to specify the ExtensionBundle-Activator header.

# 8 Considered Alternatives

Considered adding a FrameworkWiring.getChangeCount method that could be used by bundles with resolver hooks that could be used to determine if some resolve operation occurred while they were not available or registered. This solution is really only useful for frameworks that cache their resolution state between framework sessions. Otherwise the change count would be different for each restart and require a resolver hook implementation to always do a consistency check.

# 9 Security Considerations

Framework extensions will be handed the BundleContext of the system bundle without performing any security check. This is acceptable because framework extensions must have all permissions in order to be installed successfully.

# 10 Document Support

## 10.1 References

[1]. Bradner, S., Key words for use in RFCs to Indicate Requirement Levels, RFC2119, March 1997.

[2]. Software Requirements & Specifications. Michael Jackson. ISBN 0-201-87712-0

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## 10.3 Acronyms and Abbreviations

## 10.4 End of Document