RFC 222: Declarative Services Updates

Draft

9 Pages

Abstract

Updates to Declarative Services for Release 7.

0 Document Information

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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 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	2016-04-13	Initial draft BJ Hargrave, IBM

1 Introduction

This RFC collects a numbers of requested enhancements to Declarative Services that were suggested after Release 6 design work was completed.

2 Application Domain

Declarative Services (DS) was first released in 2005 as part of Release 4. From the Version 1.0 spec:

> The service component model uses a declarative model for publishing, finding and binding to OSGi services. This model simplifies the task of authoring OSGi services by performing the work of registering the service and handling service dependencies. This minimizes the amount of code a program- mer has to write; it also allows service components to be loaded only when they are needed. As a result, bundles need not provide a BundleActivator class to collaborate with others through the service registry.

DS has proven a popular and useful way of developing for OSGi. There have been 3 updates to the spec resulting in the current Version 1.3 in Release 6.

3 Problem Description

3.1 Component Factory Properties (Bug 2800)

Currently factory components can only have 2 service properties, component.name and component.factory. See 112.2.4 Factory Component.

It would be useful to allow a ComponentFactory service to have additional service properties. For example, a discussion of possible Device Access changes resulted in an alternate proposal using ComponentFactory. But this proposal utilized some service properties on the ComponentFactory service. Currently this could only be done through the value of the factory attribute which results in the component.factory service property.

3.2 Component Reclamation (Bug 2801)

With the current DS spec, a service can either be lazy or immediate. Neglecting configuration policy and satisfying of references, an immediate service is activate as soon as possible and deactivated when the bundle is stopped. A lazy component is only activated if someone else is using it, and deactivated once it's not used anymore. For the examples below I used Event Admin, as everyone is familiar with it; but it's applicable for other scenarios, usually whiteboard related.

There are at least two consequences of the lazy behavior:

1. A lazy component might create a burden on the system. For example, if an EventHandler is lazy and the handler is activated and deactivated for each event it's receiving, a lot of activation/deactivation of that service might happen, even concurrently. Of course, an event admin implementation can keep the service once it's send the first event. Making the EventHandler immediate reduces the burden in any case.

2. If a service wants to store information in between usages, for example if an EventHandler wants to count how often it was invoked, immediate is the only option. Of course, if the service becomes unsatisfied or the bundle is restarted the state is lost. However, in many cases keeping state in this way is sufficient.

For use case like the above mentioned, immediate works but comes with the penalty that the service is activated as soon as possible, even if it is not used. For example, if there is no EventAdmin the EventHandler is activated nevertheless.

Therefore it would be nice to have an option in between immediate and lazy: the service is activated like it is lazy but deactivated like it is immediate.

3.3 Constructor Injection (Public Bug 179)

Method injection was the original dependency injection technique supported in DS. In Version 1.3, field injection support was added. Both of these techniques require the use of non-final field since the fields must be updatable after object construction. There is interest in also supporting constructor injection to allow the injected component instances to be stored in final fields.

3.4 Mapped Field Injection (RFP 178)

When having multiple instances of the same service interface, often a key property is used to identify and differentiate these instances. When using these service instances from a DS component, it makes sense to collect these services and map them by their key property.

For example using the good old method injection:

```
Map<String, SomeService> services = new ConcurrentHashMap<>();

@Reference(
      cardinality=ReferenceCardinality.MULTIPLE,
      policy=ReferencePolicy.DYNAMIC)
void addService(SomeService s, Map<String, Object> properties){
    String key = (String)properties.get("keyProperty");
    services.put(key, s);
}

void removeService(SomeService s, Map<String, Object> properties){
    String key = (String)properties.get("keyProperty");
    services.remove(key);
}
```

However, this is currently not possible using field injection.

3.5 Field injection of component activation objects (Bug 2902)

In many cases the activate method is only implemented to receive the ComponentContext, BundleContext or configuration and store it in a field. Similarly the deactivate method might be implemented to null out these fields - this allows service methods to check whether a component is active or not.

To reduce this boilerplate code, we could support annotating fields with @Activate. The type of a field can be one of the types supported by the activate method and are set before any component method is called.

4 Requirements

DS-0010 – Provide a means to define configurable services properties for ComponentFactory services. These are separate from the service properties of the component instances constructed by the ComponentFactory service.

DS-0020 – Provide a means to specify that a component instance construction can be delayed but its reclamation deferred until the component configuration becomes unsatisfied.

DS-0030 – Provide a means to support injecting bound services to a component constructor.

DS-0040 – Provide a means to inject a map of keyed services. The means must allow the key name to be specified and also whether the multiple values for the key are supported.

DS-0041 – The type of the key and the type of the value, for DS-0040, must be specifiable or inferred from the generics types of annotated Map field.

DS-0050 – Provide a means to inject component activation objects into fields. This means must also handle modified and deactivation cases.

DS-1000 – All solutions must provide a way to utilize them via Annotations as well as via the component description xml.

5 Technical Solution

First give an architectural overview of the solution so the reader is gently introduced in the solution (Javadoc is not considered gently). What are the different modules? How do the modules relate? How do they interact? Where do they come from? This section should contain a class diagram. Then describe the different modules in detail. This should contain descriptions, Java code, UML class diagrams, state diagrams and interaction diagrams. This section should be sufficient to implement the solution assuming a skilled person.

Strictly use the terminology a defined in the Problem Context.

On each level, list the limitations of the solutions and any rationales for design decisions. Almost every decision is a trade off so explain what those trade offs are and why a specific trade off is made.

Address what security mechanisms are implemented and how they should be used.

6 Data Transfer Objects

RFC 185 defines Data Transfer Objects as a generic means for management solutions to interact with runtime entities in an OSGi Framework. DTOs provides a common, easily serializable representation of the technology.

For all new functionality added to the OSGi Framework the question should be asked: would this feature benefit from a DTO? The expectation is that in most cases it would.

The DTOs for the design in this RFC should be described here and if there are no DTOs being defined an explanation should be given explaining why this is not applicable in this case.

This section is optional and could also be provided in a separate RFC.

7 Javadoc

Please include Javadoc of any new APIs here, once the design has matured. Instructions on how to export Javadoc for inclusion in the RFC can be found here: https://www.osgi.org/members/RFC/Javadoc

8 Considered Alternatives

None at this time.

9 Security Considerations

Description of all known vulnerabilities this may either introduce or address as well as scenarios of how the weaknesses could be circumvented.

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

10.2 Author's Address

Name	BJ Hargrave
Company	IBM

10.3 Acronyms and Abbreviations

DS – Declarative Services

SCR – Service Component Runtime

10.4 End of Document