



RFC 190 - Declarative Services Enhancements

Draft

73 Pages

Abstract

Declarative Services provide nice functionality to implement Dependency Injection programming in OSGi based applications. One of the goals is to limit the requirement to use OSGi specific API. This RFC proposes extensions towards this goal. In addition Declarative Services currently lacks a proper diagnostic API to introspect components.

0 Document Information

0.1 License

DISTRIBUTION AND FEEDBACK LICENSE, Version 2.0

The OSGi Alliance hereby grants you a limited copyright license to copy and display this document (the "Distribution") in any medium without fee or royalty. This Distribution license is exclusively for the purpose of reviewing and providing feedback to the OSGi Alliance. You agree not to modify the Distribution in any way and further agree to not participate in any way in the making of derivative works thereof, other than as a necessary result of reviewing and providing feedback to the Distribution. You also agree to cause this notice, along with the accompanying consent, to be included on all copies (or portions thereof) of the Distribution. The OSGi Alliance also grants you a perpetual, non-exclusive, worldwide, fully paid-up, royalty free, limited license (without the right to sublicense) under any applicable copyrights, to create and/or distribute an implementation of the Distribution that: (i) fully implements the Distribution including all its required interfaces and functionality; (ii) does not modify, subset, superset or otherwise extend the OSGi Name Space, or include any public or protected packages, classes, Java interfaces, fields or methods within the OSGi Name Space other than those required and authorized by the Distribution. An implementation that does not satisfy limitations (i)-(ii) is not considered an implementation of the Distribution, does not receive the benefits of this license, and must not be described as an implementation of the Distribution. "OSGi Name Space" shall mean the public class or interface declarations whose names begin with "org.osgi" or any recognized successors or replacements thereof. The OSGi Alliance expressly reserves all rights not granted pursuant to these limited copyright licenses including termination of the license at will at any time.

EXCEPT FOR THE LIMITED COPYRIGHT LICENSES GRANTED ABOVE, THE OSGi ALLIANCE DOES NOT GRANT, EITHER EXPRESSLY OR IMPLIEDLY, A LICENSE TO ANY INTELLECTUAL PROPERTY IT, OR ANY THIRD PARTIES, OWN OR CONTROL. Title to the copyright in the Distribution will at all times remain with the OSGi Alliance. The example companies, organizations, products, domain names, e-mail addresses, logos, people, places, and events depicted therein are fictitious. No association with any real company, organization, product, domain name, email address, logo, person, place, or event is intended or should be inferred.

THE DISTRIBUTION IS PROVIDED "AS IS," AND THE OSGi ALLIANCE (INCLUDING ANY THIRD PARTIES THAT HAVE CONTRIBUTED TO THE DISTRIBUTION) MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, OR TITLE; THAT THE CONTENTS OF THE DISTRIBUTION ARE SUITABLE FOR ANY PURPOSE; NOR THAT THE IMPLEMENTATION OF SUCH CONTENTS WILL NOT INFRINGE ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADEMARKS OR OTHER RIGHTS.

NEITHER THE OSGi ALLIANCE NOR ANY THIRD PARTY WILL BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR RELATING TO ANY USE OR DISTRIBUTION OF THE DISTRIBUTION.

Implementation of certain elements of this Distribution may be subject to third party intellectual property rights, including without limitation, patent rights (such a third party may or may not be a member of the OSGi Alliance). The OSGi Alliance is not responsible and shall not be held responsible in any manner for identifying or failing to identify any or all such third party intellectual property rights.

The Distribution is a draft. As a result, the final product may change substantially by the time of final publication, and you are cautioned against relying on the content of this Distribution. You are encouraged to update any implementation of the Distribution if and when such Distribution becomes a final specification.

The OSGi Alliance is willing to receive input, suggestions and other feedback ("Feedback") on the Distribution. By providing such Feedback to the OSGi Alliance, you grant to the OSGi Alliance and all its Members a non-exclusive, non-transferable, worldwide, perpetual, irrevocable, royalty-free copyright license to copy, publish, license, modify, sublicense or otherwise distribute and exploit your Feedback for any purpose. Likewise, if incorporation of your Feedback would cause an implementation of the Distribution, including as it may be modified, amended, or published at any point in the future ("Future Specification"), to necessarily infringe a patent or patent application that you own or control, you hereby commit to grant to all

implementers of such Distribution or Future Specification an irrevocable, worldwide, sublicenseable, royalty free license under such patent or patent application to make, have made, use, sell, offer for sale, import and export products or services that implement such Distribution or Future Specification. You warrant that (a) to the best of your knowledge you have the right to provide this Feedback, and if you are providing Feedback on behalf of a company, you have the rights to provide Feedback on behalf of your company; (b) the Feedback is not confidential to you and does not violate the copyright or trade secret interests of another; and (c) to the best of your knowledge, use of the Feedback would not cause an implementation of the Distribution or a Future Specification to necessarily infringe any third-party patent or patent application known to you. You also acknowledge that the OSGi Alliance is not required to incorporate your Feedback into any version of the Distribution or a Future Specification.

I HEREBY ACKNOWLEDGE AND AGREE TO THE TERMS AND CONDITIONS DELINEATED ABOVE.

0.2 Trademarks

OSGi™ is a trademark, registered trademark, or service mark of the OSGi Alliance in the US and other countries. Java is a trademark, registered trademark, or service mark of Oracle Corporation in the US and other countries. All other trademarks, registered trademarks, or service marks used in this document are the property of their respective owners and are hereby recognized.

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 Document Information.....	2
0.1 License.....	2
0.2 Trademarks.....	3
0.3 Feedback.....	3
0.4 Table of Contents.....	3
0.5 Terminology and Document Conventions.....	4
0.6 Revision History.....	4
1 Introduction.....	6
2 Application Domain.....	6
2.1 Terminology + Abbreviations.....	6
3 Problem Description.....	7
3.1 Management.....	7
3.2 Bound Service Properties.....	7
4 Requirements.....	7
5 Technical Solution.....	8
5.1 DiagnosticIntrospective API.....	8
5.2 Event Method Signature.....	9
5.3 API version.....	9
5.4 XML Descriptor Namespace.....	9
5.5 Extender Capability.....	9
5.6 Extension to Annotation Support.....	9
5.6.1 Custom annotations to define properties.....	9
5.6.2 Adding annotation fields to the component descriptorMapping Annotation Elements to Component Properties.....	10

5.6.3 Mapping cComponent pProperties to aAnnotation fieldsElements.....	11
5.6.4 Clarification of @Component annotation.....	13
5.7 Clarification of Section 112.7.1.....	13
5.8 Integration with the Configuration Admin Service.....	14
5.9 Service Scopes.....	15
6 Data Transfer Objects.....	15
7 Java API.....	16
8 Considered Alternatives.....	70
8.1 Diagnostic API.....	70
8.2 @Component annotation inheritance.....	70
8.3 Create separate Service annotation (Bug 2140).....	71
8.4 Component provided service properties (Bug 2250).....	71
8.5 Create separate Property annotation (Bug 2141).....	71
8.6 New Life Cycle States.....	71
9 Security Considerations.....	72
10 Document Support.....	72
10.1 References.....	72
10.2 Author's Address.....	72
10.3 Acronyms and Abbreviations.....	73
10.4 End of Document.....	73

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	Sept. 17 2012	Initial version from RFP Felix Meschberger, Adobe Systems Incorporated, fmeschbe@adobe.com

Revision	Date	Comments
Update	Sept. 24 2012	<p>Updates from Basel F2F:</p> <ul style="list-style-type: none"> • Integrate Administrative API and design it to be DTO-style • Simplify security (ServicePermission [ServiceComponentRuntime, GET] is enough) <p>Felix Meschberger, Adobe Systems Incorporated, fmeschbe@adobe.com</p>
Update	06/06/13	<p>Update from Orlando F2F and BJ's feedback on the CPEG mailing list</p> <ul style="list-style-type: none"> • Relable the administrative API as the diagnostic API • Fleshed out annotation inheritance but suggest to actually remove it (section 5.7.4, Supporting Inheritance) • Added section 5.9, Service Scopes <p>Felix Meschberger, Adobe Systems Incorporated, fmeschbe@adobe.com</p>
Update	07/08/13	<p>Update from Palo Alto F2F</p> <ul style="list-style-type: none"> • Removed separate service annotations • Removed annotation inheritance • Removed setting properties through the component • Updated DTOs • New suggestion for property annotation <p>Carsten Ziegeler, Adobe Systems Incorporated, cziegele@adobe.com</p>
Update	07/19/13	<p>Update from CPEG Call (18/07/13)</p> <ul style="list-style-type: none"> • Removed alternative property annotation proposals • Clarified annotation based approach <p>Carsten Ziegeler, Adobe Systems Incorporated, cziegele@adobe.com</p>
Update	09/18/13	<p>Update after BJ's review, major changes:</p> <ul style="list-style-type: none"> • Removed props attribute from @Component annotation and allow multiple annotation arguments in the lifecycle methods • Remove DISPOSED state <p>Carsten Ziegeler, Adobe Systems Incorporated, cziegele@adobe.com</p>

Revision	Date	Comments
Update	01/10/13	Update with feedback from CPEG call: <ul style="list-style-type: none">Add information (back) from annotations as properties to descriptor XML Carsten Ziegeler, Adobe Systems Incorporated, ctiegele@adobe.com
Update	17/10/13	Update from Bug 2515 Carsten Ziegeler, Adobe Systems Incorporated, ctiegele@adobe.com
Update	24/10/13	Update from CPEG call <ul style="list-style-type: none">Clarified annotation field to property mapping
<u>Updated</u>	<u>2013-11-11</u>	<u>API/Javadoc improvements (up through section 5.6)</u> <u>BJ Hargrave, IBM</u>

1 Introduction

This Declarative Services Enhancements RFC defines functionality currently implemented in some implementations of the specification or currently requiring special component code as part of the OSGi Declarative Services Specification.

2 Application Domain

Declarative Services (chapter 121 in the OSGi specifications) defines a POJO programming model for OSGi services. This model requires Service Component class be implemented in a certain way and the XML component descriptions be authored.

2.1 Terminology + Abbreviations

DS Declarative Services

- POJO** Plain old Java Object; term use for objects not implementing and framework specific plumbing such as Servlet API, Spring API, or OSGi API.
- SCR** Service Components Runtime; generally the implementation of the Declarative Services Specification; also the name of the Apache Felix implementation (Apache Felix SCR).

3 Problem Description

3.1 Management

There is no official API yet to introspect and thus manage the declared service components. To work around this missing functionality the Apache Felix project defined such an API which is also implemented by current versions of the Eclipse Equinox implementation.

This current API has some short-comings which are addressed by a new proposal.

3.2 Bound Service Properties

As of DS Version 1.1 the service registration properties of bound services can be provided to the components using an optional `java.lang.Map` argument. While this allows for great capability introspecting the bound service it lacks support for ordering defined for `org.osgi.framework.ServiceReference`.

The solution applied today is to either use the greedy service binding policy option as defined in DS Version 1.2 or to implement such ordering in the component itself. Such implementation, though, is pure template code and thus error prone load to developers.

4 Requirements

- R-1 The solution **MUST** define an **diagnosis** API to introspect declared components and their configurations.

- R-2 The solution MUST make it possible to leverage the ordering capability of the `ServiceReference` along with the service instance provisioning through the event method by allowing the new signature:

```
void <method-name>(<parameter-type>, ServiceReference);
```

- R-3 The solution MUST define a new way to define component properties by referencing a java annotation class. The fields of this annotation class are used to define properties for the component.
- R-4 The solution MUST define the `osgi.extender` capability for DS in accordance with the core specification rules for the `osgi.extender` name space.
- R-5 The solution MUST support targeted PIDs according to Configuration Admin 1.5.

5 Technical Solution

5.1 ~~Diagnostic~~Introspective API

The ~~diagnostic~~introspective API is structured after the component descriptor within its own package `org.osgi.service.component.runtime`. The `ServiceComponentRuntime` service interface is the API entry point. It is registered by the ~~DS-implementation~~SCR and provides access to properties of the implementation and to the properly declared components. Any components whose descriptor cannot be validated is considered unknown and thus is not available through the `ServiceComponentRuntime` service.

Each component declaration is accessible through the `ServiceComponentRuntime` as an instance of the `ComponentDescription`DTO class. The `ComponentDescription`DTO provides access to the static declaration.

Components actually are available from the `ServiceComponentRuntime` as `ComponentConfiguration`DTO instances. Each `ComponentConfiguration`DTO links back to its declaring `ComponentDescription`DTO.

Since a single declaration may be activated multiple times – for example due to multiple~~factory~~ configurations – a single `ComponentDescription`DTO instance may be referred to by multiple `ComponentConfiguration`DTO instances.

To cover the same difference between the declaration of references and actually bound references, the `ComponentDescription`DTO object provides the declared references as `Reference`DTO objects while the `ComponentConfiguration`DTO returns `BoundReference`DTO object representing actually bound services.

To simplify remote management, the `ComponentDescription`DTO, `ComponentConfiguration`DTO, `Reference`DTO, and `BoundReference`DTO types are defined as DTO-style classes and integrate with the API defined by RFC-185, Data Transfer Objects [3][3].

A bundle wishing to access the DTOs must have `ServicePermission[ServiceComponentRuntime, GET]` to get the `ServiceComponentRuntime` service.

5.2 Event Method Signature

A new supported signature for event strategy methods is added to the end of the list of supported signatures in Section 112.3.2, Event Methods:

```
void <method-name>(<parameter-type>, ServiceReference);
```

This signature is only supported if the component is declared in a descriptor with namespace `http://www.osgi.org/xmlns/scr/v1.3.0` or newer.

5.3 API version

The DS API is exported as version 1.3 to reflect these updates.

5.4 XML Descriptor Namespace

The XML descriptor namespace is changed to

<http://www.osgi.org/xmlns/scr/v1.3.0>

New functionality defined in this specification requires component to be registered with this namespace. Otherwise, for backwards compatibility reasons, neither the added event method signature nor the new prototype service scope can be used.

5.5 Extender Capability

The DS implementation bundle must declare the following extender capability:

```
Provide-Capability: osgi.extender;  
    osgi.extender="osgi.component";  
    uses="org.osgi.service.component";  
    version:Version="1.3"
```

5.6 Extension to Annotation Support

5.6.1 Custom annotations to define properties

Component properties can be defined through custom annotation `classessetypes` containing the property names together with their property types and default values. For example:

```
@interface Config {  
    boolean enabled() default true;  
    String[] names() default {"a", "b"};  
    String topic() default MyComponent.DEFAULT_TOPIC_PREFIX + "/topic";  
}  
@Component  
public class MyComponent {  
  
    static final String DEFAULT_TOPIC_PREFIX = "topic.prefix";  
  
    protected void activate(Config configuration) {  
        String t = configuration.topic();  
    }  
}
```

```
}
}
```

The lifecycle methods for activation, deactivation and modification can use a signature which allows them to specify one or more annotation classes as arguments. The fields annotation elements with default values from all the annotation types from used in the lifecycle method arguments are added as via property elements to the generated component xml descriptions. The order of processing is: first annotation types from used as arguments to the activate method, followed by annotation types used as arguments to from the modified method and finally those annotation types used as arguments to from the deactivate method. If such a lifecycle method has more than one annotation type arguments, these are processed in the order of the method arguments.

New signatures for the lifecycle methods are supported, taking one or more arguments of annotation classes. These are additional possible arguments. The following details the search for a lifecycle method:

1. The method takes a single argument and the type of the argument is org.osgi.service.component.ComponentContext.
2. The method takes a single argument and the type of the argument is org.osgi.framework.BundleContext.
3. The method takes one or more arguments and all the types of the arguments are annotation types.
4. The method takes a single argument and the type of the argument is the java.util.Map.
5. For deactivation methods only: The method takes a single argument and the type of the argument is the int.
6. For deactivation methods only: The method takes a single argument and the type of the argument is the java.lang.Integer.
7. The method takes two or more arguments and the type of each argument must be org.osgi.service.component.ComponentContext, org.osgi.framework.BundleContext, java.util.Map or an annotation type. For the deactivation method int or java.lang.Integer are allowed types as well. If multiple methods match this rule, this implies the method name is overloaded and SCR may choose any of the methods to call.
8. The method takes zero arguments.

5.6.2 Adding annotation fields to the component descriptor Mapping Annotation Elements to Component Properties

Each field element of an annotation type used as a lifecycle method argument with a default value is mapped to a component property. Certain common property name characters, such as '.' are not not valid in Java identifiers. So the name of the field an annotation element is converted to the property name as follows:

- Two consecutive underscores ('_') are mapped to a single underscore
- A single underscore is converted into a dot ('.')
- -All otherEach characters and numbers are used as is, a single underscore is converted into a dot and two consecutive underscores are mapped to a single underscore.

The processing starts at the beginning of the name. Examples:

Annotation Field Name	Property Name
myProperty143	myProperty143
some_prop	some.prop
another__prop	another_prop
three___prop	three_.prop

This [processingconversion](#) means that there is currently no way to define a mapping for a property containing the character sequence of a dot followed by an underscore ('. _').

The [property](#) type can directly be derived from the type of the [fieldannotation element](#). All [scalar](#) types and the [String](#) type can be directly used supported for annotation elements can be used except for annotation types.

If the [annotation element](#) type is Class or Class[], the corresponding property [type](#) gets the [is-type](#) String or String[]. At runtime, the property String value is converted into a Class object using the component's bundle's class loader's [loadClass\(String\)](#) method. If the property String value cannot be converted into a Class object, a [ComponentException](#) is thrown when invoking the annotation element.

If the [annotation element](#) type is an enumeration type or an array thereof, the corresponding [property](#) type is String or String[] as well. At runtime, the property String value is converted into an enumeration value using the [static valueOf\(String\)](#) method of the enumeration type of the annotation element. If the property String value cannot be converted into an enumeration value, a [ComponentException](#) is thrown when invoking the annotation element.

[FieldsAnnotation elements](#) with an annotation type or array thereof are not supported. At runtime a field using one of these types always returns the default value, if the field doesn't have a default value null is returned. A tool processing the [DS](#) annotations should [throwdeclare](#) an error during the processing in this case. It's in general discouraged to use such types. Any default value is ignored. At runtime, a [ComponentException](#) is thrown when invoking the annotation element.

The default value of the [an annotation field element](#) has a default value, the tool processing the [DS](#) annotation must add a property element to the component description with the property name converted from the annotation element name and the property value from the annotation element's default value. Default values of type Class or an enumeration type are mapped to String values in the component description using [Class.getName\(\)](#) and [Enum.name\(\)](#) respectively. is used as the value of the component property in the descriptor, for values of type Class [Class.getName\(\)](#) is used, for enumeration values the [name\(\)](#) method is used. A field without a default value is not added to the component descriptor. If an annotation element does not have a default value, the tool processing the [DS](#) annotation must not add a property element to the component description for the converted property name.

5.6.3 Mapping [eComponent pProperties](#) to [aAnnotation fieldsElements](#)

If an annotation [type](#) is used as an argument for within a lifecycle method, [DSSCR](#) must create an [implementation conforming object](#) implementing the [to this](#) annotation [type](#) and maps the available component properties to the [fieldsannotation elements](#). If there is no property for a field, the default value of the annotation field is returned. If the field does not have a default value, for numbers and char 0 is used as the value, everything else gets the value null including arrays of any type.

The mapping from component properties to [fieldsannotation elements](#) is done as follows:

- The name of the [fieldannotation element](#) is [mappedconverted](#) to the property name as described above

- The property value might need to be mapped to the value type of the annotation field element:
 - aAs configurations might contain any object type a component property might have any type as well. DS only supports scalar types, Strings, arrays, lists or vectors thereof. Lists and vectors are treated like arrays (see below). If an annotation field element is accessed which maps to any other type a `ComponentException` is thrown.
 - if cardinality and type are the same, the property value is used.
 - if the type is the same, but the cardinality is different, a single property value is mapped to a single element array with exactly this value. If the property value is an array but the annotation field element expects a single value, the first value of the array is returned.
 - If the type differs, the property value is converted to a string using Object.toString() on the value and then passed into the static valueOf(String) method of the type class. For arrays this is done for each value. If the cardinality differs the same rules apply as explained in the previous point.
 - If the type of the annotation field element is `Class`, the property value is converted to a string using Object.toString() and the class is tried to be loaded from the component's bundle's class loader's loadClass(String) method. For arrays, this is done for each value. If a class is not found using the component's bundle's class loader a `ComponentException` is thrown with the `ClassNotFoundException` as the cause.
 - If the type of the annotation field element is an enumeration, the property value is converted to a string using Object.toString() and this string is passed into the static valueOf(String) method of the enumeration type of the annotation element. For arrays, this is done for each value. If trying to instantiate the enum the valueOf method throws an `IllegalArgumentException` this exception is caught and a `ComponentException` is thrown with the IllegalArgumentException original exception as the cause.
 - If an exception occurs during the conversion like a text is tried attempted to be converted into a number, a `ComponentException` is thrown when the field element of the annotation is accessed/invoked. The cause of the `ComponentException` is set to the origination exception. This allows component implementations to catch such a situation and act accordingly.
- AdditionalComponent properties whose names do not map to annotation elements not defined in the annotation are ignored —i. If the implementation needs to access these additional properties, it can use a method signature which includes also receives the properties map in addition to the annotation type.

If there is no corresponding component property for an annotation element, the returned value must be:

- 0 for numerical types including characters
- false for boolean types
- null for object types, including arrays of any type

This new lifecycle method signatures with supporting annotations type arguments is are only supported if when the component description is declared in a descriptor with namespace <http://www.osgi.org/xmlns/scr/v1.3.0> (or newer later).

5.6.4 Clarification of @Component annotation

The @Component annotation contains two different approaches to define component properties values through two different attributes elements: property and properties. In addition, annotations types can now be used to define component properties values as well. As annotation properties elements do not have an are unordered when they are DS annotations are processed by a tool, the current specification does not define the order of the corresponding elements in the XML-generated component descriptor. However the order in the XML-generated component description defines the order of processing and later properties values with the same property name override previously declared ones.

This should be clarified by defining an order of processing output to the generated component description:

1. pProperties defined through annotation classes types used in the signature of the lifecycle methods.
 1. Annotations types used in from the activate method in the order of parameters in the signature
 2. Annotations from types used in the modified method in the order of parameters in the signature
 3. Annotations from types used in the deactivate method in the order of parameters in the signature
2. property attribute element from @Component
3. properties attribute element from @Component
- 4.

This means that the properties defined through annotation types are added declared first to in the XML-generated component descriptor, followed by all properties defined defined through the @Component.properties directive element and finally the property statements entries defined through the @Component.properties element are added.

Since property values defined later in the component description override property values defined earlier in the component description, this means that property values defined in @Component.properties override property values defined in @Component.property which override values defined by default values in annotation types used in lifecycle method signatures.

5.7 Clarification of Section 112.7.1

As discussed in Bug 2515 section 112.7.1 needs some clarification. The proposed new text is:

SCR must track changes in the Configuration objects used in the component properties of a component configuration. Depending on the configuration policy and whether the modified attribute is set in the component description, a deletion of a configuration has a different outcome. If a configuration has set the policy-option to IGNORE, any configuration change has no influence on the component. For all other components the change is described in the below table.

A configuration change does not cause a deactivation and an attempt to reactivate a component if:

- the component description has the modified attribute set
- for every static reluctant reference, every bound service matches the new filter

- for every static greedy reference, the set of bound services would be the same for the new and the old filter
- for every dynamic reference with minimum cardinality of 1, there is at least one service satisfying the new filter

In all other cases, a configuration change will result in deactivating and attempting to reactive the component.

Policy	Create	Update	Delete
IGNORE	no effect on the component	no effect on the component	no effect on the component
REQUIRE	create and activate new component	call modified method	deactivate the component
OPTIONAL Single Configuration	configure the existing single instance	call modified method	call modified method
OPTIONAL Factory Configuration first or single instance	configure the existing single instance	call modified method	call modified method
OPTIONAL Factory Configuration more than one instance	create and activate new component	call modified method	deactivate the component

If a component has registered a service, but is not activated, the service properties change based on the new configuration.

5.8 Integration with the Configuration Admin Service

DS integrates with the Configuration Admin Service. Therefore implementations of DS must support the latest additions to the Configuration Admin Service:

- Targeted PIDs have been introduced in Configuration Admin 1.5. Section 104.3.3, Extenders and Targeted PIDs, requires extenders such as DS to properly support Targeted PIDs.
- Configuration Admin 1.4 introduced *multi-location* binding. DS implementations must make sure these bindings are properly supported. If the multilocation is just the question mark, no additional checks must be made, as this configuration can be used by any bundle. If a region is specified, the DS implementation must check whether the component bundle has the required permission as outlined in Configuration Admin 1.4, Section 104.7.6.

5.9 Service Scopes

RFC 195, Service Scopes, defines a new mechanism to access services from the service registry. This mechanism allows to get new service instances on demand instead of either always the same instance globally (regular service) or per bundle (service factory).

RFC 195 specifies the changes to Declarative Services to cope with Service Scopes in section 5.3, Declarative Services:

- The `service.servicefactory` attribute is replaced by a new `service.scope` attribute defined in the DS descriptor.
- A new `reference.scope` attribute to define the service reference scope is defined in the DS descriptor.
- A new bind and unbind signature `void <method-name>(ServiceObjects);` is defined to support prototype scoped references.
- `@Component.servicefactory()` is deprecated in favor of the new `@Component.scope()` of type `ServiceScope`.
- `@Reference.scope()` of type `ReferenceScope` is added.

These changes specified in RFC 195, Service Scope, form an integral part of this RFC.~~New Life Cycle States~~

~~Two additional states describing the life cycle of a component are added: activating and deactivating. A component is in the activating state when it is leaving the satisfied state while it is activated by calling the activate method of a component. This state is a transient state and an immediate component enters the active state once it's activated and all other components enter the registered state. If activation fails, the component is back in the unsatisfied state.~~

~~If a component is deactivated, it enters the deactivating state during this process. Once deactivation is finished it is disposed.~~

|

|

6 Data Transfer Objects

The `ServiceComponentRuntime` service allows for the programmatic enablement and disablement of components as well as access to the state of components and component configurations. In particular the service provides these methods:

```
ComponentDescriptionDTO getComponentDescriptionDTO(Bundle, String)
Collection<ComponentDescriptionDTO> getComponentDescriptionsDTOs(Bundle...)
Collection<ComponentConfigurationDTO> _getComponentConfigurationDTOs(ComponentDescriptionDTO)
```

See the JavaDoc for details.

7 Java API

OSGi Javadoc

11/13/13 6:45 PM

Package Summary		<i>Page</i>
org.osgi.service.component	Service Component Package Version 1.3.	18
org.osgi.service.component.annotations	Service Component Annotations Package Version 1.3.	30
org.osgi.service.component.runtime	Service Component Runtime Package Version 1.3.	55

Package org.osgi.service.component

@org.osgi.annotation.versioning.Version(value="1.3")

Service Component Package Version 1.3.

See:

[Description](#)

Interface Summary		Page
ComponentConstants	Defines standard names for Service Component constants.	19
ComponentContext	A Component Context object is used by a component instance to interact with its execution context including locating services by reference name.	22
ComponentFactory	When a component is declared with the <code>factory</code> attribute on its <code>component</code> element, the Service Component Runtime will register a Component Factory service to allow new component configurations to be created and activated rather than automatically creating and activating component configuration as necessary.	28
ComponentInstance	A ComponentInstance encapsulates a component instance of an activated component configuration.	29

Exception Summary		Page
ComponentException	Unchecked exception which may be thrown by the Service Component Runtime.	26

Package org.osgi.service.component Description

Service Component Package Version 1.3.

Bundles wishing to use this package must list the package in the Import-Package header of the bundle's manifest. This package has two types of users: the consumers that use the API in this package and the providers that implement the API in this package.

Example import for consumers using the API in this package:

```
Import-Package: org.osgi.service.component; version="[1.3,2.0]"
```

Example import for providers implementing the API in this package:

```
Import-Package: org.osgi.service.component; version="[1.3,1.4]"
```

Interface ComponentConstants

org.osgi.service.component

```
@org.osgi.annotation.versioning.ProviderType
public interface ComponentConstants
```

Defines standard names for Service Component constants.

Field Summary		Page
String	COMPONENT_FACTORY A service registration property for a Component Factory that contains the value of the <code>factory</code> attribute.	20
String	COMPONENT_ID A component property that contains the generated id for a component configuration.	20
String	COMPONENT_NAME A component property for a component configuration that contains the name of the component as specified in the <code>name</code> attribute of the <code>component</code> element.	19
int	DEACTIVATION_REASON_BUNDLE_STOPPED The component configuration was deactivated because the bundle was stopped.	21
int	DEACTIVATION_REASON_CONFIGURATION_DELETED The component configuration was deactivated because its configuration was deleted.	21
int	DEACTIVATION_REASON_CONFIGURATION_MODIFIED The component configuration was deactivated because its configuration was changed.	21
int	DEACTIVATION_REASON_DISABLED The component configuration was deactivated because the component was disabled.	20
int	DEACTIVATION_REASON_DISPOSED The component configuration was deactivated because the component was disposed.	21
int	DEACTIVATION_REASON_REFERENCE The component configuration was deactivated because a reference became unsatisfied.	20
int	DEACTIVATION_REASON_UNSPECIFIED The reason the component configuration was deactivated is unspecified.	20
String	REFERENCE_TARGET_SUFFIX The suffix for reference target properties.	20
String	SERVICE_COMPONENT Manifest header specifying the XML documents within a bundle that contain the bundle's Service Component descriptions.	19

Field Detail

SERVICE_COMPONENT

```
public static final String SERVICE_COMPONENT = "Service-Component"
```

Manifest header specifying the XML documents within a bundle that contain the bundle's Service Component descriptions.

The attribute value may be retrieved from the `Dictionary` object returned by the `Bundle.getHeaders` method.

COMPONENT_NAME

```
public static final String COMPONENT_NAME = "component.name"
```

A component property for a component configuration that contains the name of the component as specified in the `name` attribute of the `component` element. The value of this property must be of type `String`.

COMPONENT_ID

```
public static final String COMPONENT_ID = "component.id"
```

A component property that contains the generated id for a component configuration. The value of this property must be of type `Long`.

The value of this property is assigned by the Service Component Runtime when a component configuration is created. The Service Component Runtime assigns a unique value that is larger than all previously assigned values since the Service Component Runtime was started. These values are NOT persistent across restarts of the Service Component Runtime.

COMPONENT_FACTORY

```
public static final String COMPONENT_FACTORY = "component.factory"
```

A service registration property for a Component Factory that contains the value of the `factory` attribute. The value of this property must be of type `String`.

REFERENCE_TARGET_SUFFIX

```
public static final String REFERENCE_TARGET_SUFFIX = ".target"
```

The suffix for reference target properties. These properties contain the filter to select the target services for a reference. The value of this property must be of type `String`.

DEACTIVATION_REASON_UNSPECIFIED

```
public static final int DEACTIVATION_REASON_UNSPECIFIED = 0
```

The reason the component configuration was deactivated is unspecified.

Since:
1.1

DEACTIVATION_REASON_DISABLED

```
public static final int DEACTIVATION_REASON_DISABLED = 1
```

The component configuration was deactivated because the component was disabled.

Since:
1.1

DEACTIVATION_REASON_REFERENCE

```
public static final int DEACTIVATION_REASON_REFERENCE = 2
```

The component configuration was deactivated because a reference became unsatisfied.

Since:
1.1

DEACTIVATION_REASON_CONFIGURATION_MODIFIED

```
public static final int DEACTIVATION_REASON_CONFIGURATION_MODIFIED = 3
```

The component configuration was deactivated because its configuration was changed.

Since:
1.1

DEACTIVATION_REASON_CONFIGURATION_DELETED

```
public static final int DEACTIVATION_REASON_CONFIGURATION_DELETED = 4
```

The component configuration was deactivated because its configuration was deleted.

Since:
1.1

DEACTIVATION_REASON_DISPOSED

```
public static final int DEACTIVATION_REASON_DISPOSED = 5
```

The component configuration was deactivated because the component was disposed.

Since:
1.1

DEACTIVATION_REASON_BUNDLE_STOPPED

```
public static final int DEACTIVATION_REASON_BUNDLE_STOPPED = 6
```

The component configuration was deactivated because the bundle was stopped.

Since:
1.1

Interface ComponentContext

org.osgi.service.component

```
@org.osgi.annotation.versioning.ProviderType
public interface ComponentContext
```

A Component Context object is used by a component instance to interact with its execution context including locating services by reference name. Each component instance has a unique Component Context.

A component instance may have an activate method. If a component instance has a suitable and accessible activate method, this method will be called when a component configuration is activated. If the activate method takes a `ComponentContext` argument, it will be passed the component instance's Component Context object. If the activate method takes a `BundleContext` argument, it will be passed the component instance's Bundle Context object. If the activate method takes a `Map` argument, it will be passed an unmodifiable Map containing the component properties.

A component instance may have a deactivate method. If a component instance has a suitable and accessible deactivate method, this method will be called when the component configuration is deactivated. If the deactivate method takes a `ComponentContext` argument, it will be passed the component instance's Component Context object. If the deactivate method takes a `BundleContext` argument, it will be passed the component instance's Bundle Context object. If the deactivate method takes a `Map` argument, it will be passed an unmodifiable Map containing the component properties. If the deactivate method takes an `int` or `Integer` argument, it will be passed the reason code for the component instance's deactivation.

ThreadSafe

Method Summary		Page
void	disableComponent (String name) Disables the specified component name.	25
void	enableComponent (String name) Enables the specified component name.	24
org.osgi.framework.BundleContext	getBundleContext () Returns the <code>BundleContext</code> of the bundle which contains this component.	24
ComponentInstance	getComponentInstance () Returns the Component Instance object for the component instance associated with this Component Context.	24
Dictionary<String, Object>	getProperties () Returns the component properties for this Component Context.	23
org.osgi.framework.ServiceReference<?>	getServiceReference () If the component instance is registered as a service using the <code>service</code> element, then this method returns the service reference of the service provided by this component instance.	25
org.osgi.framework.Bundle	getUsingBundle () If the component instance is registered as a service using the <code>servicescope="bundle"</code> or <code>servicescope="prototype"</code> attribute, then this method returns the bundle using the service provided by the component instance.	24
Object	locateService (String name) Returns the service object for the specified reference name.	23
Object	locateService (String name, org.osgi.framework.ServiceReference<?> reference) Returns the service object for the specified reference name and <code>ServiceReference</code> .	23
Object[]	locateServices (String name) Returns the service objects for the specified reference name.	23

Method Detail

getProperties

Dictionary<String, Object> **getProperties**()

Returns the component properties for this Component Context.

Returns:

The properties for this Component Context. The Dictionary is read only and cannot be modified.

locateService

Object **locateService**(String name)

Returns the service object for the specified reference name.

If the cardinality of the reference is 0..n or 1..n and multiple services are bound to the reference, the service with the highest ranking (as specified in its `Constants.SERVICE_RANKING` property) is returned. If there is a tie in ranking, the service with the lowest service ID (as specified in its `Constants.SERVICE_ID` property); that is, the service that was registered first is returned.

Parameters:

name - The name of a reference as specified in a `reference` element in this component's description.

Returns:

A service object for the referenced service or `null` if the reference cardinality is 0..1 or 0..n and no bound service is available.

Throws:

[ComponentException](#) - If the Service Component Runtime catches an exception while activating the bound service.

locateService

Object **locateService**(String name,
org.osgi.framework.ServiceReference<?> reference)

Returns the service object for the specified reference name and `ServiceReference`.

Parameters:

name - The name of a reference as specified in a `reference` element in this component's description.

reference - The `ServiceReference` to a bound service. This must be a `ServiceReference` provided to the component via the `bind` or `unbind` method for the specified reference name.

Returns:

A service object for the referenced service or `null` if the specified `ServiceReference` is not a bound service for the specified reference name.

Throws:

[ComponentException](#) - If the Service Component Runtime catches an exception while activating the bound service.

locateServices

Object[] **locateServices**(String name)

Returns the service objects for the specified reference name.

Parameters:

`name` - The name of a reference as specified in a `reference` element in this component's description.

Returns:

An array of service objects for the referenced service or `null` if the reference cardinality is `0..1` or `0..n` and no bound service is available. If the reference cardinality is `0..1` or `1..1` and a bound service is available, the array will have exactly one element.

Throws:

[ComponentException](#) - If the Service Component Runtime catches an exception while activating a bound service.

getBundleContext

```
org.osgi.framework.BundleContext getBundleContext()
```

Returns the `BundleContext` of the bundle which contains this component.

Returns:

The `BundleContext` of the bundle containing this component.

getUsingBundle

```
org.osgi.framework.Bundle getUsingBundle()
```

If the component instance is registered as a service using the `servicescope="bundle"` or `servicescope="prototype"` attribute, then this method returns the bundle using the service provided by the component instance.

This method will return `null` if:

1. The component instance is not a service, then no bundle can be using it as a service.
2. The component instance is a service but did not specify the `servicescope="bundle"` or `servicescope="prototype"` attribute, then all bundles using the service provided by the component instance will share the same component instance.
3. The service provided by the component instance is not currently being used by any bundle.

Returns:

The bundle using the component instance as a service or `null`.

getComponentInstance

```
ComponentInstance getComponentInstance()
```

Returns the Component Instance object for the component instance associated with this Component Context.

Returns:

The Component Instance object for the component instance.

enableComponent

```
void enableComponent(String name)
```

Enables the specified component name. The specified component name must be in the same bundle as this component.

Parameters:

`name` - The name of a component or `null` to indicate all components in the bundle.

disableComponent

void **disableComponent**(String name)

Disables the specified component name. The specified component name must be in the same bundle as this component.

Parameters:

name - The name of a component.

getServiceReference

org.osgi.framework.ServiceReference<?> **getServiceReference**()

If the component instance is registered as a service using the `service` element, then this method returns the service reference of the service provided by this component instance.

This method will return `null` if the component instance is not registered as a service.

Returns:

The `ServiceReference` object for the component instance or `null` if the component instance is not registered as a service.

Class `ComponentException`

[org.osgi.service.component](#)

```
java.lang.Object
├── java.lang.Throwable
│   ├── java.lang.Exception
│   │   ├── java.lang.RuntimeException
│   │   └── org.osgi.service.component.ComponentException
```

All Implemented Interfaces:

`Serializable`

```
public class ComponentException
    extends RuntimeException
```

Unchecked exception which may be thrown by the Service Component Runtime.

Constructor Summary

	Page
ComponentException (String message) Construct a new <code>ComponentException</code> with the specified message.	26
ComponentException (String message, Throwable cause) Construct a new <code>ComponentException</code> with the specified message and cause.	26
ComponentException (Throwable cause) Construct a new <code>ComponentException</code> with the specified cause.	27

Method Summary

	Page
Throwable getCause () Returns the cause of this exception or <code>null</code> if no cause was set.	27
Throwable initCause (Throwable cause) Initializes the cause of this exception to the specified value.	27

Constructor Detail

`ComponentException`

```
public ComponentException(String message,
                          Throwable cause)
```

Construct a new `ComponentException` with the specified message and cause.

Parameters:

`message` - The message for the exception.
`cause` - The cause of the exception. May be `null`.

`ComponentException`

```
public ComponentException(String message)
```

Construct a new `ComponentException` with the specified message.

Parameters:

`message` - The message for the exception.

ComponentException

```
public ComponentException(Throwable cause)
```

Construct a new `ComponentException` with the specified cause.

Parameters:

`cause` - The cause of the exception. May be `null`.

Method Detail

getCause

```
public Throwable getCause()
```

Returns the cause of this exception or `null` if no cause was set.

Overrides:

`getCause` in class `Throwable`

Returns:

The cause of this exception or `null` if no cause was set.

initCause

```
public Throwable initCause(Throwable cause)
```

Initializes the cause of this exception to the specified value.

Overrides:

`initCause` in class `Throwable`

Parameters:

`cause` - The cause of this exception.

Returns:

This exception.

Throws:

`IllegalArgumentException` - If the specified cause is this exception.

`IllegalStateException` - If the cause of this exception has already been set.

Interface ComponentFactory

[org.osgi.service.component](#)

```
@org.osgi.annotation.versioning.ProviderType
public interface ComponentFactory
```

When a component is declared with the `factory` attribute on its `component` element, the Service Component Runtime will register a Component Factory service to allow new component configurations to be created and activated rather than automatically creating and activating component configuration as necessary.

ThreadSafe

Method Summary

Page

ComponentInstance	newInstance (Dictionary<String,?> properties) Create and activate a new component configuration.
-----------------------------------	---------------------------------------------------------------------------------------------------------------------

28

Method Detail

newInstance

[ComponentInstance](#) **newInstance**(Dictionary<String,?> properties)

Create and activate a new component configuration. Additional properties may be provided for the component configuration.

Parameters:

`properties` - Additional properties for the component configuration or `null` if there are no additional properties.

Returns:

A `ComponentInstance` object encapsulating the component instance of the component configuration. The component configuration has been activated and, if the component specifies a `service` element, the component instance has been registered as a service.

Throws:

[ComponentException](#) - If the Service Component Runtime is unable to activate the component configuration.

Interface ComponentInstance

[org.osgi.service.component](#)

```
@org.osgi.annotation.versioning.ProviderType
public interface ComponentInstance
```

A ComponentInstance encapsulates a component instance of an activated component configuration. ComponentInstances are created whenever a component configuration is activated.

ComponentInstances are never reused. A new ComponentInstance object will be created when the component configuration is activated again.

ThreadSafe

Method Summary		Page
void	dispose() Dispose of the component configuration for this component instance.	29
Object	getInstance() Returns the component instance of the activated component configuration.	29

Method Detail

dispose

```
void dispose()
```

Dispose of the component configuration for this component instance. The component configuration will be deactivated. If the component configuration has already been deactivated, this method does nothing.

getInstance

```
Object getInstance()
```

Returns the component instance of the activated component configuration.

Returns:

The component instance or `null` if the component configuration has been deactivated.

Package org.osgi.service.component.annotations

```
@org.osgi.annotation.versioning.Version(value="1.3")
```

Service Component Annotations Package Version 1.3.

See:

[Description](#)

Enum Summary		Page
ConfigurationPolicy	Configuration Policy for the Component annotation.	37
ReferenceCardinality	Cardinality for the Reference annotation.	45
ReferencePolicy	Policy for the Reference annotation.	47
ReferencePolicyOption	Policy option for the Reference annotation.	49
ReferenceScope	Reference scope for the Reference annotation.	51
ServiceScope	Service scope for the Component annotation.	53

Annotation Types Summary		Page
Activate	Identify the annotated method as the <code>activate</code> method of a Service Component.	31
Component	Identify the annotated class as a Service Component.	32
Deactivate	Identify the annotated method as the <code>deactivate</code> method of a Service Component.	39
Modified	Identify the annotated method as the <code>modified</code> method of a Service Component.	40
Reference	Identify the annotated method as a <code>bind</code> method of a Service Component.	41

Package org.osgi.service.component.annotations Description

Service Component Annotations Package Version 1.3.

This package is not used at runtime. Annotated classes are processed by tools to generate Component Descriptions which are used at runtime.

Annotation Type Activate

org.osgi.service.component.annotations

```
@Retention(value=RetentionPolicy.CLASS)
@Target(value=ElementType.METHOD)
public @interface Activate
```

Identify the annotated method as the `activate` method of a Service Component.

The annotated method is the `activate` method of the Component.

This annotation is not processed at runtime by a Service Component Runtime implementation. It must be processed by tools and used to add a Component Description to the bundle.

Since:

1.1

See Also:

"The `activate` attribute of the component element of a Component Description."

Annotation Type Component

org.osgi.service.component.annotations

```
@Retention(value=RetentionPolicy.CLASS)
@Target(value=ElementType.TYPE)
public @interface Component
```

Identify the annotated class as a Service Component.

The annotated class is the implementation class of the Component.

This annotation is not processed at runtime by a Service Component Runtime implementation. It must be processed by tools and used to add a Component Description to the bundle.

See Also:

"The component element of a Component Description."

Required Element Summary		Page
String	configurationPid The configuration PID for the configuration of this Component.	35
ConfigurationPolicy	configurationPolicy The configuration policy of this Component.	35
boolean	enabled Declares whether this Component is enabled when the bundle containing it is started.	34
String	factory The factory identifier of this Component.	33
boolean	immediate Declares whether this Component must be immediately activated upon becoming satisfied or whether activation should be delayed.	34
String	name The name of this Component.	32
String[]	properties Property entries for this Component.	34
String[]	property Properties for this Component.	34
ServiceScope	scope The service scope for the service of this Component.	36
Class<?>[]	service The types under which to register this Component as a service.	33
boolean	servicefactory Deprecated. Since 1.3.	33
String	xmlns The XML name space of the Component Description for this Component.	35

Element Detail

name

```
public abstract String name
```

The name of this Component.

If not specified, the name of this Component is the fully qualified type name of the class being annotated.

Default:
""

See Also:
"The name attribute of the component element of a Component Description."

service

```
public abstract Class<?>[] service
```

The types under which to register this Component as a service.

If no service should be registered, the empty value {} must be specified.

If not specified, the service types for this Component are all the *directly* implemented interfaces of the class being annotated.

Default:
{}

See Also:
"The service element of a Component Description."

factory

```
public abstract String factory
```

The factory identifier of this Component. Specifying a factory identifier makes this Component a Factory Component.

If not specified, the default is that this Component is not a Factory Component.

Default:
""

See Also:
"The factory attribute of the component element of a Component Description."

servicefactory

```
public abstract boolean servicefactory
```

Deprecated. *Declares whether this Component uses the OSGi ServiceFactory concept and each bundle using this Component's service will receive a different component instance.*

This element is ignored when the [scope\(\)](#) element does not have the default value. If `true`, this Component uses [bundle](#) service scope. If `false` or not specified, this Component uses [singleton](#) service scope. If the [factory\(\)](#) element is specified or the [immediate\(\)](#) element is specified with `true`, this element can only be specified with `false`.

Declares whether this Component uses the OSGi ServiceFactory concept and each bundle using this Component's service will receive a different component instance.

This element is ignored when the [scope\(\)](#) element does not have the default value. If `true`, this Component uses [bundle](#) service scope. If `false` or not specified, this Component uses [singleton](#) service scope. If the [factory\(\)](#) element is specified or the [immediate\(\)](#) element is specified with `true`, this element can only be specified with `false`.

Default:
`false`

See Also:
"The servicefactory attribute of the service element of a Component Description."

enabled

```
public abstract boolean enabled
```

Declares whether this Component is enabled when the bundle containing it is started.

If `true`, this Component is enabled. If `false` or not specified, this Component is disabled.

Default:

`true`

See Also:

"The enabled attribute of the component element of a Component Description."

immediate

```
public abstract boolean immediate
```

Declares whether this Component must be immediately activated upon becoming satisfied or whether activation should be delayed.

If `true`, this Component must be immediately activated upon becoming satisfied. If `false`, activation of this Component is delayed. If this property is specified, its value must be `false` if the [factory\(\)](#) property is also specified or must be `true` if the [service\(\)](#) property is specified with an empty value.

If not specified, the default is `false` if the [factory\(\)](#) property is specified or the [service\(\)](#) property is not specified or specified with a non-empty value and `true` otherwise.

Default:

`false`

See Also:

"The immediate attribute of the component element of a Component Description."

property

```
public abstract String[] property
```

Properties for this Component.

Each property string is specified as "`key=value`". The type of the property value can be specified in the key as `key:type=value`. The type must be one of the property types supported by the type attribute of the property element of a Component Description.

To specify a property with multiple values, use multiple key, value pairs. For example, "`foo=bar`", "`foo=baz`".

Default:

`{}`

See Also:

"The property element of a Component Description."

properties

```
public abstract String[] properties
```

Property entries for this Component.

Specifies the name of an entry in the bundle whose contents conform to a standard Java Properties File. The entry is read and processed to obtain the properties and their values.

Default:

{}

See Also:

"The properties element of a Component Description."

xmlns

```
public abstract String xmlns
```

The XML name space of the Component Description for this Component.

If not specified, the XML name space of the Component Description for this Component should be the lowest Declarative Services XML name space which supports all the specification features used by this Component.

Default:

""

See Also:

"The XML name space specified for a Component Description."

configurationPolicy

```
public abstract ConfigurationPolicy configurationPolicy
```

The configuration policy of this Component.

Controls whether component configurations must be satisfied depending on the presence of a corresponding Configuration object in the OSGi Configuration Admin service. A corresponding configuration is a Configuration object where the PID equals the name of the component.

If not specified, the [OPTIONAL](#) configuration policy is used.

Default:

[ConfigurationPolicy.OPTIONAL](#)

Since:

1.1

See Also:

"The configuration-policy attribute of the component element of a Component Description."

configurationPid

```
public abstract String configurationPid
```

The configuration PID for the configuration of this Component.

Allows the configuration PID for this Component to be different than the name of this Component.

If not specified, the name of this Component is used as the configuration PID of this Component.

Default:

""

Since:

1.2

See Also:

"The configuration-pid attribute of the component element of a Component Description."

scope

public abstract [ServiceScope](#) **scope**

The service scope for the service of this Component.

If not specified and the deprecated [servicefactory\(\)](#) element is not specified, the [singleton](#) service scope is used. If the [factory\(\)](#) element is specified or the [immediate\(\)](#) element is specified with `true`, this element can only be specified with the [singleton](#) service scope.

Default:

[ServiceScope.DEFAULT](#)

Since:

1.3

See Also:

"The scope attribute of the service element of a Component Description."

Enum ConfigurationPolicy

[org.osgi.service.component.annotations](#)

```
java.lang.Object
└─ java.lang.Enum<ConfigurationPolicy>
    └─ org.osgi.service.component.annotations.ConfigurationPolicy
```

All Implemented Interfaces:

Comparable<[ConfigurationPolicy](#)>, Serializable

```
public enum ConfigurationPolicy
extends Enum<ConfigurationPolicy>
```

Configuration Policy for the [Component](#) annotation.

Controls whether component configurations must be satisfied depending on the presence of a corresponding Configuration object in the OSGi Configuration Admin service. A corresponding configuration is a Configuration object where the PID is the name of the component.

Since:

1.1

Enum Constant Summary	Page
IGNORE Always allow the component configuration to be satisfied and do not use the corresponding Configuration object even if it is present.	38
OPTIONAL Use the corresponding Configuration object if present but allow the component to be satisfied even if the corresponding Configuration object is not present.	37
REQUIRE There must be a corresponding Configuration object for the component configuration to become satisfied.	38

Method Summary	Page
String toString()	38
static valueOf (String name)	38
static values ()	38

Enum Constant Detail

OPTIONAL

```
public static final ConfigurationPolicy OPTIONAL
```

Use the corresponding Configuration object if present but allow the component to be satisfied even if the corresponding Configuration object is not present.

REQUIRE

```
public static final ConfigurationPolicy REQUIRE
```

There must be a corresponding Configuration object for the component configuration to become satisfied.

IGNORE

```
public static final ConfigurationPolicy IGNORE
```

Always allow the component configuration to be satisfied and do not use the corresponding Configuration object even if it is present.

Method Detail

values

```
public static ConfigurationPolicy[] values()
```

valueOf

```
public static ConfigurationPolicy valueOf(String name)
```

toString

```
public String toString()
```

Overrides:

toString in class Enum

Annotation Type Deactivate

org.osgi.service.component.annotations

```
@Retention(value=RetentionPolicy.CLASS)
@Target(value=ElementType.METHOD)
public @interface Deactivate
```

Identify the annotated method as the `deactivate` method of a Service Component.

The annotated method is the `deactivate` method of the Component.

This annotation is not processed at runtime by a Service Component Runtime implementation. It must be processed by tools and used to add a Component Description to the bundle.

Since:

1.1

See Also:

"The `deactivate` attribute of the component element of a Component Description."

Annotation Type Modified

org.osgi.service.component.annotations

```
@Retention(value=RetentionPolicy.CLASS)
@Target(value=ElementType.METHOD)
public @interface Modified
```

Identify the annotated method as the `modified` method of a Service Component.

The annotated method is the modified method of the Component.

This annotation is not processed at runtime by a Service Component Runtime implementation. It must be processed by tools and used to add a Component Description to the bundle.

Since:

1.1

See Also:

"The modified attribute of the component element of a Component Description."

Annotation Type Reference

org.osgi.service.component.annotations

```
@Retention(value=RetentionPolicy.CLASS)
@Target(value=ElementType.METHOD)
public @interface Reference
```

Identify the annotated method as a `bind` method of a Service Component.

The annotated method is a `bind` method of the Component.

This annotation is not processed at runtime by a Service Component Runtime implementation. It must be processed by tools and used to add a Component Description to the bundle.

In the generated Component Description for a component, the references must be ordered in ascending lexicographical order (using `String.compareTo`) of the reference [names](#).

See Also:

"The reference element of a Component Description."

Required Element Summary		Page
ReferenceCardinality	cardinality The cardinality of the reference.	42
String	name The name of this reference.	41
ReferencePolicy	policy The policy for the reference.	42
ReferencePolicyOption	policyOption The policy option for the reference.	43
ReferenceScope	scope The requested service scope for this Reference.	43
Class<?>	service The type of the service to bind to this reference.	42
String	target The target filter for the reference.	42
String	unbind The name of the unbind method which is associated with the annotated bind method.	42
String	updated The name of the updated method which is associated with the annotated bind method.	43

Element Detail

name

```
public abstract String name
```

The name of this reference.

If not specified, the name of this reference is based upon the name of the method being annotated. If the method name begins with `bind`, `set` or `add`, that is removed.

Default:

""

See Also:

"The name attribute of the reference element of a Component Description."

service

```
public abstract Class<?> service
```

The type of the service to bind to this reference.

If not specified, the type of the service to bind is based upon the type of the first argument of the method being annotated.

Default:
Object.class

See Also:
"The interface attribute of the reference element of a Component Description."

cardinality

```
public abstract ReferenceCardinality cardinality
```

The cardinality of the reference.

If not specified, the reference has a [1..1](#) cardinality.

Default:
[ReferenceCardinality.MANDATORY](#)

See Also:
"The cardinality attribute of the reference element of a Component Description."

policy

```
public abstract ReferencePolicy policy
```

The policy for the reference.

If not specified, the [STATIC](#) reference policy is used.

Default:
[ReferencePolicy.STATIC](#)

See Also:
"The policy attribute of the reference element of a Component Description."

target

```
public abstract String target
```

The target filter for the reference.

Default:
""

See Also:
"The target attribute of the reference element of a Component Description."

unbind

```
public abstract String unbind
```

The name of the unbind method which is associated with the annotated bind method.

To declare no unbind method, the value "-" must be used.

If not specified, the name of the unbind method is derived from the name of the annotated bind method. If the annotated method name begins with `bind`, `set` or `add`, that is replaced with `unbind`, `unset` or `remove`, respectively, to derive the unbind method name. Otherwise, `un` is prefixed to the annotated method name to derive the unbind method name. The unbind method is only set if the component type contains a method with the derived name.

Default:

""

See Also:

"The unbind attribute of the reference element of a Component Description."

policyOption

```
public abstract ReferencePolicyOption policyOption
```

The policy option for the reference.

If not specified, the [RELUCTANT](#) reference policy option is used.

Default:

[ReferencePolicyOption.RELUCTANT](#)

Since:

1.2

See Also:

"The policy-option attribute of the reference element of a Component Description."

updated

```
public abstract String updated
```

The name of the updated method which is associated with the annotated bind method.

To declare no updated method, the value "-" must be used.

If not specified, the name of the updated method is derived from the name of the annotated bind method. If the annotated method name begins with `bind`, `set` or `add`, that is replaced with `updated` to derive the updated method name. Otherwise, `updated` is prefixed to the annotated method name to derive the updated method name. The updated method is only set if the component type contains a method with the derived name.

Default:

""

Since:

1.2

See Also:

"The updated attribute of the reference element of a Component Description."

scope

```
public abstract ReferenceScope scope
```

The requested service scope for this Reference.

If not specified, the [bundle](#) service scope is requested.

Default:

[ReferenceScope.BUNDLE](#)

Since:

1.3

See Also:

"The scope attribute of the reference element of a Component Description."

Enum ReferenceCardinality

[org.osgi.service.component.annotations](#)

```
java.lang.Object
└─ java.lang.Enum<ReferenceCardinality>
    └─ org.osgi.service.component.annotations.ReferenceCardinality
```

All Implemented Interfaces:

Comparable<[ReferenceCardinality](#)>, Serializable

```
public enum ReferenceCardinality
extends Enum<ReferenceCardinality>
```

Cardinality for the [Reference](#) annotation.

Specifies if the reference is optional and if the component implementation support a single bound service or multiple bound services.

Enum Constant Summary		Pag e
AT_LEAST_ONE	The reference is mandatory and multiple.	46
MANDATORY	The reference is mandatory and unary.	45
MULTIPLE	The reference is optional and multiple.	46
OPTIONAL	The reference is optional and unary.	45

Method Summary		Pag e
String	toString()	46
static ReferenceC ardinality	valueOf (String name)	46
static ReferenceC ardinality []	values ()	46

Enum Constant Detail

OPTIONAL

```
public static final ReferenceCardinality OPTIONAL
```

The reference is optional and unary. That is, the reference has a cardinality of 0..1.

MANDATORY

```
public static final ReferenceCardinality MANDATORY
```

The reference is mandatory and unary. That is, the reference has a cardinality of 1..1.

MULTIPLE

```
public static final ReferenceCardinality MULTIPLE
```

The reference is optional and multiple. That is, the reference has a cardinality of 0..n.

AT_LEAST_ONE

```
public static final ReferenceCardinality AT_LEAST_ONE
```

The reference is mandatory and multiple. That is, the reference has a cardinality of 1..n.

Method Detail

values

```
public static ReferenceCardinality[] values()
```

valueOf

```
public static ReferenceCardinality valueOf(String name)
```

toString

```
public String toString()
```

Overrides:

toString in class Enum

Enum ReferencePolicy

[org.osgi.service.component.annotations](#)

```
java.lang.Object
└─ java.lang.Enum<ReferencePolicy>
    └─ org.osgi.service.component.annotations.ReferencePolicy
```

All Implemented Interfaces:

Comparable<[ReferencePolicy](#)>, Serializable

```
public enum ReferencePolicy
extends Enum<ReferencePolicy>
```

Policy for the [Reference](#) annotation.

Enum Constant Summary

Page
e

[DYNAMIC](#)

The dynamic policy is slightly more complex since the component implementation must properly handle changes in the set of bound services.

47

[STATIC](#)

The static policy is the most simple policy and is the default policy.

47

Method Summary

Page
e

String [toString](#)()

48

static [ReferencePolicy](#) [valueOf](#)(String name)

48

static [ReferencePolicy](#)[] [values](#)()

48

Enum Constant Detail

STATIC

```
public static final ReferencePolicy STATIC
```

The static policy is the most simple policy and is the default policy. A component instance never sees any of the dynamics. Component configurations are deactivated before any bound service for a reference having a static policy becomes unavailable. If a target service is available to replace the bound service which became unavailable, the component configuration must be reactivated and bound to the replacement service.

DYNAMIC

```
public static final ReferencePolicy DYNAMIC
```

The dynamic policy is slightly more complex since the component implementation must properly handle changes in the set of bound services. With the dynamic policy, SCR can change the set of bound services without deactivating a component configuration. If the component uses the event strategy to access services, then the component instance will be notified of changes in the set of bound services by calls to the bind and unbind methods.

Method Detail

values

```
public static ReferencePolicy[] values()
```

valueOf

```
public static ReferencePolicy valueOf(String name)
```

toString

```
public String toString()
```

Overrides:

`toString` in class `Enum`

Enum ReferencePolicyOption

[org.osgi.service.component.annotations](#)

```
java.lang.Object
└─ java.lang.Enum<ReferencePolicyOption>
    └─ org.osgi.service.component.annotations.ReferencePolicyOption
```

All Implemented Interfaces:

Comparable<[ReferencePolicyOption](#)>, Serializable

```
public enum ReferencePolicyOption
extends Enum<ReferencePolicyOption>
```

Policy option for the [Reference](#) annotation.

Since:

1.2

Enum Constant Summary		Page
GREEDY	The greedy policy option is a valid policy option for both static and dynamic reference policies.	49
RELUCTANT	The reluctant policy option is the default policy option for both static and dynamic reference policies.	49

Method Summary		Page
String	toString()	50
static ReferencePolicyOption	valueOf (String name)	50
static ReferencePolicyOption []	values()	50

Enum Constant Detail

RELUCTANT

```
public static final ReferencePolicyOption RELUCTANT
```

The reluctant policy option is the default policy option for both [static](#) and [dynamic](#) reference policies. When a new target service for a reference becomes available, references having the reluctant policy option for the static policy or the dynamic policy with a unary cardinality will ignore the new target service. References having the dynamic policy with a multiple cardinality will bind the new target service.

GREEDY

```
public static final ReferencePolicyOption GREEDY
```

The greedy policy option is a valid policy option for both [static](#) and [dynamic](#) reference policies. When a new target service for a reference becomes available, references having the greedy policy option will bind the new target service.

Method Detail

values

```
public static ReferencePolicyOption[] values()
```

valueOf

```
public static ReferencePolicyOption valueOf(String name)
```

toString

```
public String toString()
```

Overrides:

`toString` in class `Enum`

Enum ReferenceScope

[org.osgi.service.component.annotations](#)

```
java.lang.Object
└─ java.lang.Enum<ReferenceScope>
    └─ org.osgi.service.component.annotations.ReferenceScope
```

All Implemented Interfaces:

Comparable<[ReferenceScope](#)>, Serializable

```
public enum ReferenceScope
extends Enum<ReferenceScope>
```

Reference scope for the [Reference](#) annotation.

Since:

1.3

Enum Constant Summary		Page
BUNDLE	A single service object is used for all references to the service in this bundle.	51
PROTOTYPE	If the referenced service has prototype service scope, then each instance of the component with this reference can receive a unique instance of the service.	51

Method Summary		Page
String	toString()	52
static ReferenceScope	valueOf (String name)	52
static ReferenceScope []	values()	52

Enum Constant Detail

BUNDLE

```
public static final ReferenceScope BUNDLE
```

A single service object is used for all references to the service in this bundle.

PROTOTYPE

```
public static final ReferenceScope PROTOTYPE
```

If the referenced service has prototype service scope, then each instance of the component with this reference can receive a unique instance of the service. If the referenced service does not have prototype service scope, then no service object will be received.

Method Detail

values

```
public static ReferenceScope[] values()
```

valueOf

```
public static ReferenceScope valueOf(String name)
```

toString

```
public String toString()
```

Overrides:

`toString` in class `Enum`

Enum ServiceScope

[org.osgi.service.component.annotations](#)

```
java.lang.Object
└─ java.lang.Enum<ServiceScope>
    └─ org.osgi.service.component.annotations.ServiceScope
```

All Implemented Interfaces:

Comparable<[ServiceScope](#)>, Serializable

```
public enum ServiceScope
extends Enum<ServiceScope>
```

Service scope for the [Component](#) annotation.

Since:

1.3

Enum Constant Summary	Page
BUNDLE When the component is registered as a service, it will be registered as a bundle scope service and an instance of the component will be created for each bundle using the service.	53
DEFAULT Default element value for annotation.	54
PROTOTYPE When the component is registered as a service, it will be registered as a prototype scope service.	54
SINGLETON When the component is registered as a service, it will be registered as a bundle scope service but only a single instance of the component will be used for all bundles using the service.	53

Method Summary	Page
String toString()	54
static ServiceScope valueOf (String name)	54
static ServiceScope [] values()	54

Enum Constant Detail

SINGLETON

```
public static final ServiceScope SINGLETON
```

When the component is registered as a service, it will be registered as a bundle scope service but only a single instance of the component will be used for all bundles using the service.

BUNDLE

```
public static final ServiceScope BUNDLE
```

When the component is registered as a service, it will be registered as a bundle scope service and an instance of the component will be created for each bundle using the service.

PROTOTYPE

```
public static final ServiceScope PROTOTYPE
```

When the component is registered as a service, it will be registered as a prototype scope service.

DEFAULT

```
public static final ServiceScope DEFAULT
```

Default element value for annotation. This is used to distinguish the default value for an element and should not otherwise be used.

Method Detail

values

```
public static ServiceScope[] values()
```

valueOf

```
public static ServiceScope valueOf(String name)
```

toString

```
public String toString()
```

Overrides:

`toString` in class `Enum`

Package org.osgi.service.component.runtime

```
@org.osgi.annotation.versioning.Version(value="1.3")
```

Service Component Runtime Package Version 1.3.

See:

[Description](#)

Interface Summary		Page
ServiceComponentRuntime	The <code>ServiceComponentRuntime</code> service represents the Declarative Services main controller also known as the Service Component Runtime or SCR for short.	68

Class Summary		Page
BoundReferenceDTO	A representation of a bound reference to a service.	56
ComponentConfigurationDTO	A representation of an actual instance of a declared component description parameterized by component properties.	58
ComponentDescriptionDTO	A representation of a declared component description.	61
ReferenceDTO	A representation of a declared reference to a service.	65

Package org.osgi.service.component.runtime Description

Service Component Runtime Package Version 1.3.

Bundles wishing to use this package must list the package in the Import-Package header of the bundle's manifest. This package has two types of users: the consumers that use the API in this package and the providers that implement the API in this package.

Example import for consumers using the API in this package:

```
Import-Package: org.osgi.service.component.runtime; version="[1.3,2.0)"
```

Example import for providers implementing the API in this package:

```
Import-Package: org.osgi.service.component.runtime; version="[1.3,1.4)"
```

Class BoundReferenceDTO

[org.osgi.service.component.runtime](#)

```
java.lang.Object
├── org.osgi.dto.DTO
│   └── org.osgi.service.component.runtime.BoundReferenceDTO
```

```
public class BoundReferenceDTO
extends org.osgi.dto.DTO
```

A representation of a bound reference to a service.

Since: 1.3
NotThreadSafe

Field Summary		Page
ReferenceDTO	reference The declared reference.	56
org.osgi.dto.framework.ServiceReferenceDTO[]	serviceReferences The bound services.	57
String	target The target property of the bound reference.	56

Constructor Summary	Page
BoundReferenceDTO()	57

Methods inherited from class org.osgi.dto.DTO
toString

Field Detail

reference

```
public ReferenceDTO reference
```

The declared reference.

This is the representation of the declaration of the reference from the `reference` element of the component description.

target

```
public String target
```

The target property of the bound reference.

This is the value of the `component_property` whose name is the concatenation of the `declared reference name` and ".target". This will be `null` if no target property is set for the reference.

serviceReferences

```
public org.osgi.dto.framework.ServiceReferenceDTO[] serviceReferences
```

The bound services.

Each `org.osgi.dto.framework.ServiceReferenceDTO` in the array represents a service bound to the component configuration.

Constructor Detail

BoundReferenceDTO

```
public BoundReferenceDTO()
```

Class `ComponentConfigurationDTO`

[org.osgi.service.component.runtime](#)

```
java.lang.Object
├── org.osgi.dto.DTO
│   └── org.osgi.service.component.runtime.ComponentConfigurationDTO
```

```
public class ComponentConfigurationDTO
    extends org.osgi.dto.DTO
```

A representation of an actual instance of a declared component description parameterized by component properties.

Since:

1.3

NotThreadSafe

Field Summary		Page
static int	ACTIVE The component configuration is active.	59
BoundReferenceDTO[]	boundReferences The currently bound references.	59
ComponentDescriptionDTO	description The representation of the component configuration's component description.	59
Map<String, Object>	properties The component properties for the component configuration.	59
static int	SATISFIED The component configuration is satisfied.	59
int	state The current state of the component configuration.	59
static int	UNSATISFIED The component configuration is unsatisfied.	58

Constructor Summary	Page
ComponentConfigurationDTO ()	60

Methods inherited from class <code>org.osgi.dto.DTO</code>
<code>toString</code>

Field Detail

UNSATISFIED

```
public static final int UNSATISFIED = 1
```

The component configuration is unsatisfied.

This is the initial state of a component configuration. When the component configuration becomes satisfied it enters the [SATISFIED](#) state.

SATISFIED

```
public static final int SATISFIED = 2
```

The component configuration is satisfied.

Any [services](#) declared by the component description are registered. If the component configuration becomes unsatisfied for any reason, any declared services must be unregistered and the component configuration returns to the [UNSATISFIED](#) state.

ACTIVE

```
public static final int ACTIVE = 4
```

The component configuration is active.

This is the normal operational state of a component configuration. The component configuration will move to the [SATISFIED](#) state when it is deactivated.

description

```
public ComponentDescriptionDTO description
```

The representation of the component configuration's component description.

state

```
public int state
```

The current state of the component configuration.

This is one of [UNSATISFIED](#), [SATISFIED](#) or [ACTIVE](#).

properties

```
public Map<String, Object> properties
```

The component properties for the component configuration.

See Also:

[ComponentContext.getProperties\(\)](#)

boundReferences

```
public BoundReferenceDTO[] boundReferences
```

The currently bound references.

Each [BoundReferenceDTO](#) in the array represents a service bound to a reference of the component configuration. The array will be empty if the component configuration has no bound references.

Constructor Detail

ComponentConfigurationDTO

```
public ComponentConfigurationDTO()
```

Class ComponentDescriptionDTO

[org.osgi.service.component.runtime](#)

```
java.lang.Object
├── org.osgi.dto.DTO
│   └── org.osgi.service.component.runtime.ComponentDescriptionDTO
```

```
public class ComponentDescriptionDTO
    extends org.osgi.dto.DTO
```

A representation of a declared component description.

Since:

1.3

NotThreadSafe

Field Summary		Page
String	activate The name of the activate method.	63
org.osgi.dto.framework.BundleDTO	bundle The bundle declaring the component description.	62
String	configurationPid The configuration pid.	64
String	configurationPolicy The configuration policy.	64
String	deactivate The name of the deactivate method.	64
boolean	defaultEnabled The initial enabled state.	63
String	factory The component factory name.	62
long	id The id of the component description.	64
boolean	immediate The immediate state.	63
String	implementationClass The fully qualified name of the implementation class.	62
String	modified The name of the modified method.	64
String	name The name of the component.	62
Map<String, Object>	properties The declared component properties.	63
ReferenceDTO[]	references The referenced services.	63
String	scope The service scope.	62
String[]	serviceInterfaces The fully qualified names of the service interfaces.	63

Constructor Summary	Page
ComponentDescriptionDTO ()	64

Methods inherited from class <code>org.osgi.dto.DTO</code>
<code>toString</code>

Field Detail

name

```
public String name
```

The name of the component.

This is declared in the `name` attribute of the `component` element. This will be the default name if the component description does not declare a name.

bundle

```
public org.osgi.dto.framework.BundleDTO bundle
```

The bundle declaring the component description.

factory

```
public String factory
```

The component factory name.

This is declared in the `factory` attribute of the `component` element. This will be `null` if the component description is not declared as a component factory.

scope

```
public String scope
```

The service scope.

This is declared in the `scope` attribute of the `service` element.

implementationClass

```
public String implementationClass
```

The fully qualified name of the implementation class.

This is declared in the `class` attribute of the `implementation` element.

defaultEnabled

```
public boolean defaultEnabled
```

The initial enabled state.

This is declared in the `enabled` attribute of the `component` element.

immediate

```
public boolean immediate
```

The immediate state.

This is declared in the `immediate` attribute of the `component` element.

serviceInterfaces

```
public String[] serviceInterfaces
```

The fully qualified names of the service interfaces.

These are declared in the `interface` attribute of the `provide` elements. The array will be empty if the component description does not declare any service interfaces.

properties

```
public Map<String,Object> properties
```

The declared component properties.

These are declared in the `property` and `properties` elements.

references

```
public ReferenceDTO[] references
```

The referenced services.

These are declared in the `reference` elements. The array will be empty if the component description does not declare references to any services.

activate

```
public String activate
```

The name of the activate method.

This is declared in the `activate` attribute of the `component` element. This will be `null` if the component description does not declare an activate method name.

deactivate

```
public String deactivate
```

The name of the deactivate method.

This is declared in the `deactivate` attribute of the `component` element. This will be `null` if the component description does not declare a deactivate method name.

modified

```
public String modified
```

The name of the modified method.

This is declared in the `modified` attribute of the `component` element. This will be `null` if the component description does not declare a modified method name.

configurationPolicy

```
public String configurationPolicy
```

The configuration policy.

This is declared in the `configuration-policy` attribute of the `component` element. This will be the default configuration policy if the component description does not declare a configuration policy.

configurationPid

```
public String configurationPid
```

The configuration pid.

This is declared in the `configuration-pid` attribute of the `component` element. This will be the default configuration pid if the component description does not declare a configuration pid.

id

```
public long id
```

The id of the component description.

The id is a non-persistent, unique value assigned at runtime. The id is also available as the `component.id` component property.

Constructor Detail

ComponentDescriptionDTO

```
public ComponentDescriptionDTO()
```


Class ReferenceDTO

[org.osgi.service.component.runtime](#)

```
java.lang.Object
├── org.osgi.dto.DTO
│   └── org.osgi.service.component.runtime.ReferenceDTO
```

```
public class ReferenceDTO
    extends org.osgi.dto.DTO
```

A representation of a declared reference to a service.

Since:

1.3

NotThreadSafe

Field Summary		Page
String	bind The name of the bind method of the reference.	66
String	cardinality The cardinality of the reference.	66
String	interfaceName The service interface of the reference.	66
String	name The name of the reference.	65
String	policy The policy of the reference.	66
String	policyOption The policy option of the reference.	66
String	scope The scope of the reference.	67
String	target The target of the reference.	66
String	unbind The name of the unbind method of the reference.	67
String	updated The name of the updated method of the reference.	67

Constructor Summary	Page
ReferenceDTO ()	67

Methods inherited from class org.osgi.dto.DTO
toString

Field Detail

name

```
public String name
```

The name of the reference.

This is declared in the `name` attribute of the `reference` element. This will be the default name if the component description does not declare a name for the reference.

interfaceName

```
public String interfaceName
```

The service interface of the reference.

This is declared in the `interface` attribute of the `reference` element.

cardinality

```
public String cardinality
```

The cardinality of the reference.

This is declared in the `cardinality` attribute of the `reference` element. This will be the default cardinality if the component description does not declare a cardinality for the reference.

policy

```
public String policy
```

The policy of the reference.

This is declared in the `policy` attribute of the `reference` element. This will be the default policy if the component description does not declare a policy for the reference.

policyOption

```
public String policyOption
```

The policy option of the reference.

This is declared in the `policy-option` attribute of the `reference` element. This will be the default policy option if the component description does not declare a policy option for the reference.

target

```
public String target
```

The target of the reference.

This is declared in the `target` attribute of the `reference` element. This will be `null` if the component description does not declare a target for the reference.

bind

```
public String bind
```

The name of the bind method of the reference.

This is declared in the `bind` attribute of the `reference` element. This will be `null` if the component description does not declare a bind method for the reference.

unbind

```
public String unbind
```

The name of the unbind method of the reference.

This is declared in the `unbind` attribute of the `reference` element. This will be `null` if the component description does not declare an unbind method for the reference.

updated

```
public String updated
```

The name of the updated method of the reference.

This is declared in the `updated` attribute of the `reference` element. This will be `null` if the component description does not declare an updated method for the reference.

scope

```
public String scope
```

The scope of the reference.

This is declared in the `scope` attribute of the `reference` element. This will be the default scope if the component description does not declare a scope for the reference.

Constructor Detail

ReferenceDTO

```
public ReferenceDTO()
```

Interface ServiceComponentRuntime

org.osgi.service.component.runtime

```
@org.osgi.annotation.versioning.ProviderType
public interface ServiceComponentRuntime
```

The `ServiceComponentRuntime` service represents the Declarative Services main controller also known as the Service Component Runtime or SCR for short. It provides access to the components managed by the Service Component Runtime.

This service differentiates between a [ComponentDescriptionDTO](#) and a [ComponentConfigurationDTO](#). A [ComponentDescriptionDTO](#) is a representation of a declared component description. A [ComponentConfigurationDTO](#) is a representation of an actual instance of a declared component description parameterized by component properties.

Access to this service requires the `ServicePermission[ServiceComponentRuntime, GET]` permission. It is intended that only administrative bundles should be granted this permission to limit access to the potentially intrusive methods provided by this service.

Since:

1.3

ThreadSafe

Method Summary		Page
void	disableComponent (ComponentDescriptionDTO description) Disables the specified component description.	70
void	enableComponent (ComponentDescriptionDTO description) Enables the specified component description.	69
Collection < ComponentConfigurationDTO >	getComponentConfigurationDTOs (ComponentDescriptionDTO description) Returns the component configurations for the specified component description.	69
ComponentDescriptionDTO	getComponentDescriptionDTO (<code>org.osgi.framework.Bundle bundle, String name</code>) Returns the ComponentDescriptionDTO declared with the specified name by the specified bundle.	69
Collection < ComponentDescriptionDTO >	getComponentDescriptionDTOs (<code>org.osgi.framework.Bundle... bundles</code>) Returns the component descriptions declared by the specified active bundles.	68
boolean	isComponentEnabled (ComponentDescriptionDTO description) Returns whether the specified component description is currently enabled.	69

Method Detail

getComponentDescriptionDTOs

```
Collection<ComponentDescriptionDTO> getComponentDescriptionDTOs(org.osgi.framework.Bundle... bundles)
```

Returns the component descriptions declared by the specified active bundles.

Only component descriptions from active bundles are returned. If the specified bundles have no declared components or are not active, an empty collection is returned.

Parameters:

`bundles` - The bundles whose declared component descriptions are to be returned. Specifying no bundles, or the equivalent of an empty `Bundle` array, will return the declared component descriptions from all active bundles.

Returns:

The declared component descriptions of the specified active `bundles`. An empty collection is returned if there are no component descriptions for the specified active bundles.

getComponentDescriptionDTO

[ComponentDescriptionDTO](#) **getComponentDescriptionDTO**(`org.osgi.framework.Bundle bundle`,
`String name`)

Returns the [ComponentDescriptionDTO](#) declared with the specified name by the specified bundle.

Only component descriptions from active bundles are returned. `null` if no such component is declared by the given `bundle` or the bundle is not active.

Parameters:

`bundle` - The bundle declaring the component description. Must not be `null`.

`name` - The name of the component description. Must not be `null`.

Returns:

The declared component description or `null` if the specified bundle is not active or does not declare a component description with the specified name.

getComponentConfigurationDTOs

`Collection<ComponentConfigurationDTO>` **getComponentConfigurationDTOs**([ComponentDescriptionDTO](#) `description`)

Returns the component configurations for the specified component description.

Parameters:

`description` - The component description. Must not be `null`.

Returns:

A collection containing a snapshot of the current component configurations for the specified component description. An empty collection is returned if there are none.

isComponentEnabled

`boolean` **isComponentEnabled**([ComponentDescriptionDTO](#) `description`)

Returns whether the specified component description is currently enabled.

The enabled state of a component description is initially set by the [enabled](#) attribute of the component description.

Parameters:

`description` - The component description. Must not be `null`.

Returns:

`true` if the specified component description is currently enabled. Otherwise, `false`.

See Also:

[enableComponent\(\[ComponentDescriptionDTO\]\(#\)\)](#),
[disableComponent\(\[ComponentDescriptionDTO\]\(#\)\)](#),
[ComponentContext.disableComponent\(\[String\]\(#\)\)](#),
[ComponentContext.enableComponent\(\[String\]\(#\)\)](#)

enableComponent

`void` **enableComponent**([ComponentDescriptionDTO](#) `description`)

Enables the specified component description.

If the specified component description is currently enabled, this method has no effect.

Parameters:

`description` - The component description to enable. Must not be `null`.

See Also:

[`isEnabled\(ComponentDescriptionDTO\)`](#)

disableComponent

```
void disableComponent(ComponentDescriptionDTO description)
```

Disables the specified component description.

If the specified component description is currently disabled, this method has no effect.

Parameters:

`description` - The component description to disable. Must not be `null`.

See Also:

[`isEnabled\(ComponentDescriptionDTO\)`](#)

Java API documentation generated with [DocFlex/Doclet](#) v1.5.6

DocFlex/Doclet is both a multi-format Javadoc doclet and a free edition of [DocFlex/Javadoc](#). If you need to customize your Javadoc without writing a full-blown doclet from scratch, DocFlex/Javadoc may be the only tool able to help you! Find out more at www.docflex.com

8 Considered Alternatives

8.1 Diagnostic API

The proposed diagnostic API is an evolution of the API already supported by the Apache Felix and Eclipse DS implementations. That existing API has a number of weaknesses which are addressed in the proposed API:

- Lack of a security model: Except for the `ServicePermission[GET]` to access the `ScrService` service no security is defined at all
- The service is badly named “`ScrService`”
- There is no distinction between a Component as a declared entity and a Component Configuration as an actual instance of the declared entity. This makes the API look strange when dealing with multiple Component Configurations for the same Component.

Thus the proposed API is a complete rewrite of the existing API to better match the actual situation of a service component runtime.

8.2 @Component annotation inheritance

The original Bug 2138 asked for full support for inheritance of annotations. Such inheritance is already supported by the DS annotations provided by the Apache Felix project.

Yet full support is problematic because annotations are evaluated at build time based on build time dependencies available. Later at run time the static declarations are used to define properties, bind references and expose services. If a base class is modified between some expectations of that base class may not be met.

Consider for example a component `Extender` extending from the `Base` component. The `Base` component has an optional reference to Service `S1` at build time. At deployment time a new version of the `Base` component is deployed which besides the optional reference now has a mandatory reference to a Service `S2`. The descriptor created for `Extender` does not have this mandatory reference and thus may cause unexpected runtime errors (probably `NullPointerException`).

Another problem with full inheritance support is that implementations have to be exported. For the extending classes to have access to the base classes, those must be available in the class space of the extending class. This requires components to be exported. But this violates a basic assumption of DS which deems it best practice to not expose implementation details through export.

For these two reasons it was decided at the Basel F2F to support inheritance for components within the same bundle.

As it is very hard for tooling – up to impossible – to decide whether a (parent) class is within the same bundle, it was decided at the Palo Alto F2F to drop inheritance completely.

8.3 Create separate Service annotation (Bug 2140)

The original bug 2140 asked for the creation of a separate service annotation. However, due to impedance mismatch on the default of `@Component.service()` and a new `@Service` annotation, it was decided after the F2F meeting in Palo Alto to drop this additional annotation.

8.4 Component provided service properties (Bug 2250)

Different ways of supporting changes of service properties through the component have been discussed like returning a map from the activation method and/or having a setter method on the component context. However this would create several problems like how to update the properties and when especially with factory components. Therefore it was decided at the Palo Alto F2F to drop this enhancement.

8.5 Create separate Property annotation (Bug 2141)

The original bug 2141 asked for a separate property annotation. After extensive considerations this suggestion has been withdrawn and replaced with the new annotation based approach to define properties.

8.6 New Life Cycle States

The following proposed new states were removed per bug 2567.

Two additional states describing the life cycle of a component are added: activating and deactivating. A component is in the activating state when it is leaving the satisfied state while it is activated by calling the activate method of a component. This state is a transient state and an immediate component enters the active state once it's activated and all other components enter the registered state. If activation fails, the component is back in the unsatisfied state.

If a component is deactivated, it enters the deactivating state during this process. Once deactivation is finished it is disposed.

For posterity, record the design alternatives that were considered but rejected along with the reason for rejection. This is especially important for external/earlier solutions that were deemed not applicable.

9 Security Considerations

The diagnostic API has security implications in that it allows to introspect into component declarations and instances which are otherwise not accessible. In addition the API provides functionality to actually disable or enable components, albeit this is only temporary and reverted by a system or bundle restart.

Thus the complete API should only be available to management agents. Since this is a simple have-it-or-not situation, any bundle requiring access to the diagnostic API must have the `ServicePermission[ServiceComponentRuntime, GET]` permission.

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
- [3] RFC 185, Data Transfer Objects

10.2 Author's Address

Name	Felix Meschberger
Company	Adobe Systems Incorporated
Address	Barfüsserplatz 6, 4055 Basel, Switzerland
Voice	+41 61 226 55 49
e-mail	fmeschbe@adobe.com

Name	Carsten Ziegeler
Company	Adobe Systems Incorporated
Address	Barfüsserplatz 6, 4055 Basel, Switzerland
Voice	+41 61 226 55 0
e-mail	cziegele@adobe.com

10.3 Acronyms and Abbreviations

10.4 End of Document
