



# OSGi<sup>TM</sup> Alliance

## **RFC 190 - Declarative Services Enhancements**

Draft

75 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

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## 0.3 Feedback

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

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## 0.4 Table of Contents

<b>0 Document Information.....</b>	<b>2</b>
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
<b>1 Introduction.....</b>	<b>6</b>
<b>2 Application Domain.....</b>	<b>6</b>
2.1 Terminology + Abbreviations.....	6
<b>3 Problem Description.....</b>	<b>6</b>
3.1 Management.....	6
3.2 Requirement to use OSGi API.....	7
3.3 Bound Service Properties.....	7
3.4 Support inheritance in the DS Annotations (Bug 2138).....	7
3.5 Create separate Service annotation (Bug 2140).....	7
3.6 Create separate Property annocation (Bug 2141).....	8
<b>4 Requirements.....</b>	<b>8</b>
<b>5 Technical Solution.....</b>	<b>9</b>
5.1 Diagnostic API.....	9
5.2 Component provided service registration properties.....	10
5.2.1 ComponentContext.setServiceProperties(Dictionary).....	10
5.2.2 Return Map<String, Object> from activator methods.....	10
5.2.3 Property Filtering.....	11

5.3 Event Method Signature.....	11
5.4 API version.....	11
5.5 XML Descriptor Namespace.....	12
5.6 Extender Capability.....	12
5.7 Extension to Annotation Support.....	12
5.7.1 @Service annotation.....	12
5.7.2 Custom annotations as properties.....	12
5.7.3 Clarification of @Component annotation.....	14
5.7.4 @Properties annotation.....	15
5.7.5 Supporting inheritance.....	15
5.8 Integration with the Configuration Admin Service.....	15
5.9 Service Scopes.....	15
<b>6 Data Transfer Objects.....</b>	<b>16</b>
<b>7 Java API.....</b>	<b>16</b>
<b>8 Considered Alternatives.....</b>	<b>73</b>
8.1 Diagnostic API.....	73
8.2 @Component annotation inheritance.....	73
8.3 Create separate Service annotation (Bug 2140).....	74
8.4 Component provided service properties (Bug 2250).....	74
<b>9 Security Considerations.....</b>	<b>74</b>
<b>10 Document Support.....</b>	<b>74</b>
10.1 References.....	74
10.2 Author's Address.....	74
10.3 Acronyms and Abbreviations.....	75
10.4 End of Document.....	75

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## 0.5 Terminology and Document Conventions

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

Source code is shown in this typeface.

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## 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, <a href="mailto:fmeschbe@adobe.com">fmeschbe@adobe.com</a>

Revision	Date	Comments
Update	Sept. 24 2012	<p>Updates from Basel F2F:</p> <ul style="list-style-type: none"> <li>• Integrate Administrative API and design it to be DTO-style</li> <li>• Simplify security (ServicePermission [ServiceComponentRuntime, GET] is enough)</li> </ul> <p>Felix Meschberger, Adobe Systems Incorporated, <a href="mailto:fmeschbe@adobe.com">fmeschbe@adobe.com</a></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"> <li>• Relable the administrative API as the diagnostic API</li> <li>• Fleshed out annotation inheritance but suggest to actually remove it (section 5.7.4, Supporting Inheritance)</li> <li>• Added section 5.9, Service Scopes</li> </ul> <p>Felix Meschberger, Adobe Systems Incorporated, <a href="mailto:fmeschbe@adobe.com">fmeschbe@adobe.com</a></p>
<a href="#">Update</a>	<a href="#">08/07/13</a>	<p><a href="#">Update from Palo Alto F2F</a></p> <ul style="list-style-type: none"> <li>• <a href="#">Removed separate service annotations</a></li> <li>• <a href="#">Removed annotation inheritance</a></li> <li>• <a href="#">Removed setting properties through the component</a></li> <li>• <a href="#">Updated DTOs</a></li> <li>• <a href="#">New suggestion for property annotation</a></li> </ul> <p><a href="#">Carsten Ziegeler, Adobe Systems Incorporated, <a href="mailto:cziegele@adobe.com">cziegele@adobe.com</a></a></p>
<a href="#">Update</a>	<a href="#">19/07/13</a>	<p><a href="#">Update from CPEG Call (18/07/13)</a></p> <ul style="list-style-type: none"> <li>• <a href="#">Removed alternative property annotation proposals</a></li> <li>• <a href="#">Clarified annotation based approach</a></li> </ul> <p><a href="#">Carsten Ziegeler, Adobe Systems Incorporated, <a href="mailto:cziegele@adobe.com">cziegele@adobe.com</a></a></p>

# 1 Introduction

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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.

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## 2 Application Domain

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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.

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### 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).

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## 3 Problem Description

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### 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 Requirement to use OSGi API

The overall goal of DS is to limit or remove the requirement to use OSGi API in the components and thus support regular POJOs. With the latest release of the Declarative Services Specification (Version 1.2), this goal is attained to a great extent.

One thing still missing support is the ability to specify custom service registration properties. The only solution to do this in the current specification is to register the service in the activation method (and unregister in the deactivation method). But this requires use of OSGi API and also leads to non-use of a central functionality of DS, the registration of services on behalf of the declared components and thus reducing template code.

This same proposal is also asked for in Bug 2250 (allow a component to update its own service properties).

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## 3.3 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.

---

## 3.4 Support inheritance in the DS Annotations (Bug 2138)

The Declarative Services specification 1.2 introduced annotations to help developers with the creation of Component descriptors. The current design requires these annotations to be specified on the component implementation class. They are not processed when specified on super classes.

The main reason for this is that the annotations are processed at tooling time and not runtime. At runtime, you must have the full type hierarchy known and thus could reliably inspect super types for annotations. But at tool time (e.g. bundle packaging), you may not have the full type hierarchy available or the available type hierarchy may be different than at runtime due to package substitution. So constructing the component descriptions at tool time from information in super classes is risky.

However, there seems to be a constant stream of requests to support inheritance of DS annotations.

---

## 3.5 Create separate Service annotation (Bug 2140)

*TODO: The proposed changes to annotation support are potentially breaking backwards compatibility (e.g. the default handling as a service) and controversial or problematic (inheritance). Would it make sense to drop annotations from the current RFC and create a separate RFC for new annotations? Or to drop the proposed changes completely? The existing specified annotations perfectly work and the changes derived from the Apache Felix annotation support continue to live on in the Apache Felix implementation.*

The current DS annotations define a `service` attribute on the `@Component` annotation which defaults to all directly implemented interfaces of the class.

~~I think it would be better to separate more between components and services and create a separate Service annotation.~~

~~If just the Component annotation is present, its not registered as a service. With the Service annotation its possible register the component as a service. The Service annotation should have a class or value attribute. If that is left empty, the component is registered for all interfaces or all directly implemented interfaces (whether all or all directly implemented might be another discussion).~~

~~Especially the default of not specifying the service attribute on the Component is error prone as it is not intuitive. Not specifying something should mean: this is no service :)~~

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### 3.6 Create separate Property annotation (Bug 2141)

The current DS annotations define a `property` attribute on the `@Component` annotation which takes a key-value pair as a single string property. If a different type as string is used, this has to be coded into this string as well.

This is very error prone and forbids to use Java constants for the key or the value. In addition this notation easily clutters the `@Component` annotation if more than a small handful of properties is defined.

In the Apache Felix SCR annotations we have created a separate Property annotation (see <http://felix.apache.org/site/scr-annotations.html#SCRAnnotations-Property>) which has its own attributes for name and value like

```
@Property(name="key", value="aString")
```

or

```
@Property(name="anotherKey", intValue=1)
```

or

```
@Property(name=SOME_KEY, value=SOME_VALUE)
```

This annotation can be put on a constant to derive the name:

```
@Property(value=DEFAULT_VALUE)
public static String SOME_KEY = "key.name";
```

---

## 4 Requirements

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- |     |  |
|-----|--|
| R-1 | The solution MUST define <a href="#">ana administrativediagnosis</a> API to introspect declared components.  |
| R-2 | <del>The solution MUST allow component instances to define their own service registration properties. The specification has to explicitly state how to deal with mandatory service registration properties</del> |



~~(such as `component.id`) and private properties whose names have leading dots. See also Bug 2250 (allow a component to update its own service properties)~~

- R-3 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);
```

- ~~The solution MUST add support for class inheritance to DS Annotations. Differences between static inheritance at build time and dynamic inheritance at runtime must be described.~~

~~The solution MUST define a new DS Annotation to declare the services exposed by a component in addition to the existing service attribute to the `@Component` annotation.~~

- R-4 The solution MUST define a new DS Annotation to declare component properties for a component in addition to the existing `property` attribute to the `@Component` annotation.
- R-5 The solution MUST define the `osgi.extender` capability for DS in accordance with the core specification rules for the `osgi.extender` name space.
- R-6 The solution MUST support targeted PIDs according to Configuration Admin 1.5.

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## 5 Technical Solution

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### 5.1 Diagnostic API

The diagnostic API is structured after the component descriptor within its own package `org.osgi.service.component.runtime`. ~~The~~ with the `ServiceComponentRuntime` service interface as the API entry point. ~~The `ServiceComponentRuntime`~~ It is registered by the DS implementation 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` interface ~~class~~. The `ComponentDescription` provides access to the static declaration.

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

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

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

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

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

## 5.2 ~~Component provided service registration properties~~

~~To prevent manual service registration and be able to maintain the promise of registering a predefined set of service registration properties with a component's service a component has two options to define the service registration properties:~~

- ~~1. `ComponentContext.setServiceProperties(Dictionary)`~~
- ~~2. Return a `Map<String, Object>` from the `activate`, `modified`, and/or `deactivate` method.~~

~~By default SCR will use the component properties as service properties as described in Section 112.6.1, Service Properties. Using above mentioned mechanisms effectively overwrites this and defines the properties to be used with the restrictions outlined in section Error: Reference source not found, Error: Reference source not found, below:~~

### 5.2.1 ~~ComponentContext.setServiceProperties(Dictionary)~~

~~The `ComponentContext` interface is extended with the `setServiceProperties` taking a `Dictionary<String, Object>`. This is not a `Map` to stay inline with the existing `getProperties` method.~~

~~The new method sets the service registration properties from the given dictionary. If the dictionary is null or empty, the default service registration properties are used. In any case the `component.name` and `component.id` properties are always provided by the Service Component Runtime and cannot be changed or omitted. Likewise private properties, that is properties whose key have a leading dot, are removed from the dictionary before using the properties.~~

~~If the component is already registered as a service when this method is called, the service registration is immediately updated. If the component is not registered yet, the properties will be used for the service registration. If the component does not provide a service at all, this method has no effect.~~

### 5.2.2 ~~Return `Map<String, Object>` from activator methods~~

~~The `activate`, `modified`, and `deactivate` methods defined in a component declaration may return a `Map<String, Object>`. The respective properties are used for subsequent service registration or to update the service registration.~~

~~If both an `activate`, `modified`, or `deactivate` returns a `Map` and the `ComponentContext.setServiceProperties` is called, the later event takes precedence. So a call to~~

~~ComponentContext.setServiceProperties may be overwritten by the activate method returning a Map. Likewise the returned Map may be overwritten by a later call to the ComponentContext.setServiceProperties method.~~

~~A call to ComponentContext.setServiceProperties will immediately update the service properties. So calling that method and returning a Map of properties from the activator method will actually cause the service properties to be updated twice and thus the service listeners will be called twice.~~

~~For components declared with a namespace previous to version 1.3 only methods with void return types are considered. For components declared with the version 1.3 namespace, methods returning a Map are preferred over methods returning void if both variants exist. Methods returning any other type are ignored.~~

~~Care must be taken for delayed components updating service properties upon activation and deactivation: Changing the service properties may result in a consumer asking for the service in the first place to unget the service and thus cause the deactivate method resetting the service properties. This in turn could cause the consumer to get the service again and thus potentially lead to a loop.~~

~~Care must be taken in the case of service factory components: For such components a separate instance of the component class is activated for each consuming bundle. If the activate method updates the service registration properties this might have consequences for all instances of the service factory component.~~

~~While both situations may also occur in non-DS setups, its much simpler to happen in DS with the activate methods returning a different set of service registration properties.~~

### 5.2.3 Property Filtering

~~In addition to the filtering defined in Section 112.6.1, Service Properties, properties to be used as service registration properties are filtered as follows:~~

~~Properties whose key is component.name or component.id are always replaced by the actual component name and ID as provided by the service component runtime. If these properties are missing, they will be added automatically.~~

---

## 5.3 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.

---

## 5.4 API version

The DS API is exported as version 1.3 to reflect these updates as well as the new `ComponentContext.setServiceProperties` method.

## 5.5 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 ~~returning Map<String, Object> from the activate, modified, or deactivate method are supported~~ the new prototype service scope can be used.

## 5.6 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"
```

## 5.7 Extension to Annotation Support

### 5.7.1 ~~@Service~~ annotation

~~TODO: Given the impedance mismatch on the default value of @Component.service() and the @Service annotation, I wonder, whether we should not remove the @Service annotation and decide to not do requirement R-5:~~

~~If both the @Service annotation and the @Component.service are defined the build tool may not be able to know what the intend of the developer actually is. Therefore the build tool must log an error message. If the build system allows it, it would be reasonable to also break the build in these cases. A component descriptor for such a component must not be created.~~

~~The @Service annotation takes a list of types implemented (or extended) by the component implementation class. If an empty annotation is declared the list of provided services is derived from the implemented interfaces.~~

~~Note, that the @Service annotation works differently than the @Component.service property:~~

- ~~To not expose a service the @Service must not be declared while the @Component.service property must be set to the empty value to prevent service registration.~~
- ~~To expose the implemented interfaces by default, the @Service annotation must be defined with an empty value while the absence of the @Component.service property implies this default.~~

~~To expose a component as a service factory service, the @Service.serviceFactory attribute is set to true.~~

### 5.7.2 Custom annotations as properties

Configuration properties for a component can be defined through a custom annotation class containing the property names together with their default values:

```
@interface Config {  
    boolean enabled() default true;  
    String[] names() default {"a", "b"};  
    String topic() default MyComponent.DEFAULT_TOPIC_PREFIX + "/topic";  
}  
@Component(props=Config.class)
```

```

public class MyComponent {

    static final String DEFAULT_TOPIC_PREFIX = "topic.prefix";

    protected void activate(Config configuration) {
        String t = configuration.topic();

    }
}

```

The attribute props of the `@Component` annotation can be configured with an annotation class. In that case for each field of the annotation a property definition is generated. The name of the field is converted to the property name as follows: Each character and number are used as is, a single underscore is converted into a dot and two consecutive underscores are mapped to a single underscore. Examples:

Field Name	Property Name
myProperty143	myProperty143
some_prop	some.prop
another__prop	another_prop

The type of the property can directly be derived from the type of the field. If the field is of type Class the property will be of type String. If the field has a default value this is used as the default value for the property annotation.

The annotation class can be used in the activate, deactivate and modified methods. Therefore new signatures for these methods are supported, taking an argument of the annotation class. This is an additional possible argument. If used as the single argument for a lifecycle method, it has higher precedence than a method using a map as the argument.

If an annotation is used within a lifecycle method, DS creates an implementation conforming to this annotation and maps the available configuration properties to the fields:

- the name is mapped as described above
- If the configuration of a component contains a value, this value might need to be mapped to the value of the annotation field:
  - 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 an array with exactly this value. If the property value is an array but the annotation field 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 `toString()` on the value and then passed into the `valueOf(String)` method of the type class.
  - If an exception occurs during the conversion like a text is tried to be converted into a number, this error will be logged and handled like an exception during the activate method and the component won't be activated.
- If no configuration property is available, the defaults from the annotation are returned

- Additional properties not defined in the annotation are ignored – if the implementation needs these additional properties, it can use a method signature which includes the properties map in addition to the annotation.

This new 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. The signature can be used with or without using annotations to define a component and its properties.

@Property annotation

To easily define properties with desired types and to be able to leverage refer to constants also used in the actual code the @Property annotation can be used on the type or field level. When used on the field level, the name or the value may be derived from the field.

```
@Component
@Property(name="service.vendor", value="The ACME Company")
public class Sample {
    @Property(intValue = 5) 1
    public static final String INT_NAME = "int.property";
    @Property(name = "boolean.property"); 2
    public static final boolean BOOL_DEFAULT = true;
    @Property(value=STRING_DEFAULT) 3
    public static final String STRING_NAME = "string.property";
    public static final String STRING_DEFAULT = "none";
    ...
}
```

1. Annotation on a String constant with the value defined makes the constant value the property name.
2. Annotation on a constant with the name defined makes the constant value the property value.
3. To use constants for both the name and the value, the annotation can be placed on the name constant and refer to the value constant with the name of the constant.
4. If no value is provided to the @Property annotation neither the value nor the type attribute of the <Property> descriptor are generated.

### **5.7.3 Clarification of @Component annotation**

The @Component annotation contains three different approaches to define properties through three different attributes: property, properties and props. As annotation properties to not have an order when they are processed, the current specification does not define the order of the corresponding elements in the XML descriptor. However the order in the XML defines the order of processing.

This should be clarified by defining an order of processing:

1. properties
2. property
3. props

#### 5.7.4 ~~@Properties~~ annotation

~~It is only possible to have a single annotation of a specific type on a particular target, e.g. only one @Property annotation on the class. To work around this limitation the @Properties annotation is defined to just take an array of @Property annotations.~~

~~Multiple @Property annotations are only used on the type level. Therefore the @Properties annotation is only available on types.~~

#### 5.7.5 Supporting inheritance

~~*TODO: Given the issues and complexity of describing annotation inheritance on the one hand and the probably limited use of such annotation inheritance within a single bundle, I suggest to actually remove this from the roadmap and thus decide to not do requirement R-4.*~~

~~Annotations may be inherited from base classes. But since the classes and their annotations may be different at build and deployment time such inheritance is potentially brittle: Consider a component Ext in Bundle B2 extending a Component Base in Bundle B1. B2 is built with version 1 of B1 where Base has no mandatory references. At deployment time, B1 is actually deployed at version 2 and now has a mandatory reference and the component code expects the service to be bound or present at the time of activation. Yet the descriptor of B2's Ext component does not have the mandatory reference and thus the service may not be present and is not bound. This may cause the component to actually fail.~~

~~To prevent these situations inheritance of annotations is only supported within the same bundle. Tooling support for annotations has to make sure to build bundles such that if a component Ext extends from a component Base both components are included in the same bundle.~~

---

## 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 either by registered `ManagedService` or `ManagedServiceFactory` services on behalf of the components or by applying the configuration binding checks as defined by the Configuration Admin Service specification before providing configuration to components.

---

## 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 ~~deprecated~~replaced by and 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 `ReferenceScope`.
- `@Reference.scope()` of type `ReferenceScope` is added.

These changes specified in RFC 195, Service Scope, form an integral part of this RFC.

---

## 6 Data Transfer Objects

---

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

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

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

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

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:

```
Component getComponent(Bundle, String)
List<Component> getComponents(Bundle...)
List<ComponentConfiguration> getConfigurations(Bundle, String)
```

See the JavaDoc for details.

---

## 7 Java API

---



OSGi Javadoc  
09.07.13 17:37

Package Summary		Page
<a href="#">org.osgi.service.component</a>	Service Component Package Version 1.3.	Error: Reference source not found
<a href="#">org.osgi.service.component.annotations</a>	Service Component Annotations Package Version 1.3.	Error: Reference source not found
<a href="#">org.osgi.service.component.runtime</a>	Service Component Package Version 1.3.	Error: Reference source not found

Package org.osgi.service.component

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

Service Component Package Version 1.3.

See:

[Description](#)

Interface Summary		Page
<a href="#">ComponentConstants</a>	Defines standard names for Service Component constants.	Error: Reference source not found
<a href="#">ComponentContext</a>	A Component Context object is used by a component instance to interact with its execution context including locating services by reference name.	Error: Reference source not found
<a href="#">ComponentFactory</a>	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.	Error: Reference source not found
<a href="#">ComponentInstance</a>	A ComponentInstance encapsulates a component instance of an activated component configuration.	Error: Reference source not found

Exception Summary		Page
<a href="#">ComponentException</a>	Unchecked exception which may be thrown by the Service Component Runtime.	Error: Reference source not found

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	<a href="#">COMPONENT_FACTORY</a> A service registration property for a Component Factory that contains the value of the <code>factory</code> attribute.	Error: Reference source not found
String	<a href="#">COMPONENT_ID</a> A component property that contains the generated id for a component configuration.	Error: Reference source not found
String	<a href="#">COMPONENT_NAME</a> 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.	Error: Reference source not found
int	<a href="#">DEACTIVATION_REASON_BUNDLE_STOPPED</a> The component configuration was deactivated because the bundle was stopped.	Error: Reference source not found
int	<a href="#">DEACTIVATION_REASON_CONFIGURATION_DELETED</a> The component configuration was deactivated because its configuration was deleted.	Error: Reference source not found
int	<a href="#">DEACTIVATION_REASON_CONFIGURATION_MODIFIED</a> The component configuration was deactivated because its configuration was changed.	Error: Reference source not found
int	<a href="#">DEACTIVATION_REASON_DISABLED</a> The component configuration was deactivated because the component was disabled.	Error: Reference source not found
int	<a href="#">DEACTIVATION_REASON_DISPOSED</a> The component configuration was deactivated because the component was disposed.	Error: Reference source not found
int	<a href="#">DEACTIVATION_REASON_REFERENCE</a> The component configuration was deactivated because a reference became unsatisfied.	Error: Reference source not found

int	<a href="#">DEACTIVATION_REASON_UNSPECIFIED</a> The reason the component configuration was deactivated is unspecified.	Error: Refer ence sourc e not found
String	<a href="#">REFERENCE_TARGET_SUFFIX</a> The suffix for reference target properties.	Error: Refer ence sourc e not found
String	<a href="#">SERVICE_COMPONENT</a> Manifest header specifying the XML documents within a bundle that contain the bundle's Service Component descriptions.	Error: Refer ence sourc e not found

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.  


---

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 attribute of the component element. The value of this property must be of type String.  


---

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.  


---

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.  


---

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.  


---

public static final int DEACTIVATION_REASON_UNSPECIFIED = 0  
    The reason the component configuration was deactivated is unspecified.  
    Since:  
    DEACTIVATION1REASON_DISABLED  


---

public static final int DEACTIVATION_REASON_DISABLED = 1  
    The component configuration was deactivated because the component was disabled.  
    Since:  
    DEACTIVATION1REASON_REFERENCE  


---

public static final int DEACTIVATION_REASON_REFERENCE = 2  
    The component configuration was deactivated because a reference became unsatisfied.  
    Since:  
    DEACTIVATION1REASON_CONFIGURATION_MODIFIED  


---

public static final int DEACTIVATION_REASON_CONFIGURATION_MODIFIED = 3  
    The component configuration was deactivated because its configuration was changed.  
    Since:  
    DEACTIVATION1REASON_CONFIGURATION_DELETED  


---

public static final int DEACTIVATION_REASON_CONFIGURATION_DELETED = 4  
    The component configuration was deactivated because its configuration was deleted.
```

Since:

**DEACTIVATION<sup>1</sup>REASON\_DISPOSED**

---

public static final int DEACTIVATION\_REASON\_DISPOSED = 5

The component configuration was deactivated because the component was disposed.

Since:

**DEACTIVATION<sup>1</sup>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	<a href="#">disableComponent</a> (String name) Disables the specified component name.	Error: Reference source not found
void	<a href="#">enableComponent</a> (String name) Enables the specified component name.	Error: Reference source not found
org.osgi.framework.BundleContext	<a href="#">getBundleContext</a> () Returns the <code>BundleContext</code> of the bundle which contains this component.	Error: Reference source not found
<a href="#">ComponentInstance</a>	<a href="#">getComponentInstance</a> () Returns the Component Instance object for the component instance associated with this Component Context.	Error: Reference source not found
Dictionary<String, Object>	<a href="#">getProperties</a> () Returns the component properties for this Component Context.	Error: Reference source not found
org.osgi.framework.ServiceReference<?>	<a href="#">getServiceReference</a> () 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.	Error: Reference source not found
org.osgi.framework.Bundle	<a href="#">getUsingBundle</a> () If the component instance is registered as a service using the <code>servicefactory="true"</code> attribute, then this method returns the bundle using the service provided by the component instance.	Error: Reference source not found

Object	<a href="#">locateService</a> (String name) Returns the service object for the specified reference name.	Error: Reference source not found
Object	<a href="#">locateService</a> (String name, org.osgi.framework.ServiceReference<?> reference) Returns the service object for the specified reference name and ServiceReference.	Error: Reference source not found
Object[]	<a href="#">locateServices</a> (String name) Returns the service objects for the specified reference name.	Error: Reference source not found
void	<a href="#">setServiceProperties</a> (Dictionary<String,Object> properties) Sets the service registration properties of the component registered as a service.	Error: Reference source not found

## Method Detail

### getProperties

Dictionary<String,Object> getProperties()

Returns the component properties for this Component Context.

Returns:

[locateService](#) The properties for this Component Context. The Dictionary is read only and cannot be modified.

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](#)

## Interface ComponentContext

---

`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 `servicefactory="true"` attribute, then this method returns the bundle using the service provided by the component instance.

This method will return `null` if:

- The component instance is not a service, then no bundle can be using it as a service.
- The component instance is a service but did not specify the `servicefactory="true"` attribute, then all bundles using the service provided by the component instance will share the same component instance.
- 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(String name)`~~

`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(String name)`~~

`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(String name)`~~

`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.

---

~~`setServiceProperties(Dictionary<String, Object> properties)`~~

`void setServiceProperties(Dictionary<String, Object> properties)`

Sets the service registration properties of the component registered as a service. If the component is not declared to provide a service this method has no effect.

The provided properties are treated as follows to get to the actual set of properties for the service registration:

1. If the properties parameter is `null` or an empty Dictionary the default properties are retrieved as defined in Section 112.6, Component Properties.
2. Any private properties whose key starts with a dot are removed from the dictionary.
3. The `component.id` and `component.name` property are added or replaced as defined in Section 112.6, Component Properties.

If the component is already registered as a service the service registration properties are updated as per `org.osgi.framework.ServiceRegistration.setProperties(Dictionary)`. If the component is not registered as a service (yet) the provided properties are used for the upcoming service registration.



Parameters:

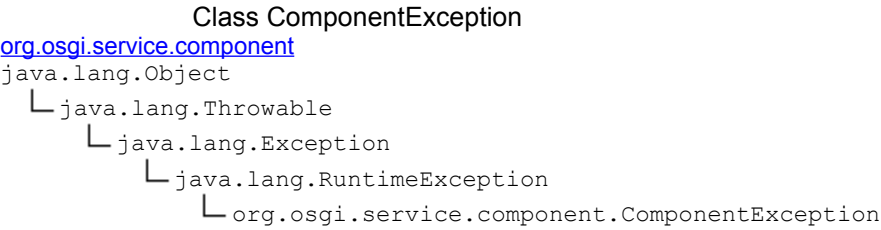
`properties` - properties to update the default component properties with. If this is `null` or empty the default set of properties as defined in Section 112.6, Component Properties, are used as the service registration properties.

Throws:

`IllegalStateException` - if this method is called for a Component Factory component

Since:

1.3



All Implemented Interfaces:  
Serializable

```
public class ComponentException
extends RuntimeException
```

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

Constructor Summary	Page
<a href="#">ComponentException</a> (String message) Construct a new ComponentException with the specified message.	rror: Refer ence sourc e not found
<a href="#">ComponentException</a> (String message, Throwable cause) Construct a new ComponentException with the specified message and cause.	Error: Refer ence sourc e not found
<a href="#">ComponentException</a> (Throwable cause) Construct a new ComponentException with the specified cause.	Error: Refer ence sourc e not found

Method Summary	Page
Throwable <a href="#">getCause</a> () Returns the cause of this exception or null if no cause was set.	rror: Refer ence sourc e not found
Throwable <a href="#">initCause</a> (Throwable cause) Initializes the cause of this exception to the specified value.	Error: Refer ence sourc e not found

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.
```

---

```
public ComponentException (String message)
Construct a new ComponentException with the specified message.
Parameters:
```

**ComponentException** message - The message for the exception.

---

`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:

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

---

`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
<a href="#">ComponentInstance</a>	<b><code>newInstance</code></b> (Dictionary<String,?> properties) Create and activate a new component configuration.	rror: Reference source not found

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	<a href="#">dispose</a> () Dispose of the component configuration for this component instance.	rror: Refer ence sourc e not found
Object	<a href="#">getInstance</a> () Returns the component instance of the activated component configuration.	Error: Refer ence sourc e not found

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
<a href="#">ConfigurationPolicy</a>	Configuration Policy for the <a href="#">Component</a> annotation.	Error: Reference source not found
<a href="#">ReferenceCardinality</a>	Cardinality for the <a href="#">Reference</a> annotation.	Error: Reference source not found
<a href="#">ReferencePolicy</a>	Policy for the <a href="#">Reference</a> annotation.	Error: Reference source not found
<a href="#">ReferencePolicyOption</a>	Policy option for the <a href="#">Reference</a> annotation.	Error: Reference source not found
<a href="#">ReferenceScope</a>	Reference scope for the <a href="#">Reference</a> annotation.	Error: Reference source not found
<a href="#">ServiceScope</a>	Service scope for the <a href="#">Component</a> annotation.	Error: Reference source not found

Annotation Types Summary		Page
<a href="#">Activate</a>	Identify the annotated method as the <code>activate</code> method of a Service Component.	Error: Reference source not found
<a href="#">Component</a>	Identify the annotated class as a Service Component.	Error: Reference source not found

<a href="#">Deactivate</a>	Identify the annotated method as the <code>deactivate</code> method of a Service Component.	Error: Reference source not found
<a href="#">Modified</a>	Identify the annotated method as the <code>modified</code> method of a Service Component.	Error: Reference source not found
<a href="#">Properties</a>	Allows to define multiple <a href="#">Property</a> annotations for one type.	Error: Reference source not found
<a href="#">Property</a>	The <code>Property</code> annotation defines properties which are made available to the component through the <code>ComponentContext.getProperties()</code> method.	Error: Reference source not found
<a href="#">Reference</a>	Identify the annotated method as a <code>bind</code> method of a Service Component.	Error: Reference source not found

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](http://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](http://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	<a href="#">configurationPid</a> The configuration PID for the configuration of this Component.	Error: Reference source not found
<a href="#">ConfigurationPolicy</a>	<a href="#">configurationPolicy</a> The configuration policy of this Component.	Error: Reference source not found
boolean	<a href="#">enabled</a> Declares whether this Component is enabled when the bundle containing it is started.	Error: Reference source not found
String	<a href="#">factory</a> The factory identifier of this Component.	Error: Reference source not found
boolean	<a href="#">immediate</a> Declares whether this Component must be immediately activated upon becoming satisfied or whether activation should be delayed.	Error: Reference source not found
String	<a href="#">name</a> The name of this Component.	Error: Reference source not found
String[]	<a href="#">properties</a> Property entries for this Component.	Error: Reference source not found
String[]	<a href="#">property</a> Properties for this Component.	Error: Reference source not found

<code>ServiceScope</code>	<code>scope</code> The service scope for the service of this Component.	Error: Reference source not found
<code>Class&lt;?&gt;[]</code>	<code>service</code> The types under which to register this Component as a service.	Error: Reference source not found
<code>boolean</code>	<code>servicefactory</code> <b>Deprecated.</b> Since 1.3.	Error: Reference source not found
<code>String</code>	<code>xmlns</code> The XML name space of the Component Description for this Component.	Error: Reference source not found

## 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:  
`service` "The name attribute of the component element of a Component Description."

`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:  
`factory` "The service element of a Component Description."

`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:

`servicefactory` "The factory attribute of the component element of a Component Description."  
`@Deprecated`  
`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.*  
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.

Default:

`false`

See Also:

---

**enabled** "The servicefactory attribute of the service element of a Component Description."

`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:

---

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

`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:

---

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

`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:

---

**properties** "The property element of a Component Description."

`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:

---

**xmlns** "The properties element of a Component Description."

`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:

---

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

`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:

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

---

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:

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

---

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.

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
<a href="#">IGNORE</a>	Always allow the component configuration to be satisfied and do not use the corresponding Configuration object even if it is present.	Error: Reference source not found
<a href="#">OPTIONAL</a>	Use the corresponding Configuration object if present but allow the component to be satisfied even if the corresponding Configuration object is not present.	Error: Reference source not found
<a href="#">REQUIRE</a>	There must be a corresponding Configuration object for the component configuration to become satisfied.	Error: Reference source not found

Method Summary		Page
String <a href="#">toString</a> ()		Error: Reference source not found
static <a href="#">ConfigurationPolicy</a> <a href="#">valueOf</a> (String name)		Error: Reference source not found
static <a href="#">ConfigurationPolicy</a> [] <a href="#">values</a> ()		Error: Reference source not found

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

valueOf	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](http://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](http://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 Properties  
[org.osgi.service.component.annotations](#)  
@Target(value=ElementType.TYPE)  
@Retention(value=RetentionPolicy.CLASS)  
public @interface Properties  
Allows to define multiple [Property](#) annotations for one type.  
Since: 1.3

Required Element Summary		Page
<a href="#">Property</a> []	<b>value</b> List of <a href="#">Property</a> annotations.	rror: Refer ence sourc e not found

Element Detail

value

public abstract [Property](#)[] value  
List of [Property](#) annotations.

## Annotation Type Property

[org.osgi.service.component.annotations](http://org.osgi.service.component.annotations)

@Retention(value=RetentionPolicy.CLASS)

public @interface Property

The `Property` annotation defines properties which are made available to the component through the `ComponentContext.getProperties()` method. These annotations are not strictly required but may be used by components to defined initial configuration. Additionally properties may be set here to identify the component if it is registered as a service, for example the `service.description` and `service.vendor` properties.

This tag is used to declare `<property>` elements of the component declaration. See section 112.4.5, Properties and Property Elements, in the OSGi Service Platform Service Compendium Specification for more information.

Since:

1.3

Required Element Summary		Page
<code>boolean[]</code> <a href="#">boolValue</a> The bool value(s) of the property.		rror: Refer ence sourc e not found
<code>byte[]</code> <a href="#">byteValue</a> The byte value(s) of the property.		Error: Refer ence sourc e not found
<code>char[]</code> <a href="#">charValue</a> The char value(s) of the property.		Error: Refer ence sourc e not found
<code>Class&lt;?&gt;[]</code> <a href="#">classValue</a> The class value(s) of the property.		Error: Refer ence sourc e not found
<code>double[]</code> <a href="#">doubleValue</a> The double value(s) of the property.		Error: Refer ence sourc e not found
<code>float[]</code> <a href="#">floatValue</a> The float value(s) of the property.		Error: Refer ence sourc e not found
<code>int[]</code> <a href="#">intValue</a> The int value(s) of the property.		Error: Refer ence sourc e not found
<code>long[]</code> <a href="#">longValue</a> The long value(s) of the property.		Error: Refer ence sourc e not found

String	<a href="#">name</a> The name of the property	Error: Refer ence sourc e not found
short[]	<a href="#">shortValue</a> The short value(s) of the property.	Error: Refer ence sourc e not found
String[]	<a href="#">value</a> The value(s) of the property.	Error: Refer ence sourc e not found

## Element Detail

### name

```
public abstract String name
    The name of the property
    Default: ""
```

---

**value**

```
public abstract String[] value
    The value(s) of the property. If the property type is not String, parsing of the value is done using the
    valueOf(String) method of the class defined by the property type. This attribute should not be used in
    combination with any of the other value attributes.
    Default:
```

---

**classValue** {}

```
public abstract Class<?>[] classValue
    The class value(s) of the property. This attribute should not be used in combination with any of the other
    value attributes or the type attribute.
    Default:
```

---

**longValue** {}

```
public abstract long[] longValue
    The long value(s) of the property. This attribute should not be used in combination with any of the other
    value attributes or the type attribute.
    Default:
```

---

**doubleValue** {}

```
public abstract double[] doubleValue
    The double value(s) of the property. This attribute should not be used in combination with any of the other
    value attributes.
    Default:
```

---

**floatValue** {}

```
public abstract float[] floatValue
    The float value(s) of the property. This attribute should not be used in combination with any of the other
    value attributes or the type attribute.
    Default:
```

---

**intValue** {}

```
public abstract int[] intValue
    The int value(s) of the property. This attribute should not be used in combination with any of the other value
    attributes or the type attribute.
    Default:
```

---

**byteValue** {}

```
public abstract byte[] byteValue
    The byte value(s) of the property. This attribute should not be used in combination with any of the other
    value attributes or the type attribute.
    Default:
```

charValue {}

```
public abstract char[] charValue
```

The char value(s) of the property. This attribute should not be used in combination with any of the other value attributes or the type attribute.

Default:

```
boolValue      }
```

```
public abstract boolean[] boolValue
```

The bool value(s) of the property. This attribute should not be used in combination with any of the other value attributes or the type attribute.

Default:

```
shortValue }
```

```
public abstract short[] shortValue
```

The short value(s) of the property. This attribute should not be used in combination with any of the other value attributes or the type attribute.

Default:

 $\{$

## 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
<a href="#">ReferenceCardinality</a>	<p><b>cardinality</b></p> <p>The cardinality of the reference.</p>	Error: Reference source not found
<a href="#">String</a>	<p><b>name</b></p> <p>The name of this reference.</p>	Error: Reference source not found
<a href="#">ReferencePolicy</a>	<p><b>policy</b></p> <p>The policy for the reference.</p>	Error: Reference source not found
<a href="#">ReferencePolicyOption</a>	<p><b>policyOption</b></p> <p>The policy option for the reference.</p>	Error: Reference source not found
<a href="#">ReferenceScope</a>	<p><b>scope</b></p> <p>The requested service scope for this Reference.</p>	Error: Reference source not found
<a href="#">Class&lt;?&gt;</a>	<p><b>service</b></p> <p>The type of the service to bind to this reference.</p>	Error: Reference source not found
<a href="#">String</a>	<p><b>target</b></p> <p>The target filter for the reference.</p>	Error: Reference source not found
<a href="#">String</a>	<p><b>unbind</b></p> <p>The name of the unbind method which is associated with the annotated bind method.</p>	Error: Reference source not found

String	<a href="#">updated</a> The name of the updated method which is associated with the annotated bind method.	Error: Reference source not found
--------	---	-----------------------------------

## 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:

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

---

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:

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

---

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		Page
<a href="#">AT_LEAST_ONE</a>	The reference is mandatory and multiple.	Error: Reference source not found
<a href="#">MANDATORY</a>	The reference is mandatory and unary.	Error: Reference source not found
<a href="#">MULTIPLE</a>	The reference is optional and multiple.	Error: Reference source not found
<a href="#">OPTIONAL</a>	The reference is optional and unary.	Error: Reference source not found

Method Summary		Page
String	<a href="#">toString</a> ()	Error: Reference source not found
static <a href="#">ReferenceCardinality</a>	<a href="#">valueOf</a> (String name)	Error: Reference source not found
static <a href="#">ReferenceCardinality</a> []	<a href="#">values</a> ()	Error: Reference source not found



## 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()

public static [ReferenceCardinality](#) valueOf(String name)

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
<a href="#">DYNAMIC</a>	The dynamic policy is slightly more complex since the component implementation must properly handle changes in the set of bound services.	Error: Reference source not found
<a href="#">STATIC</a>	The static policy is the most simple policy and is the default policy.	Error: Reference source not found

Method Summary		Page
<code>String</code> <a href="#">toString</a> ()		Error: Reference source not found
<code>static ReferencePolicy</code> <a href="#">valueOf</a> (String name)		Error: Reference source not found
<code>static ReferencePolicy[]</code> <a href="#">values</a> ()		Error: Reference source not found

## 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()
public static ReferencePolicy valueOf(String name)
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
<a href="#">GREEDY</a>	The greedy policy option is a valid policy option for both <a href="#">static</a> and <a href="#">dynamic</a> reference policies.	Error: Reference source not found
<a href="#">RELUCTANT</a>	The reluctant policy option is the default policy option for both <a href="#">static</a> and <a href="#">dynamic</a> reference policies.	Error: Reference source not found

Method Summary		Page
<a href="#">toString</a> ()		Error: Reference source not found
<a href="#">valueOf</a> (String name)		Error: Reference source not found
<a href="#">values</a> ()		Error: Reference source not found

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()
public static ReferencePolicyOption valueOf(String name)
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
<a href="#">BUNDLE</a>	A single service object is used for all references to the service in this bundle.	Error: Reference source not found
<a href="#">PROTOTYPE</a>	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.	Error: Reference source not found

Method Summary		Page
<code>String</code> <a href="#">toString</a> ()		Error: Reference source not found
<code>static ReferenceScope</code> <a href="#">valueOf</a> (String name)		Error: Reference source not found
<code>static ReferenceScope[]</code> <a href="#">values</a> ()		Error: Reference source not found

## 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()
public static ReferenceScope valueOf(String name)
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
<a href="#">BUNDLE</a>	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.	Error: Reference source not found
<a href="#">DEFAULT</a>	Default element value for annotation.	Error: Reference source not found
<a href="#">PROTOTYPE</a>	When the component is registered as a service, it will be registered as a prototype scope service.	Error: Reference source not found
<a href="#">SINGLETON</a>	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.	Error: Reference source not found

Method Summary		Page
String	<a href="#">toString()</a>	Error: Reference source not found
static ServiceScope	<a href="#">valueOf</a> (String name)	Error: Reference source not found
static ServiceScope[]	<a href="#">values()</a>	Error: Reference source not found



## 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()

public static [ServiceScope](#) valueOf(String name)

public String toString()

Overrides:

toString in class Enum

## Package org.osgi.service.component.runtime

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

Service Component Package Version 1.3.

See:

[Description](#)

Interface Summary		Page
<a href="#">ServiceComponentRuntime</a>	The <code>ServiceComponentRuntime</code> service represents the Declarative Services main controller also known as the Service Component Runtime or SCR for short.	Error: Reference source not found

Class Summary		Page
<a href="#">BoundReference</a>	The <code>BoundReference</code> interface represents the actual service binding of a service reference declared in the <a href="#">reference element</a> of the component declaration.	Error: Reference source not found
<a href="#">ComponentConfiguration</a>	The <code>ComponentConfiguration</code> interface represents an actual instance of a declared <a href="#">ComponentDescription</a> .	Error: Reference source not found
<a href="#">ComponentDescription</a>	The <code>Component</code> interface represents the declaration of a component in a Declarative Services descriptor.	Error: Reference source not found
<a href="#">Reference</a>	The <code>Reference</code> interface represents a single reference (or dependency) to a service used by a Component as declared in the <code>reference</code> elements of a Declarative Services descriptor.	Error: Reference source not found

Package org.osgi.service.component.runtime 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) "`

```
Class BoundReference
org.osgi.service.component.runtime
java.lang.Object
└─ org.osgi.dto.DTO
    └─ org.osgi.service.component.runtime.BoundReference
public class BoundReference
extends org.osgi.dto.DTO
```

The BoundReference interface represents the actual service binding of a service reference declared in the [reference element](#) of the component declaration.

Since:

1.3

Version:

\$Id: 5d17c4cfd9a25336ba9498daf0cb28ddded7c04 \$

Field Summary		Page
<a href="#">Reference</a>	<a href="#">reference</a> Returns the component/reference element of the component descriptor defining this bound reference.	Error: Reference source not found
boolean	<a href="#">satisfied</a> Returns whether this reference is satisfied.	Error: Reference source not found
org.osgi.dto.framework.ServiceReferenceDTO[]	<a href="#">serviceReferences</a> An array of ServiceReferenceDTO instances representing the bound services.	Error: Reference source not found
String	<a href="#">target</a> The value of the actual target value used to select services to bind to.	Error: Reference source not found

Constructor Summary		Page
<a href="#">BoundReference</a> ()		Error: Reference source not found

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

Field Detail

reference

public [Reference](#) reference

[satisfied](#) Returns the component/reference element of the component descriptor defining this bound reference.

public boolean satisfied

Returns whether this reference is satisfied. An [optional](#) reference is always satisfied. Otherwise true is only returned if at least one service is bound.

[target](#)

public String target

The value of the actual target value used to select services to bind to. Initially (without overwriting configuration) this method provides access to the `component/reference.target` attribute of the reference declaration. If configuration overwrites the target property, this method returns the value of the component property whose name is derived from the [reference name](#) plus the suffix `.target`. If no target property exists this field is set to `null`.

---

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

An array of `ServiceReferenceDTO` instances representing the bound services. If no services are actually bound, this field is set to `null`.

## Constructor Detail

### BoundReference

```
public BoundReference()
```

## Class ComponentConfiguration

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

java.lang.Object

└─ org.osgi.dto.DTO

└─ org.osgi.service.component.runtime.ComponentConfiguration

public class ComponentConfiguration

extends org.osgi.dto.DTO

The ComponentConfiguration interface represents an actual instance of a declared [ComponentDescription](#). These instances are called *configurations* in the Declarative Services specification hence the name.

Since:

1.3

Version:

\$Id: 9d2a68e7a6f4be379a58a9e0b5e82a5df9095a05 \$

Field Summary		Page
<a href="#">BoundReference</a> []	<b><a href="#">boundReferences</a></b> An array of <a href="#">BoundReference</a> instances representing the service references bound to this component configuration.	Error: Reference source not found
<a href="#">ComponentDescription</a>	<b><a href="#">component</a></b> The declaration of this component configuration.	Error: Reference source not found
String	<b><a href="#">configurationPid</a></b> The <code>service.pid</code> property of the configuration properties provided by the Configuration Admin service for this component configuration or <code>null</code> if no configuration from the Configuration Admin is provided to this component configuration.	Error: Reference source not found
Map<String, Object>	<b><a href="#">properties</a></b> A map of the actual properties provided to the component configuration.	Error: Reference source not found
int	<b><a href="#">state</a></b> The current state of this component configuration, which is one of the <code>STATE_*</code> constants defined in this interface.	Error: Reference source not found
static int	<b><a href="#">STATE_ACTIVATING</a></b> A satisfied component is being activated (value is 2).	Error: Reference source not found
static int	<b><a href="#">STATE_ACTIVE</a></b> A component is in the active state (value is 8).	Error: Reference source not found
static int	<b><a href="#">STATE_DEACTIVATING</a></b> The Component is being deactivated either because it is being disabled or because a dependency is not satisfied any more (value is 16).	Error: Reference source not found

static int	<a href="#">STATE_DISPOSING</a> The Component is being disposed off (value is 32).	Error: Refer ence sourc e not found
static int	<a href="#">STATE_REGISTERED</a> The Component has successfully been activated but is a delayed or service factory component pending instantiation on first use (value is 4).	Error: Refer ence sourc e not found
static int	<a href="#">STATE_UNSATISFIED</a> The initial state of a component (value is 1).	Error: Refer ence sourc e not found

Constructor Summary		Page
<a href="#">ComponentConfiguration</a> ()		Error: Refer ence sourc e not found

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

## Field Detail

### STATE\_UNSATISFIED

public static final int STATE_UNSATISFIED = 1	The initial state of a component (value is 1).
<a href="#">STATE_ACTIVATING</a>	When the component becomes satisfied it enters the <a href="#">activating state</a> to be activated.
public static final int STATE_ACTIVATING = 2	A satisfied component is being activated (value is 2). Depending on the type of the component this may include the following steps: <ol style="list-style-type: none"><li>1. Register as a service (if providing service(s))</li><li>2. Create the component instance</li><li>3. Bind available references</li><li>4. Call the activator method (if any)</li></ol> If activation succeeds the component enters the <a href="#">active state</a> if it is an immediate component or the <a href="#">registered state</a> if it is a delayed or factory service component or if it is a component factory component. If activation fails the component falls back to the <a href="#">unsatisfied state</a> .
<a href="#">STATE_REGISTERED</a>	
public static final int STATE_REGISTERED = 4	The Component has successfully been activated but is a delayed or service factory component pending instantiation on first use (value is 4). If the service is retrieved from the service factory for the first time the component is being activated and on success enters the <a href="#">active state</a> . If activation fails, the component remains in the <a href="#">registered state</a> .
<a href="#">STATE_ACTIVE</a>	If the component is being deactivated it enters the <a href="#">deactivating state</a> .
public static final int STATE_ACTIVE = 8	A component is in the active state (value is 8). The activate state means the following depending on the type of component: <ul style="list-style-type: none"><li>• The component is an immediate component</li><li>• The component is a delayed or service factory component and at least one consumer has retrieved the provided service</li></ul>

- The component is an instance of a Component Factory component created with the [ComponentFactory.newInstance\(java.util.Dictionary\)](#) method

If the component becomes unsatisfied it is being deactivated and enters the [deactivating state](#).

If the component is a Component Factory created instance and is disposed off with the [ComponentInstance.dispose\(\)](#) method it is being destroyed and also enters the [deactivating state](#).

If the last consumer of a delayed or service factory component ungets the provided service, the component instance is destroyed and the component enters the [registered state](#).

**STATE\_DEACTIVATING**

public static final int STATE\_DEACTIVATING = 16

The Component is being deactivated either because it is being disabled or because a dependency is not satisfied any more (value is 16). After deactivation the Component enters the [unsatisfied state](#).

**STATE\_DISPOSING**

public static final int STATE\_DISPOSING = 32

The Component is being disposed off (value is 32). After the component has been disposed off it is removed from the system and is not available as a ComponentConfiguration any longer.

**component**

public [ComponentDescription](#) component

The declaration of this component configuration.

**state**

public int state

The current state of this component configuration, which is one of the STATE\_\* constants defined in this interface.

**configurationPid**

public String configurationPid

The service.pid property of the configuration properties provided by the Configuration Admin service for this component configuration or null if no configuration from the Configuration Admin is provided to this component configuration.

**properties**

public Map<String, Object> properties

A map of the actual properties provided to the component configuration. This map provides the same content as the [ComponentContext.getProperties\(\)](#) method.

**boundReferences**

public [BoundReference](#)[] boundReferences

An array of [BoundReference](#) instances representing the service references bound to this component configuration. null is returned if the component configuration has no bound references.

## Constructor Detail

## ComponentConfiguration

public ComponentConfiguration()

## Class ComponentDescription

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

java.lang.Object

└─ org.osgi.dto.DTO

└─ org.osgi.service.component.runtime.ComponentDescription

public class ComponentDescription

extends org.osgi.dto.DTO

The Component interface represents the declaration of a component in a Declarative Services descriptor.

Since:

1.3

Version:

\$Id: dc999e7d8096c5dbfbc5a206c6a6c6c22a5fd00a \$

Field Summary		Page
String	<a href="#">activate</a> The name of the method to be called when the component is being activated as defined in the <code>component.activate</code> attribute or <code>null</code> if not explicitly declared.	Error: Reference source not found
org.osgi.dto.DTO o.framework.BundleDTO	<a href="#">bundle</a> The bundle declaring this component.	Error: Reference source not found
String	<a href="#">configurationPid</a> The configuration PID to be used for the component in conjunction with Configuration Admin as defined in the <code>component.configuration-pid</code> attribute.	Error: Reference source not found
<a href="#">ConfigurationPolicy</a>	<a href="#">configurationPolicy</a> The configuration policy declared in the <code>component.configuration-policy</code> attribute.	Error: Reference source not found
String	<a href="#">deactivate</a> The name of the method to be called when the component is being deactivated as defined in the <code>component.deactivate</code> attribute or <code>null</code> if not explicitly declared.	Error: Reference source not found
boolean	<a href="#">defaultEnabled</a> Whether the component is declared to be enabled by default ( <code>true</code> ) as defined by the <code>component.enabled</code> attribute.	Error: Reference source not found
String	<a href="#">factory</a> The component factory name from <code>component.factory</code> attribute or <code>null</code> if this component is not defined as a component factory.	Error: Reference source not found
long	<a href="#">id</a> The unique ID of this component managed by the Service Component Runtime.	Error: Reference source not found



boolean	<a href="#">immediate</a> Whether the component is an immediate or a delayed component as defined by the <code>component.immediate</code> attribute.	Error: Reference source not found
String	<a href="#">implementationClass</a> The fully qualified name of the class implementing this component from the <code>component/implementation.class</code> attribute.	Error: Reference source not found
String	<a href="#">modified</a> The name of the method to be called when the component's configuration is being updated as defined in the <code>component.modified</code> attribute or <code>null</code> if not declared.	Error: Reference source not found
String	<a href="#">name</a> The name of the component defined in the <code>component.name</code> attribute which may be <code>null</code> .	Error: Reference source not found
Map<String, Object>	<a href="#">properties</a> The declared properties of the component as defined by the <code>component/property</code> and <code>component/properties</code> elements.	Error: Reference source not found
<a href="#">Reference</a> []	<a href="#">references</a> An array of <a href="#">Reference</a> instances representing the service references (or dependencies) of this component as defined in the <code>component/reference</code> elements.	Error: Reference source not found
<a href="#">ServiceScope</a>	<a href="#">scope</a> The service scope for the service of this Component as defined by the <code>service/scope</code> attribute.	Error: Reference source not found
String[]	<a href="#">serviceInterfaces</a> An array of service names provided by this component or <code>null</code> if the component is not registered as a service as defined by the <code>component/service/provide.interface</code> attributes.	Error: Reference source not found

Constructor Summary		Page
<a href="#">ComponentDescription</a> ()		Error: Reference source not found

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

## Field Detail

## name

```
public String name
```

**bundle** The name of the component defined in the `component.name` attribute which may be null.

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

**factory** The bundle declaring this component.

```
public String factory
```

The component factory name from `component.factory` attribute or null if this component is not defined as a component factory.

```
public ServiceScope scope
```

The service scope for the service of this Component as defined by the `service/scope` attribute.

```
public String implementationClass
```

The fully qualified name of the class implementing this component from the `component/implementation.class` attribute.

```
public boolean defaultEnabled
```

Whether the component is declared to be enabled by default (`true`) as defined by the `component.enabled` attribute.

```
public boolean immediate
```

Whether the component is an immediate or a delayed component as defined by the `component.immediate` attribute.

```
public String[] serviceInterfaces
```

An array of service names provided by this component or null if the component is not registered as a service as defined by the `component/service/provide.interface` attributes.

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

The declared properties of the component as defined by the `component/property` and `component/properties` elements.

```
public Reference[] references
```

An array of [Reference](#) instances representing the service references (or dependencies) of this component as defined in the `component/reference` elements.

```
public String activate
```

The name of the method to be called when the component is being activated as defined in the `component.activate` attribute or null if not explicitly declared.

```
public String deactivate
```

The name of the method to be called when the component is being deactivated as defined in the `component.deactivate` attribute or null if not explicitly declared.

```
public String modified
```

The name of the method to be called when the component's configuration is being updated as defined in the `component.modified` attribute or null if not declared.

```
public ConfigurationPolicy configurationPolicy
```

The configuration policy declared in the `component.configuration-policy` attribute. If the component descriptor is a Declarative Services 1.0 descriptor or not configuration policy has been declared, the default value *optional* is returned.

The returned string is one of the three policies defined in the Declarative Services specification 1.1:  
optional

Configuration from the Configuration Admin service is supplied to the component if available. Otherwise the component is activated without Configuration Admin configuration. This is the default value reflecting the behaviour of Declarative Services 1.0

require

Configuration is required. The component remains unsatisfied until configuration is available from the Configuration Admin service.

ignore

Configuration is ignored. No Configuration Admin service configuration is supplied to the component.

```
public String configurationPid
```

The configuration PID to be used for the component in conjunction with Configuration Admin as defined in the `component.configuration-pid` attribute.

```
public long id
```

The unique ID of this component managed by the Service Component Runtime. This value is also available as the `component.id` service registration property of component configurations registered as services.

Constructor Detail

ComponentDescription

public ComponentDescription()

## Class Reference

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

java.lang.Object

└─ org.osgi.dto.DTO

└─ org.osgi.service.component.runtime.Reference

public class Reference

extends org.osgi.dto.DTO

The `Reference` interface represents a single reference (or dependency) to a service used by a Component as declared in the `reference` elements of a Declarative Services descriptor.

Since:

1.3

Version:

\$Id: 44060765b30df744f52a143ed719105722117a8a \$

Field Summary		Page
String	<a href="#">bind</a> The name of the method called if a service is being bound to the component as defined by the <code>reference.bind</code> attribute or <code>null</code> if no such method is declared.	Error: Reference source not found
String	<a href="#">interfaceName</a> The name of the service used by this reference as defined by the <code>reference.interface</code> attribute.	Error: Reference source not found
boolean	<a href="#">multiple</a> Whether this reference is multiple as defined by the upper bound of the <code>reference.cardinality</code> .	Error: Reference source not found
String	<a href="#">name</a> The name of this Reference as defined by the <code>reference.name</code> attribute or <code>null</code> if not declared.	Error: Reference source not found
boolean	<a href="#">optional</a> Whether this reference is optional as defined by the lower bound of the <code>reference.cardinality</code> .	Error: Reference source not found
<a href="#">ReferencePolicy</a>	<a href="#">policy</a> Whether the reference is statically or dynamically bound as defined by the <code>reference.policy</code> attribute.	Error: Reference source not found
<a href="#">ReferencePolicyOption</a>	<a href="#">policyOption</a> Policy of handling of availability of a better service as defined by the <code>reference.policy-option</code> attribute.	Error: Reference source not found
<a href="#">ReferenceScope</a>	<a href="#">scope</a> The requested service scope for this Reference as defined by the <code>reference.scope</code> attribute.	Error: Reference source not found

String	<a href="#">target</a> The value of the target property of this reference as defined by the <code>reference.target</code> attribute or <code>null</code> if not declared.	Error: Reference source not found
String	<a href="#">unbind</a> The name of the method called if a service is being unbound from the component as defined by the <code>reference.unbind</code> attribute or <code>null</code> if no such method is declared.	Error: Reference source not found
String	<a href="#">updated</a> The name of the method called if the bound service service is updated as defined by the <code>reference.updated</code> attribute or <code>null</code> if no such method is declared.	Error: Reference source not found

Constructor Summary	Page
<a href="#">Reference</a> ()	Error: Reference source not found

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

Field Detail

name

public String name	The name of this Reference as defined by the <code>reference.name</code> attribute or <code>null</code> if not declared.
interfaceName	The name of the service used by this reference as defined by the <code>reference.interface</code> attribute.
optional	Whether this reference is optional as defined by the lower bound of the <code>reference.cardinality</code> . In other words this field is set to <code>true</code> if the cardinality is <code>0..1</code> or <code>0..n</code> .
multiple	Whether this reference is multiple as defined by the upper bound of the <code>reference.cardinality</code> . In other words this field is set to <code>true</code> if the cardinality is <code>0..n</code> or <code>1..n</code> .
policy	Whether the reference is statically or dynamically bound as defined by the <code>reference.policy</code> attribute.
policyOption	Policy of handling of availability of a better service as defined by the <code>reference.policy-option</code> attribute.
target	The value of the target property of this reference as defined by the <code>reference.target</code> attribute or <code>null</code> if not declared.
bind	The name of the method called if a service is being bound to the component as defined by the <code>reference.bind</code> attribute or <code>null</code> if no such method is declared.
unbind	The name of the method called if a service is being unbound from the component as defined by the <code>reference.unbind</code> attribute or <code>null</code> if no such method is declared.
updated	The name of the method called if the bound service service is updated as defined by the <code>reference.updated</code> attribute or <code>null</code> if no such method is declared.
scope	

public [ReferenceScope](#) scope  
The requested service scope for this Reference as defined by the `reference.scope` attribute.

## Constructor Detail

### Reference

public Reference()

## Interface ServiceComponentRuntime

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

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 [ComponentDescription](#) and [ComponentConfiguration](#). A [ComponentDescription](#) is the declaration of the component in the Declarative Services descriptor. A [ComponentConfiguration](#) is an actual instance of a declared [ComponentDescription](#) and is backed by an object instance of the [implementation class name declared in the component](#).

Access to this service requires the `ServicePermission[org.osgi.service.component.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

Version:

\$Id: 0cf40154dcc16759a08f7f3391de7ad32c7df87f \$

ThreadSafe

Method Summary		Page
void	<a href="#">disableComponent</a> ( <a href="#">ComponentDescription</a> description) Disables this <code>ComponentDescription</code> if it is enabled.	Error: Reference source not found
void	<a href="#">enableComponent</a> ( <a href="#">ComponentDescription</a> description) Enables this <code>ComponentDescription</code> if it is disabled.	Error: Reference source not found
Collection< <a href="#">ComponentConfiguration</a> >	<a href="#">getComponentConfigurations</a> ( <a href="#">ComponentDescription</a> description) Return a collection of <a href="#">component configurations</a> created for the component description.	Error: Reference source not found
<a href="#">ComponentDescription</a>	<a href="#">getComponentDescription</a> (org.osgi.framework.Bundle bundle, String name) Return the <a href="#">ComponentDescription</a> declared with the given name or null if no such component is declared by the given bundle.	Error: Reference source not found
Collection< <a href="#">ComponentDescription</a> >	<a href="#">getComponentDescriptions</a> (org.osgi.framework.Bundle... bundles) Returns the component descriptions declared by the given bundles or the component descriptions declared by all active bundles if bundles is null.	Error: Reference source not found
boolean	<a href="#">isEnabled</a> ( <a href="#">ComponentDescription</a> description) Whether this component is currently enabled (true) or not.	Error: Reference source not found

## Method Detail

### getComponentDescriptions

```
Collection<ComponentDescription> getComponentDescriptions(org.osgi.framework.Bundle... bundles)
```

Returns the component descriptions declared by the given bundles or the component descriptions declared by all active bundles if `bundles` is `null`. If the bundles have no declared components or the bundles are not active an empty collection is returned.

Parameters:

`bundles` - The bundles whose declared components are to be returned or `null` if the declared components from all active bundles are to be returned.

Returns:

The declared component descriptions of the given (active) `bundles` or the declared component descriptions from all active bundles if `bundle` is `null`. An empty collection is returned if no components are declared by the bundles.

```
getComponentDescription  
ComponentDescription getComponentDescription(org.osgi.framework.Bundle bundle,  
                                              String name)
```

Return the [ComponentDescription](#) declared with the given `name` or `null` if no such component is declared by the given `bundle`.

Parameters:

`bundle` - The bundle declaring the requested component

`name` - The name of the [ComponentDescription](#) to return

Returns:

The named component or `null` if none of the active bundles declare a component with that name.

Throws:

```
getComponentConfigurations  
NullPointerException - if name or bundle is null.
```

```
Collection<ComponentConfiguration> getComponentConfigurations(ComponentDescription description)
```

Return a collection of [component configurations](#) created for the component description. If there are no component configurations currently created, the collection is empty. This collection of configurations represents a snapshot of the current state.

Parameters:

`description` - The component description.

Returns:

The component configurations created for the given component description. An empty collection is returned if there are non.

Throws:

```
isEnabled  
NullPointerException - if description or null.
```

```
boolean isEnabled(ComponentDescription description)
```

Whether this component is currently enabled (`true`) or not.

Initially this follows the `Component.enabled` attribute of the declaration and can be changed by the [enableComponent\(ComponentDescription\)](#) and [disableComponent\(ComponentDescription\)](#) method.

Parameters:

`description` - The component description.

Returns:

The component configurations created for the given component description. An empty collection is returned if there are non.

Throws:

NullPointerException - if `description` or `null`.

See Also:

```
enableComponent  
ComponentDescription.defaultEnabled
```

```
void enableComponent(ComponentDescription description)
```

Enables this `ComponentDescription` if it is disabled. If the `ComponentDescription` is not currently disabled this method has no effect.

Parameters:

`description` - The component description to enable.

Throws:

```
disableComponent  
NullPointerException - if description or is null.
```

```
void disableComponent(ComponentDescription description)
```

Disables this `ComponentDescription` if it is enabled. If the `ComponentDescription` is currently disabled this method has no effect.



Parameters:

`description` - The component description to disable.

Throws:

`NullPointerException` - if `description` or is `null`.

---

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## 8 Considered Alternatives

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### 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.

*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.*

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## 9 Security Considerations

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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.

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## 10 Document Support

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### 10.1 References

- [1]. Bradner, S., Key words for use in RFCs to Indicate Requirement Levels, RFC2119, March 1997.
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## **10.3 Acronyms and Abbreviations**

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## **10.4 End of Document**