# RFC 187 - Complex Repository Requirements

Final

28 Pages

## Abstract

The generic capabilities and requirements model in OSGi provides a powerful constraints-based resource selection model, however the API for this is limited to constraints within a single namespace essentially limiting queries to a single type of information. This RFC aims to provide a technical design for the relevant requirements as stated in RFP 148.

This RFC focuses on generic Requirements in the context of the Repository Service API.

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## 0.3 Feedback

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

## 0.4 Table of Contents

## 0.5 Terminology and Document Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY" and "OPTIONAL" in this document are to be interpreted as described in 1.

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

## 0.6 Revision History

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

| Revision | Date | Comments |
|---|---|---|
| Initial | 09/01/12 | David Bosschaert (Red Hat) initial version |
| 0.2 | November, 2012 | David Bosschaert (Red Hat) incorporate feedback from the Basel F2F |
| 0.3 | December, 2012 | David Bosschaert (Red Hat) feedback from Orlando F2F |
| 0.4 | February, 2013 | David Bosschaert (Red Hat) feedback from Austin F2F |
| 0.5 | April, 2013 | David Bosschaert (Red Hat) add Javadoc |
| Final | 2015-01-30 | Mark final for EG vote. |

# 1 Introduction

The generic capabilities and requirements model in OSGi provides a powerful constraints-based selection model, however the API for selecting resources based on constraints is limited to constraints within a single namespace essentially limiting queries to a single type of information. This RFP 148 describes the uses-cases and requirements that need to be satisfied to allow extending the scope of queries to cover multiple namespaces making it possible to express requirements that cover the widest variety of constraints.

The RFC focuses on generic Requirements in the context of the Repository Service API.

# 2 Application Domain

A company provides a management solution for deployment of artifacts to a target environment. Supported targets are OSGi frameworks as well as other target containers. The management solution uses OSGi generic capabilities to work with remote artifact repositories which can provide the resources to be provisioned and combines the requirements expressed by the user, transitive requirements defined by the deployables along with the requirements of the target platform. Together these combine into complex expressions that place conditions on a number of criteria. Translated into OSGi Capabilities these constraints translate into requirements on a number of different namespaces. Unfortunately the OSGi Repository API does not provide the expressiveness to specify a requirement on more than one namespace at the time.

For the management agent this means that multiple passes need to be performed, one for each namespace involved, every pass narrowing the resulting set by applying the filter applicable to the current namespace on the result of the previous pass. The end result is that the communication between the management agent and the repositories is not as efficient as it could be, pulling down more resources than needed as only part of the requirements was passed to the Repository for selection.

This RFP relates to the following email conversation on the EEG list:

- https://mail.osgi.org/pipermail/eeg/2011-December/008849.html

and this bug in the OSGi bug system:

- https://www.osgi.org/members/bugzilla/show_bug.cgi?id=2208

# 3 Problem Description

The introduction of the generic capabilities and requirements model in OSGi Core 4.3 has opened up some great possibilities. They can be used in a myriad of different deployment scenarios. In cloud scenarios they can be used to place constraints on the environment, to pull in the bundles needed in order to operate in the current environment or to select qualifying nodes or spawn new nodes. In plain OSGi they can be used to provision dependencies and transitive dependencies. They can be used to ensure an extender is present or to enforce that only bundles that have certain corporate-assigned capabilities can be deployed. Additionally, capabilities can be used by tools to provide certain behavior, for example contract-level imports and by extenders to add behavior, as is done by the ServiceLoader Mediator.

The generic capability and requirement metadata is very useful, however the expressiveness of queries on the metadata is limited to one namespace. Queries on this metadata are expressed as a filter on a certain namespace, for example the following declares that a bundle is needed that export package javax.mail of version between 1.4 and 2.0, which is expressed as a query on the osgi.wiring.package namespace:

```
Require-Capability: osgi.wiring.package;
  filter:="(&(osgi.wiring.package=javax.mail)(version>=1.4)(!(version>=2)))";
```

While the LDAP-style querying is quite powerful, it is not possible to express a query that defines a constraint across namespaces. The osgi.identiy namespace defines a license attribute, so the following query specifies that a resource should have the EPL license:

```
Require-Capability: osgi.identity;
  filter:="(license=http://www.opensource.org/licenses/EPL-1.0)"
```

A common requirement would be for a bundle to provide some capability while at the same time it must have a certain license. While it is possible to combine multiple requirements in a single Require-Capability bundle manifest header, requiring all of them, it is not possible to combine expressions on multiple namespaces in a single Requirement object, when this is expected in the API, for example when communicating with a (possibly remote) Repository. Additionally, multiple requirements expressed in a Require-Capability header do not require to be satisfied by a single resource. The license example clearly shows that both the package requirement as well as the license requirement must be satisfied by the same resource,

The OSGi R5 Requirement interface is defined as follows:

```
package org.osgi.resource;
public interface Requirement {
  String getNamespace();
  Map<String, String> getDirectives();
  Map<String, Object> getAttributes();
  Resource getResource();
}
```

The OSGi R5 Repository Service interface is defined as:

```
package org.osgi.service.repository;
public interface Repository {
  Map<Requirement, Collection<Capability>> findProviders(
    Collection<? extends Requirement> requirements);
}
```

Additionally, it is not possible to express an or-relationship across namespaces, neither with the Require-Capability header nor through the Requirement object.

As usage of the generic capabilities and requirements becomes more prevalent making it possible to express complex or composite requirements on capabilities becomes more and more relevant.

In some cases it can already be seen that the namespaces specifications are starting to get 'polluted' by adding attributes such as bundle-symbolic-name and bundle-version to namespaces that really belong on the osgi.wiring.bundle (and osgi.identity) namespaces to other namespaces such as osgi.wiring.package.

# 4 Requirements

CRR001 – The solution MUST allow a Repository lookup for a combined requirement which spans more than one namespace.

CRR002 – The solution MUST allow combining requirements using the *and*, *or* and *not* logical operators to yield a single complex requirement.

CRR003 – A complex requirement SHOULD itself be a requirement which can be used for further combining; i.e. the solution should follow the Composite pattern.

CRR004 – The solution SHOULD provide a convenient mechanism to construct requirements and complex requirements.

# 5 Technical Solution

The technical solution proposes to extend the Repository Service API with a findResources method taking a `RequirementExpression` object. Additionally the repository now provides a builder to make it easy to create `Requirement`s through a RequirementBuilder and `RequirementExpression` objects via an ExpressionCombiner.

```
public interface Repository {
  Map<Requirement, Collection<Capability>>
    findProviders(Collection<? extends Requirement> requirements);

  Collection<Resource> findProviders(RequirementExpression requirementExpression);

  ExpressionCombiner getExpressionCombiner();

  RequirementBuilder newRequirementBuilder(String namespace);
}
```

As a RequirementExpression is not always mappable to a concise set of capabilities (for example, consider 'not' requirements) the `findProviders(RequirementExpression re)` method returns a collection of matching `Resource`s.

A single RequirementExpression can hold a combination of requirements combined with And, Or or Not operators. A convenience API to construct such requirements is provided through a ExpressionCombiner which can be obtained from the Repository service. Example usage:

```
  Repository repo = ...; // from Service Registry
```

```
  Requirement req1 = repo.newRequirementBuilder("ns1").
    addDirective("filter", "(org.foo.ns1=val1)").
    addDirective("cardinality", "multiple").build();

  Map<String, String> dirs = new HashMap<String, String>();
  dirs.put("filter", "(org.door.ns2=val2)");
  Requirement req2 = repo.newRequirementBuilder("ns2").
    setDirectives(dirs).build();

  Requirement req3 = repo.newRequirementBuilder("ns3").build();

  ExpressionCombiner expCombiner = repo.getExpressionCombiner();
  RequirementExpression re = expCombiner.or(
    expCombiner.not(expCombiner.and(req1, req2)),
    expCombiner.expression(req3));

   System.out.println("Using requirement expression:");
   printExpression(re);

  Collection<Resource> result = repo.findResources(re);
```

The RequirementBuilder provides a builder-style API to create Requirement objects.

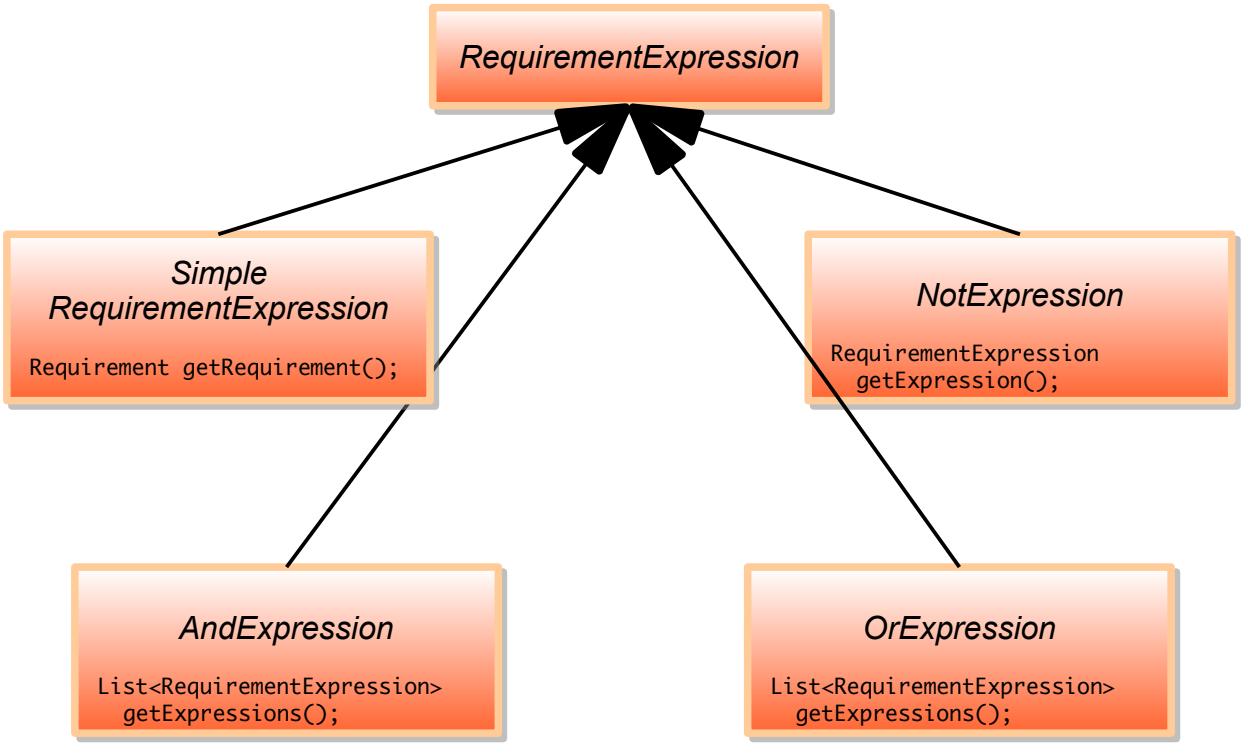
Once all the information is provided to the builder, the desired immutable Requirement object can be obtained by calling the build() method:

```
public interface RequirementBuilder {
  // Add an attribute or directive to the Requirement object
  RequirementBuilder addAttribute(String name, Object value);
  RequirementBuilder addDirective(String name, String value);

  // Replace the attributes or directives with the provided map
  RequirementBuilder setAttributes(Map<String, Object> attrs);
  RequirementBuilder setDirectives(Map<String, String> dirs);

  Requirement build();
}
```

The ExpressionCombiner provides a simple API to create RequirementExpression objects. A number of Requirement or RequirementExpression objects can be combined using and, or and not operators. The result is always a RequirementExpression object which can be further combined. To facilitate combining a Requirement and a RequirementExpression together, a Requirement can be converted to a RequirementExpression using the expression() method.

```
public interface ExpressionCombiner {
  RequirementExpression and(Requirement... reqs);
  RequirementExpression and(RequirementExpression... reqs);
  RequirementExpression expression(Requirement req);
  RequirementExpression not(Requirement req);
  RequirementExpression not(RequirementExpression req);
  RequirementExpression or(Requirement... reqs);
  RequirementExpression or(RequirementExpression... reqs);
}
```

The RequirementExpression interface hierarchy is as follows:




The interface hierarchy represents a number of holder interfaces that each can hold one or more RequirementExpression objects. The SimpleRequirementExpression can hold and existing org.osgi.resource.Requirement object, allowing it to be represented as a RequirementExpression without the need for modification.

As shown in the example above, RequirementExpression follows the Composite pattern which means that RequirementExpressions themselves can also be used as elements of the operations. It allows nesting.

The RequirementExpression hierarchy is quite simple and can easily be transformed into other representations, making it easy to be sent across the network, given that a Repository is often a remote entity. Note that the interfaces do not implement the java.io.Serializable interface as Java Object Serialization is not expected to be the primary means of remotely serializing these objects. The contents of the Requirement and RequirementExpression objects can be inspected using their APIs and converted in the serialization technology of choice, if needed.

On the receiving side, a RequirementExpression can relatively easily be unwound and processed, the following example shows some code that unwinds a RequirementExpression and creates a string representation of it:

```
private static String printExpression(RequirementExpression req) {
  if (req instanceof SimpleRequirementExpression) {
    return ((SimpleRequirementExpression)req).getRequirement().toString();
  } else if (req instanceof NotExpression) {
```

```
    return "not" + printExpression(((NotExpression) req).getExpression()) + "";
  } else if (req instanceof AndExpression) {
    StringBuilder sb = new StringBuilder();
    AndExpression and = (AndExpressions) req;
    for (int i = 0; i < and.getExpressions().size(); i++) {
      if (i > 0) sb.append(" and ");
      sb.append(printExpression(and.getExpressions().get(i)));
    }
    return "(" + sb.toString() + ")";
  } else if (req instanceof OrExpression) {
    StringBuilder sb = new StringBuilder();
    OrExpression or = (OrExpression) req;
    for (int i = 0; i < or.getExpressions().size(); i++) {
      if (i > 0) sb.append(" or ");
      sb.append(printExpression(or.getExpressions().get(i)));
    }
    return "(" + sb.toString() + ")";
  }
  throw new IllegalStateException();
}
```

Given the above example input, the printRequirements outputs the following string:

```
(not(ns1 and ns2) or ns3)
```

## 5.1 Notes

The design in this chapter does not address the following cases:

- The technical solution provides an enhancement to the Repository API, however similar issues exist with OSGi Require-Capability bundle manifest headers. The current proposal does not cover this.

# 6 Data Transfer Objects

The OSGi Repository spec 1.0 does not yet define Data Transfer Objects. This addition to the Repository spec does not introduce Data Transfer Objects.

# 7 Javadoc

# OSGi Javadoc

4/19/13 1:11 PM

| Package Summary | | Page |
|---|---|---|
| org.osgi.service.repository | Repository Service Package Version 1.0. | 12 |

# Package org.osgi.service.repository

Repository Service Package Version 1.0.

**See:**
[Description](#)

| Interface Summary | | Page |
|---|---|---|
| ***AndExpression*** | A `RequirementExpression` representing multiple requirements combined together using the `and` operator. | *13* |
| ***ExpressionCombiner*** | An `ExpressionCombiner` can be used to combine multiple requirements into a single complex requirement using the `and`, `or` and `not` operators. | *16* |
| ***NotExpression*** | A `RequirementExpression` representing the negative of a requirement, the `not` operator. | *19* |
| ***OrExpression*** | A `RequirementExpression` representing multiple requirements combined together using the `or` operator. | *20* |
| ***Repository*** | A repository service that contains `resources`. | *21* |
| ***RepositoryContent*** | An accessor for the default content of a resource. | *23* |
| ***RequirementBuilder*** | A builder for `Requirement` objects. | *24* |
| ***RequirementExpression*** | The base interface of all Requirement Expressions. | *26* |
| ***SimpleRequirementExpression*** | A wrapper to represent a simple `org.osgi.resource.Requirement` object as a `RequirementExpression`. | *27* |

| Class Summary | | Page |
|---|---|---|
| **ContentNamespace** | Content Capability and Requirement Namespace. | *14* |

# Package org.osgi.service.repository Description

Repository Service Package Version 1.0.

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.repository; version="[1.1,2.0)"
```

Example import for providers implementing the API in this package:

```
Import-Package: org.osgi.service.repository; version="[1.1,1.2)"
```

# Interface AndExpression

**org.osgi.service.repository**

**All Superinterfaces:**
RequirementExpression

---

```
public interface AndExpression
extends RequirementExpression
```

A `RequirementExpression` representing multiple requirements combined together using the `and` operator.

**ThreadSafe**

---

| Method Summary | | Page |
|---|---|---|
| List<RequirementExpression> | **getRequirements**()<br>Obtain the requirements that are combined using the `and` operator. | 13 |

## Method Detail

### getRequirements

```
List<RequirementExpression> getRequirements()
```

Obtain the requirements that are combined using the `and` operator.

**Returns:**
The requirements, represented as `RequirementExpression` objects.

# Class ContentNamespace

org.osgi.service.repository

```
java.lang.Object
  └org.osgi.resource.Namespace
      └org.osgi.service.repository.ContentNamespace
```

---

```
final public class ContentNamespace
extends org.osgi.resource.Namespace
```

Content Capability and Requirement Namespace.

This class defines the names for the attributes and directives for this namespace. All unspecified capability attributes are of type `String` and are used as arbitrary matching attributes for the capability. The values associated with the specified directive and attribute keys are of type `String`, unless otherwise indicated.

**Immutable**

---

| Field Summary | | Page |
|---|---|---|
| static String | **CAPABILITY_MIME_ATTRIBUTE**<br>The capability attribute that defines the IANA MIME Type/Format for this content. | 15 |
| static String | **CAPABILITY_SIZE_ATTRIBUTE**<br>The capability attribute that contains the size, in bytes, of the content. | 15 |
| static String | **CAPABILITY_URL_ATTRIBUTE**<br>The capability attribute that contains the URL to the content. | 14 |
| static String | **CONTENT_NAMESPACE**<br>Namespace name for content capabilities and requirements. | 14 |

| Fields inherited from class org.osgi.resource.Namespace |
|---|
| CAPABILITY_EFFECTIVE_DIRECTIVE, CAPABILITY_USES_DIRECTIVE, CARDINALITY_MULTIPLE, CARDINALITY_SINGLE, EFFECTIVE_ACTIVE, EFFECTIVE_RESOLVE, REQUIREMENT_CARDINALITY_DIRECTIVE, REQUIREMENT_EFFECTIVE_DIRECTIVE, REQUIREMENT_FILTER_DIRECTIVE, REQUIREMENT_RESOLUTION_DIRECTIVE, RESOLUTION_MANDATORY, RESOLUTION_OPTIONAL |

## Field Detail

### CONTENT_NAMESPACE

```
public static final String CONTENT_NAMESPACE = "osgi.content"
```

Namespace name for content capabilities and requirements.

Also, the capability attribute used to specify the unique identifier of the content. This identifier is the `SHA-256` hash of the content.

---

### CAPABILITY_URL_ATTRIBUTE

```
public static final String CAPABILITY_URL_ATTRIBUTE = "url"
```

The capability attribute that contains the URL to the content.

---

## CAPABILITY_SIZE_ATTRIBUTE

```
public static final String CAPABILITY_SIZE_ATTRIBUTE = "size"
```

The capability attribute that contains the size, in bytes, of the content. The value of this attribute must be of type `Long`.

---

## CAPABILITY_MIME_ATTRIBUTE

```
public static final String CAPABILITY_MIME_ATTRIBUTE = "mime"
```

The capability attribute that defines the IANA MIME Type/Format for this content.

# Interface ExpressionCombiner

org.osgi.service.repository

---

`public interface` **`ExpressionCombiner`**

An `ExpressionCombiner` can be used to combine multiple requirements into a single complex requirement using the `and`, `or` and `not` operators.

---

| Method Summary | | Page |
|---|---|---|
| RequirementExpression | **and**(org.osgi.resource.Requirement... reqs)<br>Combine multiple `org.osgi.resource.Requirement` objects into a single expression using the `and` operator. | 16 |
| RequirementExpression | **and**(RequirementExpression... reqs)<br>Combine multiple `RequirementExpression` objects into a single expression using the `and` operator. | 16 |
| RequirementExpression | **expression**(org.osgi.resource.Requirement req)<br>Convert a `org.osgi.resource.Requirement` into a `RequirementExpression`. | 17 |
| RequirementExpression | **not**(org.osgi.resource.Requirement req)<br>Provide the negative of a `org.osgi.resource.Requirement`. | 17 |
| RequirementExpression | **not**(RequirementExpression req)<br>Provide the negative of a `RequirementExpression`. | 17 |
| RequirementExpression | **or**(org.osgi.resource.Requirement... reqs)<br>Combine multiple `org.osgi.resource.Requirement` objects into a single expression using the `or` operator. | 17 |
| RequirementExpression | **or**(RequirementExpression... reqs)<br>Combine multiple `RequirementExpression` objects into a single expression using the `or` operator. | 17 |

## Method Detail

### and

`RequirementExpression` **`and`**`(org.osgi.resource.Requirement... reqs)`

Combine multiple `org.osgi.resource.Requirement` objects into a single expression using the `and` operator.

**Parameters:**
`reqs` - The requirements to combine.
**Returns:**
A `RequirementExpression` representing the combined requirements.

---

### and

`RequirementExpression` **`and`**`(RequirementExpression... reqs)`

Combine multiple `RequirementExpression` objects into a single expression using the `and` operator.

**Parameters:**
`reqs` - The requirements to combine.
**Returns:**
A `RequirementExpression` representing the combined requirements.

## expression

RequirementExpression **expression**(org.osgi.resource.Requirement req)

Convert a org.osgi.resource.Requirement into a RequirementExpression. This can be useful when working with a combination of Requirement and RequirementExpresion objects.

**Parameters:**
req - The requirement to convert.
**Returns:**
A RequirementExpression representing the requirement.

## not

RequirementExpression **not**(org.osgi.resource.Requirement req)

Provide the negative of a org.osgi.resource.Requirement.

**Parameters:**
req - The requirement to provide the negative of.
**Returns:**
A RequirementExpression representing the negative of the requirement.

## not

RequirementExpression **not**(RequirementExpression req)

Provide the negative of a RequirementExpression.

**Parameters:**
req - The requirement to provide the negative of.
**Returns:**
A RequirementExpression representing the negative of the requirement.

## or

RequirementExpression **or**(org.osgi.resource.Requirement... reqs)

Combine multiple org.osgi.resource.Requirement objects into a single expression using the or operator.

**Parameters:**
reqs - The requirements to combine.
**Returns:**
A RequirementExpression representing the combined requirements.

## or

RequirementExpression **or**(RequirementExpression... reqs)

Combine multiple RequirementExpression objects into a single expression using the or operator.

**Parameters:**
reqs - The requirements to combine.

**Returns:**

A RequirementExpression representing the combined requirements.

# Interface NotExpression

**org.osgi.service.repository**

**All Superinterfaces:**
RequirementExpression

---

```
public interface NotExpression
extends RequirementExpression
```

A `RequirementExpression` representing the negative of a requirement, the `not` operator.

**ThreadSafe**

---

| Method Summary | Page |
|---|---|
| RequirementExpression | **getRequirement**()<br>Obtain the requirement that is negated. | 19 |

## Method Detail

### getRequirement

`RequirementExpression` **getRequirement**()

Obtain the requirement that is negated.

**Returns:**
The requirement, represented as `RequirementExpression`.

# Interface OrExpression

org.osgi.service.repository

**All Superinterfaces:**
RequirementExpression

---

```
public interface OrExpression
extends RequirementExpression
```

A RequirementExpression representing multiple requirements combined together using the or operator.

**ThreadSafe**

---

| Method Summary | | Page |
|---|---|---|
| List<RequirementExpression> | **getRequirements**()<br>Obtain the requirements that are combined using the or operator. | 20 |

## Method Detail

### getRequirements

```
List<RequirementExpression> getRequirements()
```

Obtain the requirements that are combined using the or operator.

**Returns:**
The requirements, represented as RequirementExpression objects.

# Interface Repository

org.osgi.service.repository

---

```
public interface Repository
```

A repository service that contains `resources`.

Repositories may be registered as services and may be used as by a resolve context during resolver operations.

Repositories registered as services may be filtered using standard service properties.

**ThreadSafe**

---

| Field Summary | | Page |
|---|---|---|
| String | **URL**<br>Service property to provide URLs related to this repository. | 21 |

| Method Summary | | Page |
|---|---|---|
| Map<org.osgi.resource.Requirement,Collection<org.osgi.resource.Capability>> | **findProviders**(Collection<? extends org.osgi.resource.Requirement> requirements)<br>Find the capabilities that match the specified requirements. | 21 |
| Collection<org.osgi.resource.Resource> | **findProviders**(RequirementExpression requirementExpression)<br>Find the resources that match the specified `RequirementExpression` | 22 |
| ExpressionCombiner | **getExpressionCombiner**()<br>Obtain an `ExpressionCombiner` implementation. | 22 |
| RequirementBuilder | **newRequirementBuilder**(String namespace)<br>Obtain a `RequirementBuilder` implementation which provides a convenient way to create a requirement. | 22 |

## Field Detail

### URL

```
public static final String URL = "repository.url"
```

Service property to provide URLs related to this repository.

The value of this property must be of type `String`, `String[]`, or `Collection<String>`.

## Method Detail

### findProviders

```
Map<org.osgi.resource.Requirement,Collection<org.osgi.resource.Capability>> findProviders(Collection<? extends org.osgi.resource.Requirement> requirements)
```

Find the capabilities that match the specified requirements.

**Parameters:**
`requirements` - The requirements for which matching capabilities should be returned. Must not be `null`.
**Returns:**
A map of matching capabilities for the specified requirements. Each specified requirement must appear as a key in the map. If there are no matching capabilities for a specified requirement, then the value in the map for the specified requirement must be an empty collection. The returned map is the property of the caller and can be modified by the caller.

---

## findProviders

`Collection<org.osgi.resource.Resource>` **`findProviders`**`(RequirementExpression requirementExpression)`

Find the resources that match the specified `RequirementExpression`

**Parameters:**
`requirementExpression` - The `RequirementExpression` for which matching capabilities should be returned. Must not be `null` .
**Returns:**
A collection of matching `Resource`s. If there are no matching resources, an empty collection is returned.

---

## getExpressionCombiner

`ExpressionCombiner` **`getExpressionCombiner`**`()`

Obtain an `ExpressionCombiner` implementation. This can be used to combine multiple requirements into a complex requirement using `and`, `or` and `not` operators.

**Returns:**
An `ExpressionCombiner`.

---

## newRequirementBuilder

`RequirementBuilder` **`newRequirementBuilder`**`(String namespace)`

Obtain a `RequirementBuilder` implementation which provides a convenient way to create a requirement. For example:

```
Requirement myReq = .newRequirementBuilder("org.foo.ns1").
   addDirective("filter", "(org.foo.ns1=val1)").
   addDirective("cardinality", "multiple").build();
```

**Parameters:**
`namespace` - The namespace for the requirement to be constructed.
**Returns:**
A requirement builder for a requirement in the given namespace.

# Interface RepositoryContent

org.osgi.service.repository

---

```
public interface RepositoryContent
```

An accessor for the default content of a resource. All `org.osgi.resource.Resource` objects which represent resources in a `Repository` must implement this interface. A user of the resource can then cast the `org.osgi.resource.Resource` object to this type and then obtain an `InputStream` to the default content of the resource.

**ThreadSafe**

---

| Method Summary | | Page |
|---|---|---|
| InputStream | **getContent**()<br>Returns a new input stream to the default format of this resource. | 23 |

## Method Detail

### getContent

```
InputStream getContent()
```

Returns a new input stream to the default format of this resource.

**Returns:**
A new input stream for associated resource.

# Interface RequirementBuilder

org.osgi.service.repository

public interface **RequirementBuilder**

A builder for `Requirement` objects.

| Method Summary | | Page |
|---|---|---|
| RequirementBuilder | **addAttribute**(String name, Object value)<br>Add an attribute to the requirement. | 24 |
| RequirementBuilder | **addDirective**(String name, String value)<br>Add a directive to the requirement. | 24 |
| org.osgi.resource.Requirement | **build**()<br>Build the requirement according to the specification provided to the builder. | 25 |
| RequirementBuilder | **setAttributes**(Map<String,Object> attrs)<br>Set all the attributes to the values in the provided map. | 24 |
| RequirementBuilder | **setDirectives**(Map<String,String> dirs)<br>Set all the directives to the values in the provided map. | 25 |
| RequirementBuilder | **setResource**(org.osgi.resource.Resource resource)<br>Specifies the `Resource` object for the requirement. | 25 |

## Method Detail

### addAttribute

RequirementBuilder **addAttribute**(String name,
Object value)

Add an attribute to the requirement.

**Parameters:**
`name` - The attribute name.
`value` - The attribute value.
**Returns:**
a builder object that can be used to further define the requirement.

### addDirective

RequirementBuilder **addDirective**(String name,
String value)

Add a directive to the requirement.

**Parameters:**
`name` - The directive name.
`value` - The directive value.
**Returns:**
a builder object that can be used to further define the requirement.

### setAttributes

RequirementBuilder **setAttributes**(Map<String,Object> attrs)

Set all the attributes to the values in the provided map. This will replace any previous attribute set on the builder.

**Parameters:**
`attrs` - The map of attributes to use.
**Returns:**
a builder object that can be used to further define the requirement.

---

## setDirectives

`RequirementBuilder` **`setDirectives`**`(Map<String,String> dirs)`

Set all the directives to the values in the provided map. This will replace any previous directives set on the builder.

**Parameters:**
`dirs` - The map of directives to use.
**Returns:**
a builder object that can be used to further define the requirement.

---

## setResource

`RequirementBuilder` **`setResource`**`(org.osgi.resource.Resource resource)`

Specifies the `Resource` object for the requirement. Note that providing a resource is optional.

**Parameters:**
`resource` - The resource for the requirement. Will overwrite any previous resource if provided.
**Returns:**
a builder object that can be used to further define the requirement.

---

## build

`org.osgi.resource.Requirement` **`build`**`()`

Build the requirement according to the specification provided to the builder.

**Returns:**
the requirement.

# Interface RequirementExpression

**org.osgi.service.repository**

**All Known Subinterfaces:**
AndExpression, NotExpression, OrExpression, SimpleRequirementExpression

---

```
public interface RequirementExpression
```

The base interface of all Requirement Expressions. Requirement Expression objects will always be of one of its sub-interfaces.

**ThreadSafe**

# Interface SimpleRequirementExpression

org.osgi.service.repository

**All Superinterfaces:**
RequirementExpression

---

```
public interface SimpleRequirementExpression
extends RequirementExpression
```

A wrapper to represent a simple `org.osgi.resource.Requirement` object as a `RequirementExpression`.

**ThreadSafe**

---

| Method Summary | Page |
|---|---|
| `org.osgi.resource.Requirement` | **`getRequirement`**`()` Obtain the wrapped `org.osgi.resource.Requirement` object. | *27* |

## Method Detail

### getRequirement

```
org.osgi.resource.Requirement getRequirement()
```

Obtain the wrapped `org.osgi.resource.Requirement` object.

**Returns:**
The wrapped object.



# 8 Considered Alternatives

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

# 9 Security Considerations

No change from the OSGi Repository 1.0 specification.

# 10 Document Support

## 10.1 References

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

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

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## 10.3 Acronyms and Abbreviations

## 10.4 End of Document