RFC 185 Data Transfer Objects

Final

43 Pages

Abstract

Define a set of data-only objects to represent runtime objects. The types will have limited behavior to support easy serialization and use by management agents to communicate with external systems.

0 Document Information

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0.3 Feedback

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

0.4 Table of Contents

0.5 Terminology and Document Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY" and "OPTIONAL" in this document are to be interpreted as described in 9.1.

```
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	9 Jun 2012	Initial draft.
2nd draft	13 Jun 2012	Updated after CPEG f2f in NYC
3rd draft	11 Sep 2012	Added new DTOs to complete the DTOs for the Core framework.
4th draft	24 Oct 2012	Updated based upon comments from Basel F2F.
5th draft	29 Oct 2012	Updated based upon comments from 25 Oct 2012 CPEG call.
6th draft	5 Nov 2012	David Bosschaert (Red Hat) adding JMX section.
7th draft	9 Nov 2012	Updates from 6 Nov Orlando F2F.
8th draft	5 Dec 2012	Updates for bugs 2474 (toString) and 2475 (List, Set and Map). DTO is now an abstract class with toString behavior. Serializable is also removed since it cannot be supported in the base class alone. See bug 2475.

Revision	Date	Comments
9th draft	12 Dec 2012	While implementing, it became clear that FrameworkDTO needed to be adapted from the system bundle (instead of any bundle). This because a bundle context is needed to get services. Random bundles may not have valid contexts. Also there is the issue of hooks filtering services and bundles. Limiting this to the system bundles simplifies things and ensure the same DTO view rather than an empty or filtered one. Javadoc also updated to indicate that some adaptations don't apply after the bundle is uninstalled.
Final	26 Feb 2013	Marked Final.

1 Introduction

The OSGi API is rich and introspective. Since the API has a lot of behavior and is not designed for serialization, each management model must design its own representation of the relevant OSGi objects for transport to the remote management system. We see this in JMX, DMT and also in REST. Having standard, simple, easy to serialize and deserialize objects which represent the relevant OSGi object will make it easier for the management model to keep up with changes in the OSGi API.

2 Application Domain

While OSGi has a rich API for local management of bundles, services, etc., each management model must define how this OSGi objects are represented for communication with remote management systems. JMX must define the Mbeans, DMT must define the tree representation, REST must define the request/response payload.

The OSGi API continues to evolve and at each update of the OSGi API, the management systems will all need to update their representation of the OSGi objects.

3 Problem Description

Since each management model defines its own representation of the OSGi objects, each management model specification will need to be updated whenever some new feature is added to the OSGi API. A common, shared representation will reduce the effort needed by each management model specification to track changes the OSGi API.

4 Requirements

DTO-0001 – DTOs must be easily serializable. That is, no special serialization/deserialization logic must be required. Serialization must be possible simply by introspecting the DTO objects.

DTO-0002 – DTOs must have no behavior. That is, no methods other than the default public constructor.

DTO-0003 – DTOs must have only public fields.

DTO-0004 – The types of the fields in a DTO must be one of:

- primitive numerical types or their wrapper classes (e.g. int, Long)
- boolean or Boolean
- String
- a DTO
- Arrays
- Lists
- Sets
- Maps

No other types are permitted. The aggregates (arrays, Lists, Sets and Maps) may only contain any of the allowed types including aggregates.

DTO-0005 – A DTO may extend another DTO.

DTO-0006 – A mechanism must be provided to create DTO objects for the real objects they represent.

5 Technical Solution

There are two main parts to Data Transfer Objects: the design of the data structures and how to obtain instances of the data structures from the framework or other OSGi service.

5.1 Data Transfer Object Design

A Data Transfer Object [3]. is used to capture the state of a related object in a form suitable for easy transfer to some receiver. The receiver can be in the same JVM but is more likely in another process or on another system that is remote.

All DTOs are easily serializable having only public fields of primitive types and their wrapper classes, Strings, and DTOs. List, Set, Map and array aggregates may also be used. The aggregates must only hold objects of the listed types or aggregates. All DTOs must extend the `org.osgi.dto.DTO` abstract base class. DTOs are public classes with no methods (other than the compiler supplied default constructor) having only public fields limited to the easily serializable types mentioned above.

The `org.osgi.dto` package defines the basic rules and base DTO type which is extended by other DTOs.

5.1.1 DTO Naming Conventions

DTOs should follow a naming convention for the package containing the DTO as well as the DTO type.

For the package name, DTOs should be in a package that starts with `org.osgi.dto` [In our build, these packages are all part of the org.osgi.dto project] and finishes with the remainder of the package name containing the type for which the DTO provides state after removing the leading `org.osgi`. So for a DTO for a type in the `org.osgi.service.foo` package, the proper DTO package name is `org.osgi.dto.service.foo`. In other words, the segment "`dto`" is inserted right after `org.osgi`.

The name of the DTO type should be the name of the type for which the DTO provides a snapshot of the state followed by "DTO". So for a type `Widget`, the DTO for that type should be `WidgetDTO`. Sometime the entity for which the DTO provides state is not represented by a type; for example, Framework. In this case, the name of entity with a DTO suffix should be used: `FrameworkDTO`.

Putting both the package and type DTO naming conventions together: The DTO for `org.osgi.service.foo.Widget` would be `org.osgi.dto.service.foo.WidgetDTO`.

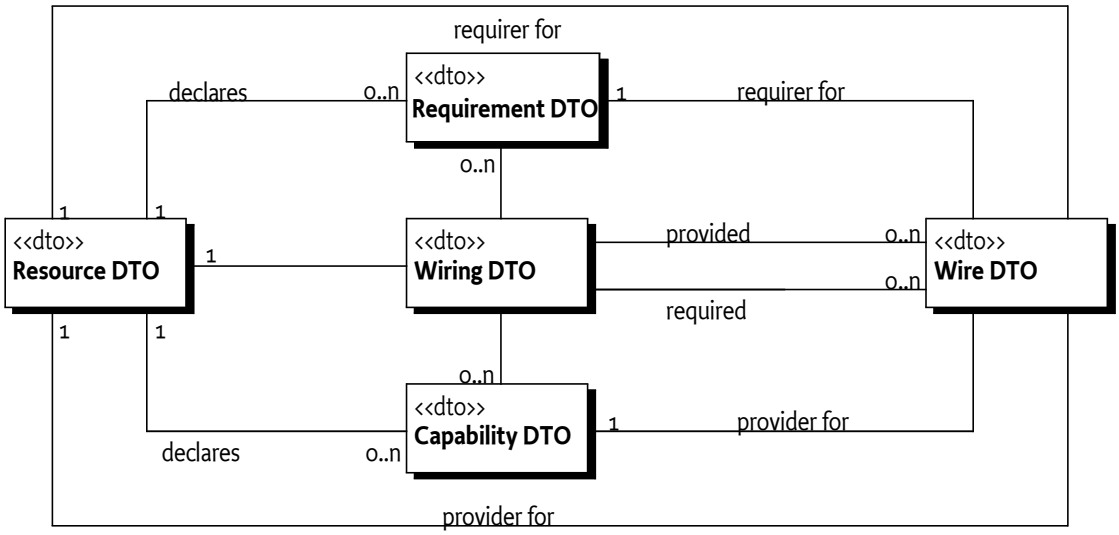
5.1.2 Core DTOs

DTOs are defined for the key framework objects: Bundle, "framework", ServiceReference, resource types, startlevel types and wiring types.

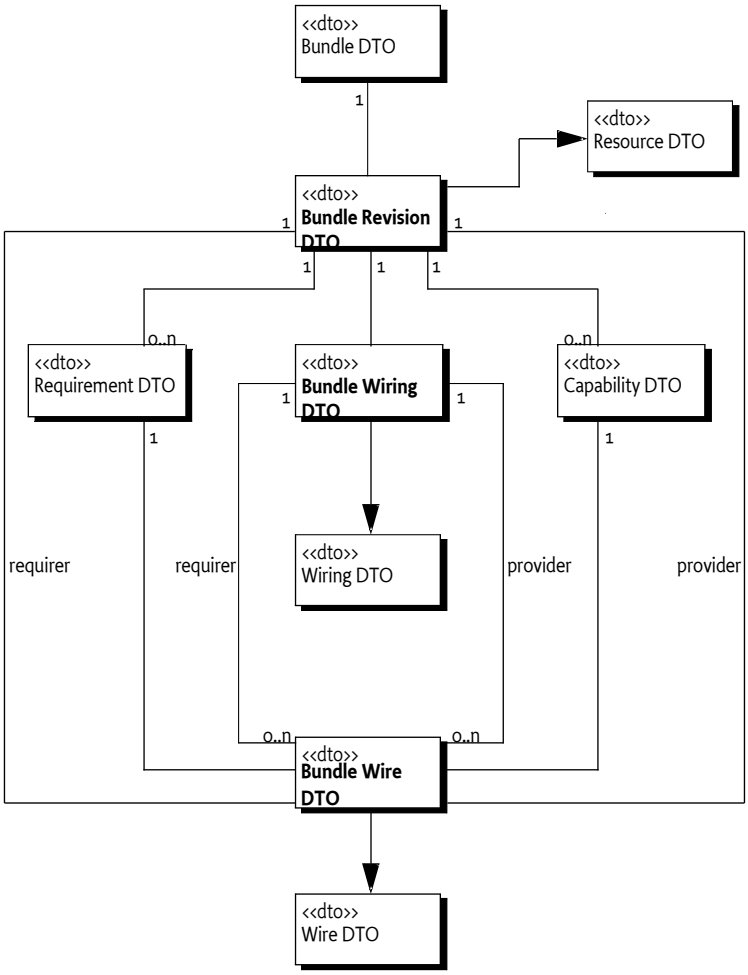
BundleDTO provides information about a single bundle. FrameworkDTO provides the list of installed bundles, the registered services and the launch properties of a single framework. ServiceReferenceDTO provides, for a single service, the service properties, the bundle which registered the service and the bundles using the service.

BundleStartLevelDTO provides the start level information about a single bundle. FrameworkStartLevelDTO provides the start level information about a single framework.

CapabilityDTO, RequirementDTO, ResourceDTO, WiringDTO and WireDTO provide the resource package equivalent view of capabilities and requirements wiring information. The following figure shows the relationship between the DTO types.



BundleRevisionDTO, BundleWiringDTO, BundleWireDTO provide the wiring package equivalent view of capabilities and requirements wiring information. The following figure shows the relationship between the DTO types.



BundleRevisionsDTO and BundleWiringsDTO provide access to the history of revisions and wirings for a single bundle.

5.2 Obtaining Data Transfer Objects

5.2.1 Core DTOs

The framework must supply DTO objects via Bundle.adapt.

An installed Bundle object can be adapted to: BundleDTO, ServiceReferenceDTO[], BundleStartLevelDTO, BundleRevisionDTO, BundleRevisionsDTO, BundleWiringDTO, and BundleWiringsDTO. The System Bundle object can be adapted to: FrameworkDTO and FrameworkStartLevelDTO.

A FrameworkDTO object can be used to obtain all the BundleDTOs and ServiceReferenceDTOs for installed bundles and registered services.

For example:

```
// DTO for the bundle
BundleDTO bundleDTO = bundle.adapt(BundleDTO.class);

// DTO for the current bundle wiring
BundleWiringDTO bundleWiringDTO = bundle.adapt(BundleWiringDTO.class);

// DTO for the current bundle revision
BundleRevisionDTO bundleRevisionDTO = bundle.adapt(BundleRevisionDTO.class);
```

5.3 Examples of DTO usage

5.3.1 REST

RFC 182 defines a REST interface to the OSGi framework. The DTO objects defined in this RFC can be used to create the representations for the REST interfaces.

A REST request to get the bundle information for bundle 1 (GET framework/bundle/1) can obtain the representation information using the BundleDTO.

```
long id = getBundleIdFromURI(requestURI);
BundleDTO bundleDTO = getContext().getBundle(id).adapt(BundleDTO.class);
String response = jsonSerializer(bundleDTO); // serialize to JSON (or XML)
```

5.3.2 JMX

The JMX spec defines a JMX interface to the OSGi framework. The DTO objects defined in this RFC can be used to obtain state information to be used by the JMX MBeans.

To expose the Framework DTOs a new JMX MBean needs to be defined that provides access to these DTOs. For example:

```
public interface FrameworkMBean {
    CompositeData[] getBundles();
    CompositeData getBundle(long id);
    CompositeData[] getServices();
    // … etc …
}
```

Instead of the plain DTO object, JMX-OpenBean versions of the objects are provided through this API. This means that Open Type supported simple types (as defined in javax.management.openmbean.OpenType.ALLOWED_CLASSNAMES_LIST) can be used as-is, but embedded DTOs and maps need to be transformed into JMX structures, as listed in the following table:

DTO data type	***JMX data type***
simple type (as supported by JMX Open Types)	javax.management.openmbean.SimpleType constant
Map	TabularType
custom DTO	CompositeType

custom DTO []	CompositeType[]

Given a certain DTO, a fairly straightforward generic transformation can be defined to produce JMX friendly data structures, this can be achieved by introspecting the DTOs using Java reflection and generating CompositeType definitions and CompositeData objects from them. Composite types and Tabulary types support nesting so nested DTOs can be supported.

Non-framework DTOs

For DTOs that provide information regarding an Enterprise, Residential or other Compendium specification, root MBeans will still be necessary in the MBean registry, however these MBeans can simply provide access to JMX views over the relevant DTOs which can be automatically produced from the DTO definition.

Modifying the Framework state

The DTOs don't provide a mechanism to change the state of the framework (or any other component) so in order to support this, specific APIs still need to be provided by the JMX MBeans.

Maintenance

Using DTOs will significantly reduce the maintenance required to provide viewing capabilities into the framework and into other components that expose themselves as DTOs, as the DTO definitions can be used to generate JMX OpenBeans suitable for a JMX management agent.

Maintenance is still needed for APIs that alter the framework state.

5.3.3 Residential DMT

The Residential DMT spec defines a Device Management Tree (DMT) interface to the OSGi framework. The DTO objects defined in this RFC can be used to obtain state information to be used to populate information in the Residential DMT.

```
// $/Framework/StartLevel node value

FrameworkStartLevelDTO fslDTO =
getContext().getBundle(0).adapt(FrameworkStartLevelDTO.class);
return new DmtData(FrameworkStartLevelDTO.startLevel);
```

6 Javadoc

OSGi Javadoc
2/26/13 11:06 PM

Package Summary		Page
org.osgi.dto	OSGi Data Transfer Object Package Version 1.0.	Error: Reference source not found
org.osgi.dto.framework	OSGi Data Transfer Object Framework Package Version 1.8.	Error: Reference source not found
org.osgi.dto.framework.startlevel	OSGi Data Transfer Object Framework Start Level Package Version 1.0.	Error: Reference source not found
org.osgi.dto.framework.wiring	OSGi Data Transfer Object Framework Wiring Package Version 1.1.	Error: Reference source not found
org.osgi.dto.resource	OSGi Data Transfer Object Resource Package Version 1.0.	Error: Reference source not found

Package org.osgi.dto

OSGi Data Transfer Object Package Version 1.0.

See:
Description

Class Summary		Page
DTO	Super type for Data Transfer Objects.	Error: Reference source not found

Package org.osgi.dto Description
OSGi Data Transfer Object 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.dto; version="[1.0,2.0)"
```

Example import for providers implementing the API in this package:

```
Import-Package: org.osgi.dto; version="[1.0,1.1)"
```

Class DTO
org.osgi.dto
java.lang.Object
  └ org.osgi.dto.DTO

Direct Known Subclasses:

BundleDTO, BundleRevisionsDTO, BundleStartLevelDTO, BundleWiringsDTO, CapabilityDTO, FrameworkDTO, FrameworkStartLevelDTO, RequirementDTO, ResourceDTO, ServiceReferenceDTO, WireDTO, WiringDTO

```
abstract public class DTO
extends Object
```

Super type for Data Transfer Objects. All data transfer objects are easily serializable having only public fields of primitive types and their wrapper classes, Strings, and DTOs. List, Set, Map and array aggregates may also be used. The aggregates must only hold objects of the listed types or aggregates.
NotThreadSafe

Constructor Summary	Page
DTO()	Error: Reference source not found

Method Summary		Page
String	**toString**() Return a string representation of this DTO suitable for use when debugging.	rror: Reference source not found

Constructor Detail

DTO

```
public DTO()
```

Method Detail

toString

```
public String toString()
```

Return a string representation of this DTO suitable for use when debugging.
The format of the string representation is not specified and subject to change.
Overrides:

`toString` in class `Object`

Returns:

A string representation of this DTO suitable for use when debugging.

Package org.osgi.dto.framework

OSGi Data Transfer Object Framework Package Version 1.8.

See:
Description

Class Summary		Page
BundleDTO	Data Transfer Object for a Bundle.	Error: Reference source not found
FrameworkDTO	Data Transfer Object for a Framework.	Error: Reference source not found
ServiceReferenceDTO	Data Transfer Object for a ServiceReference.	Error: Reference source not found

Package org.osgi.dto.framework Description
OSGi Data Transfer Object Framework Package Version 1.8.

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.dto.framework; version="[1.8,2.0)"
```

Example import for providers implementing the API in this package:

```
Import-Package: org.osgi.dto.framework; version="[1.8,1.9)"
```

Class BundleDTO
org.osgi.dto.framework
java.lang.Object
  └ org.osgi.dto.DTO
    └ org.osgi.dto.framework.BundleDTO

```
public class BundleDTO
extends DTO
```

Data Transfer Object for a Bundle.
A Bundle can be adapted to provide a `BundleDTO` for the Bundle.
NotThreadSafe

Field Summary		Page
long	**id** The bundle's unique identifier.	rror: Reference source not found
long	**lastModified** The time when the bundle was last modified.	Error: Reference source not found
int	**state** The bundle's state.	Error: Reference source not found
String	**symbolicName** The bundle's symbolic name.	Error: Reference source not found
String	**version** The bundle's version.	Error: Reference source not found

Constructor Summary	Page
BundleDTO()	Error: Reference source not found

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

Field Detail

id

```
public long id
```

The bundle's unique identifier.

lastModified

```
public long lastModified
```

state
The time when the bundle was last modified.
public int state
symbolicName
The bundle's state.
public String symbolicName
version
The bundle's symbolic name.
public String version
The bundle's version.

Constructor Detail

BundleDTO

public BundleDTO()

Class FrameworkDTO
org.osgi.dto.framework
java.lang.Object
  └ org.osgi.dto.DTO
      └ org.osgi.dto.framework.FrameworkDTO
public class FrameworkDTO
extends DTO

Data Transfer Object for a Framework.
The System Bundle can be adapted to provide a FrameworkDTO for the framework of the system bundle. A FrameworkDTO obtained from a framework will contain only the launch properties of the framework. These properties will not include the System properties.
NotThreadSafe

Field Summary		Page
List<BundleDTO>	**bundles** The bundles that are installed in the framework.	rror: Reference source not found
Map<String,Object>	**properties** The launch properties of the framework.	Error: Reference source not found
List<ServiceReferenceDTO>	**services** The services that are registered in the framework.	Error: Reference source not found

Constructor Summary	Page
FrameworkDTO()	Error: Reference source not found

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

Field Detail

bundles

public List<BundleDTO> bundles
The bundles that are installed in the framework.

properties

public Map<String,Object> properties
The launch properties of the framework. The value type must be a numerical type, Boolean, String, DTO or an array of any of the former.

services

public List<ServiceReferenceDTO> services
The services that are registered in the framework.

Constructor Detail

FrameworkDTO

```
public FrameworkDTO()
```

Class ServiceReferenceDTO
org.osgi.dto.framework
java.lang.Object
  └ org.osgi.dto.DTO
      └ org.osgi.dto.framework.ServiceReferenceDTO
public class ServiceReferenceDTO
extends DTO
Data Transfer Object for a ServiceReference.
ServiceReferenceDTOs for all registered services can be obtained from a FrameworkDTO. An installed Bundle can be adapted to provide a ServiceReferenceDTO[] of the services registered by the Bundle. A ServiceReferenceDTO obtained from a framework must convert service property values which are not valid value types for DTOs to type String using String.valueOf(Object).
NotThreadSafe

Field Summary	Page
long **bundle** The id of the bundle that registered the service.	rror: Reference source not found
Map<String, Object> **properties** The properties for the service.	Error: Reference source not found
long[] **usingBundles** The ids of the bundles that are using the service.	Error: Reference source not found

Constructor Summary	Page
ServiceReferenceDTO()	Error: Reference source not found

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

Field Detail

bundle

public long bundle
The id of the bundle that registered the service.

properties

public Map<String,Object> properties
The properties for the service. The value type must be a numerical type, Boolean, String, DTO or an array of any of the former.

usingBundles

public long[] usingBundles
The ids of the bundles that are using the service.

Constructor Detail

ServiceReferenceDTO

```
public ServiceReferenceDTO()
```

Package org.osgi.dto.framework.startlevel

OSGi Data Transfer Object Framework Start Level Package Version 1.0.

See:
Description

Class Summary		Page
BundleStartLevelDTO	Data Transfer Object for a BundleStartLevel.	Error: Reference source not found
FrameworkStartLevelDTO	Data Transfer Object for a FrameworkStartLevel.	Error: Reference source not found

Package org.osgi.dto.framework.startlevel Description
OSGi Data Transfer Object Framework Start Level 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.dto.framework.startlevel; version="[1.0,2.0)"
```

Example import for providers implementing the API in this package:

```
Import-Package: org.osgi.dto.framework.startlevel; version="[1.0,1.1)"
```

Class BundleStartLevelDTO
org.osgi.dto.framework.startlevel
java.lang.Object
  └ org.osgi.dto.DTO
    └ org.osgi.dto.framework.startlevel.BundleStartLevelDTO
public class BundleStartLevelDTO
extends DTO
Data Transfer Object for a BundleStartLevel.
An installed Bundle can be adapted to provide a BundleStartLevelDTO for the Bundle.
NotThreadSafe

Field Summary		Page
boolean	**activationPolicyUsed** The bundle's autostart setting indicates that the activation policy declared in the bundle manifest must be used.	rror: Reference source not found
boolean	**persistentlyStarted** The bundle's autostart setting indicates it must be started.	Error: Reference source not found
int	**startLevel** The assigned start level value for the bundle.	Error: Reference source not found

Constructor Summary	Page
BundleStartLevelDTO()	Error: Reference source not found

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

Field Detail

startLevel

public int startLevel
The assigned start level value for the bundle.

activationPolicyUsed

public boolean activationPolicyUsed
The bundle's autostart setting indicates that the activation policy declared in the bundle manifest must be used.

persistentlyStarted

public boolean persistentlyStarted
The bundle's autostart setting indicates it must be started.

Constructor Detail

BundleStartLevelDTO

public BundleStartLevelDTO()

Class FrameworkStartLevelDTO
org.osgi.dto.framework.startlevel
java.lang.Object
  └ org.osgi.dto.DTO
      └ org.osgi.dto.framework.startlevel.FrameworkStartLevelDTO
public class FrameworkStartLevelDTO
extends DTO
Data Transfer Object for a FrameworkStartLevel.
The System Bundle can be adapted to provide a FrameworkStartLevelDTO for the framework of the Bundle.
NotThreadSafe

Field Summary		Page
int	**initialBundleStartLevel** The initial start level value that is assigned to a bundle when it is first installed.	rror: Reference source not found
int	**startLevel** The active start level value for the framework.	Error: Reference source not found

Constructor Summary	Page
FrameworkStartLevelDTO()	Error: Reference source not found

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

Field Detail

startLevel

public int startLevel
The active start level value for the framework.

initialBundleStartLevel

public int initialBundleStartLevel
The initial start level value that is assigned to a bundle when it is first installed.

Constructor Detail

FrameworkStartLevelDTO

public FrameworkStartLevelDTO()

Package org.osgi.dto.framework.wiring

OSGi Data Transfer Object Framework Wiring Package Version 1.1.

See:
Description

Class Summary		Page
BundleRevisionDTO	Data Transfer Object for a BundleWiring.	Error: Reference source not found
BundleRevisionsDTO	Data Transfer Object for a BundleRevisions.	Error: Reference source not found
BundleWireDTO	Data Transfer Object for a BundleWire.	Error: Reference source not found
BundleWiringDTO	Data Transfer Object for a BundleWiring.	Error: Reference source not found
BundleWiringsDTO	Data Transfer Object for the BundleWirings of a bundle.	Error: Reference source not found

Package org.osgi.dto.framework.wiring Description
OSGi Data Transfer Object Framework Wiring Package Version 1.1.

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.dto.framework.wiring; version="[1.1,2.0)"
```

Example import for providers implementing the API in this package:

```
Import-Package: org.osgi.dto.framework.wiring; version="[1.1,1.2)"
```

Class BundleRevisionDTO
org.osgi.dto.framework.wiring
java.lang.Object
  └ org.osgi.dto.DTO
    └ org.osgi.dto.resource.ResourceDTO
      └ org.osgi.dto.framework.wiring.BundleRevisionDTO

```
public class BundleRevisionDTO
extends ResourceDTO
```

Data Transfer Object for a BundleWiring.
An installed Bundle can be adapted to provide a `BundleRevisionDTO` for the current revision of the Bundle. `BundleRevisionDTO` objects for all in use revisions of the Bundle can be obtained from a `BundleRevisionsDTO` of the Bundle.
NotThreadSafe

Field Summary		Page
BundleDTO	**bundle** The bundle associated with this bundle revision.	rror: Reference source not found
String	**symbolicName** The symbolic name of the bundle revision.	Error: Reference source not found
int	**type** The type of the bundle revision.	Error: Reference source not found
String	**version** The version of the bundle revision.	Error: Reference source not found

Fields inherited from class org.osgi.dto.resource.ResourceDTO
capabilities, requirements

Constructor Summary	Page
BundleRevisionDTO()	Error: Reference source not found

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

Field Detail

symbolicName

```
public String symbolicName
```

The symbolic name of the bundle revision.

type

public int type

version The type of the bundle revision.

public String version

bundle The version of the bundle revision.

public BundleDTO bundle

The bundle associated with this bundle revision.

Constructor Detail

BundleRevisionDTO

public BundleRevisionDTO()

Class BundleRevisionsDTO
org.osgi.dto.framework.wiring
java.lang.Object
  └ org.osgi.dto.DTO
      └ org.osgi.dto.framework.wiring.BundleRevisionsDTO
public class BundleRevisionsDTO
extends DTO
Data Transfer Object for a BundleRevisions.
A Bundle can be adapted to provide a BundleRevisionsDTO for the in use revisions of the Bundle.
NotThreadSafe

Field Summary		Page
List<BundleRevisionDTO>	**revisions** Revisions for the bundle.	rror: Reference source not found

Constructor Summary	Page
BundleRevisionsDTO()	Error: Reference source not found

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

Field Detail

revisions

public List<BundleRevisionDTO> revisions
Revisions for the bundle. The first revision is the current revision.

Constructor Detail

BundleRevisionsDTO

public BundleRevisionsDTO()

Class BundleWireDTO
org.osgi.dto.framework.wiring
java.lang.Object
  └ org.osgi.dto.DTO
    └ org.osgi.dto.resource.WireDTO
      └ org.osgi.dto.framework.wiring.BundleWireDTO
public class BundleWireDTO
extends WireDTO

Data Transfer Object for a BundleWire.
BundleWireDTOs can be obtained from a BundleWiringDTO.
The requirer and provider fields must contain BundleRevisionDTOs.
NotThreadSafe

Field Summary		Page
BundleWiringDTO	**providerWiring** Provider wiring for the bundle wire.	rror: Reference source not found
BundleWiringDTO	**requirerWiring** Requirer wiring for the bundle wire.	Error: Reference source not found

Fields inherited from class org.osgi.dto.resource.WireDTO
capability, provider, requirement, requirer

Constructor Summary	Page
BundleWireDTO()	Error: Reference source not found

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

Field Detail

providerWiring

public BundleWiringDTO providerWiring

Provider wiring for the bundle wire.

requirerWiring

public BundleWiringDTO requirerWiring

Requirer wiring for the bundle wire.

Constructor Detail

BundleWireDTO

public BundleWireDTO()

Class BundleWiringDTO
org.osgi.dto.framework.wiring
java.lang.Object
  └ org.osgi.dto.DTO
    └ org.osgi.dto.resource.WiringDTO
      └ org.osgi.dto.framework.wiring.BundleWiringDTO
public class BundleWiringDTO
extends WiringDTO

Data Transfer Object for a BundleWiring.

An installed Bundle can be adapted to provide a `BundleWiringDTO` for the current wiring Bundle. `BundleWiringDTO` objects for all in use wirings of the Bundle can be obtained from a `BundleWiringsDTO` of the Bundle.

The `providedWires` field must contain an array of `BundleWireDTO`s. The `requiredWires` field must contain an array of `BundleWireDTO`s. The `resource` field must contain a `BundleRevisionDTO`.

NotThreadSafe

Field Summary		Page
boolean **current**	The current state of the bundle wiring.	rror: Reference sourc e not found
boolean **inUse**	The bundle wiring's in use setting indicates that the bundle wiring is in use.	Error: Reference sourc e not found

Fields inherited from class org.osgi.dto.resource.WiringDTO
capabilities, providedWires, requiredWires, requirements, resource

Constructor Summary	Page
BundleWiringDTO()	Error: Reference sourc e not found

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

Field Detail

inUse

public boolean inUse

The bundle wiring's in use setting indicates that the bundle wiring is in use.

current

public boolean current

The current state of the bundle wiring. The bundle wiring's current setting indicates that the bundle wiring is the current bundle wiring for the bundle.

Constructor Detail

BundleWiringDTO

```
public BundleWiringDTO()
```

Class BundleWiringsDTO
org.osgi.dto.framework.wiring
java.lang.Object
  └ org.osgi.dto.DTO
      └ org.osgi.dto.framework.wiring.BundleWiringsDTO
public class BundleWiringsDTO
extends DTO
Data Transfer Object for the BundleWirings of a bundle.
A Bundle can be adapted to provide a BundleWiringsDTO for the in use wirings of the Bundle.
NotThreadSafe

Field Summary		Page
List<BundleWiringDTO>	**wirings** Wirings for the bundle.	rror: Reference source not found

Constructor Summary	Page
BundleWiringsDTO()	Error: Reference source not found

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

Field Detail

wirings

public List<BundleWiringDTO> wirings
Wirings for the bundle. The first wiring is the current wiring.

Constructor Detail

BundleWiringsDTO

public BundleWiringsDTO()

Package org.osgi.dto.resource

OSGi Data Transfer Object Resource Package Version 1.0.

See:
Description

Class Summary		Page
CapabilityDTO	Data Transfer Object for a Capability.	Error: Reference source not found
RequirementDTO	Data Transfer Object for a Requirement.	Error: Reference source not found
ResourceDTO	Data Transfer Object for a Resource.	Error: Reference source not found
WireDTO	Data Transfer Object for a Wire.	Error: Reference source not found
WiringDTO	Data Transfer Object for a Wiring.	Error: Reference source not found

Package org.osgi.dto.resource Description
OSGi Data Transfer Object Resource 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.dto.resource; version="[1.0,2.0)"
```

Example import for providers implementing the API in this package:

```
Import-Package: org.osgi.dto.resource; version="[1.0,1.1)"
```

Class CapabilityDTO
org.osgi.dto.resource
java.lang.Object
  └ org.osgi.dto.DTO
    └ org.osgi.dto.resource.CapabilityDTO
public class CapabilityDTO
extends DTO
Data Transfer Object for a Capability.
NotThreadSafe

Field Summary		Page
Map<String, Object>	**attributes** The attributes for the capability.	rror: Reference source not found
Map<String, String>	**directives** The directives for the capability.	Error: Reference source not found
String	**namespace** The namespace for the capability.	Error: Reference source not found
ResourceDTO	**resource** The resource declaring this capability.	Error: Reference source not found

Constructor Summary	Page
CapabilityDTO()	Error: Reference source not found

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

Field Detail

namespace

public String namespace
The namespace for the capability.

directives

public Map<String,String> directives
The directives for the capability.

attributes

public Map<String,Object> attributes
The attributes for the capability. The value type must be a numerical type, Boolean, String, DTO or an array of any of the former.

resource

public ResourceDTO resource
The resource declaring this capability.

Constructor Detail

CapabilityDTO

```
public CapabilityDTO()
```

Class RequirementDTO
org.osgi.dto.resource
java.lang.Object
  └ org.osgi.dto.DTO
      └ org.osgi.dto.resource.RequirementDTO
public class RequirementDTO
extends DTO
Data Transfer Object for a Requirement.
NotThreadSafe

Field Summary		Page
Map<String, Object>	**attributes** The attributes for the requirement.	rror: Reference source not found
Map<String, String>	**directives** The directives for the requirement.	Error: Reference source not found
String	**namespace** The namespace for the requirement.	Error: Reference source not found
ResourceDTO	**resource** The resource declaring this requirement.	Error: Reference source not found

Constructor Summary	Page
RequirementDTO()	Error: Reference source not found

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

Field Detail

namespace

public String namespace
The namespace for the requirement.

directives

public Map<String,String> directives
The directives for the requirement.

attributes

public Map<String,Object> attributes
The attributes for the requirement. The value type must be a numerical type, Boolean, String, DTO or an array of any of the former.

resource

public ResourceDTO resource
The resource declaring this requirement.

Constructor Detail

RequirementDTO

```
public RequirementDTO()
```

Class ResourceDTO
org.osgi.dto.resource
java.lang.Object
  └ org.osgi.dto.DTO
    └ org.osgi.dto.resource.ResourceDTO

Direct Known Subclasses:
BundleRevisionDTO

public class ResourceDTO
extends DTO

Data Transfer Object for a Resource.
NotThreadSafe

Field Summary		Page
List<CapabilityDTO>	**capabilities** The capabilities for the resource.	rror: Reference source not found
List<RequirementDTO>	**requirements** The requirements for the resource.	Error: Reference source not found

Constructor Summary	Page
ResourceDTO()	Error: Reference source not found

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

Field Detail

capabilities

public List<CapabilityDTO> capabilities
The capabilities for the resource.

requirements

public List<RequirementDTO> requirements
The requirements for the resource.

Constructor Detail

ResourceDTO

public ResourceDTO()

Class WireDTO
org.osgi.dto.resource
java.lang.Object
  └ org.osgi.dto.DTO
    └ org.osgi.dto.resource.WireDTO

Direct Known Subclasses:
BundleWireDTO

public class WireDTO
extends DTO
Data Transfer Object for a Wire.
NotThreadSafe

Field Summary		Page
CapabilityDTO	**capability** Capability for the wire.	rror: Reference source not found
ResourceDTO	**provider** Provider resource for the wire.	Error: Reference source not found
RequirementDTO	**requirement** Requirement for the wire.	Error: Reference source not found
ResourceDTO	**requirer** Requiring resource for the wire.	Error: Reference source not found

Constructor Summary	Page
WireDTO()	Error: Reference source not found

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

Field Detail

capability

public CapabilityDTO capability
Capability for the wire.

requirement

public RequirementDTO requirement
Requirement for the wire.

provider

public ResourceDTO provider
Provider resource for the wire.

requirer

public ResourceDTO requirer
Requiring resource for the wire.

Constructor Detail

WireDTO

public WireDTO()

Class WiringDTO
org.osgi.dto.resource
java.lang.Object
  └ org.osgi.dto.DTO
    └ org.osgi.dto.resource.WiringDTO

Direct Known Subclasses:
BundleWiringDTO

public class WiringDTO
extends DTO
Data Transfer Object for a Wiring.
NotThreadSafe

Field Summary		Page
List<CapabilityDTO>	**capabilities** The capabilities for the wiring.	rror: Reference source not found
List<WireDTO>	**providedWires** The provided wires for the wiring.	Error: Reference source not found
List<WireDTO>	**requiredWires** The required wires for the wiring.	Error: Reference source not found
List<RequirementDTO>	**requirements** The requirements for the wiring.	Error: Reference source not found
ResourceDTO	**resource** Resource for the wiring.	Error: Reference source not found

Constructor Summary	Page
WiringDTO()	Error: Reference source not found

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

Field Detail

capabilities

public List<CapabilityDTO> capabilities

requirements
The capabilities for the wiring.

```
public List<RequirementDTO> requirements
```

providedWires
The requirements for the wiring.

```
public List<WireDTO> providedWires
```

requiredWires
The provided wires for the wiring.

```
public List<WireDTO> requiredWires
```

resource
The required wires for the wiring.

```
public ResourceDTO resource
```

Resource for the wiring.

Constructor Detail

WiringDTO

```
public WiringDTO()
```


7 Considered Alternatives

7.1 Compendium DTOs

We decided that RFCs for a given specification should be the place for DTOs for that specification to be defined. The RFC template now has a DTO section. Therefore this RFC will only address the DTOs for the Core specification.

It was discussed how to obtain DTO instances from other services (e.g. ConfigAdmin). An "Adapter" concept was discussed but not agreed to. It was also discussed that the services add new "getDTO" methods. No conclusion was reached.

8 Security Considerations

Data transfer objects have limited behavior by definition. This behavior requires no permissions.

9 Document Support

9.1 References

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

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

[3]. Data Transfer Object. https://en.wikipedia.org/wiki/Data_transfer_object

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9.3 Acronyms and Abbreviations

DTO – Data Transfer Object

9.4 End of Document