



OSGiTM
Alliance

RFC 236 - OSGi Interworking Service for oneM2M Networks

Draft

30 Pages

Abstract

Defines the OSGi interworking service for oneM2M networks that enabling OSGi-based devices to interoperate with oneM2M devices.

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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0.5 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.

0.6 Revision History

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

Revision	Date	Comments
Initial	June 21 2017	<i>Initial Document</i> <i>Seven Gan, Huawei, seven.ganlu@huawei.com</i>

1 Introduction

oneM2M is a global organization that specifies requirements, architecture, API specifications, security solutions and interoperability for Machine-to-Machine and IoT technologies. Its specifications provide a framework to support a wide range of applications and services such as smart cities, smart grid, connected car, home automation, public safety, and health. As an increasing number of big players participating in oneM2M standard, it is becoming more and more popular and is likely to become one of the most mainstream IoT standards in the world. Interoperating with oneM2M devices can help build IoT ecosystem, expand the markets of both OSGi and oneM2M.

This RFC provides a solution to enable OSGi-based devices to interoperate with oneM2M devices.

2 Application Domain

When adding a OSGi-based device (such as IoT gateways, enhanced capability devices) into oneM2M network, it requires the oneM2M protocol communication support of these devices. So that these OSGi devices and their connected sensors can be remotely discovered and operated on the oneM2M IoT platform as shown in Fig 1.

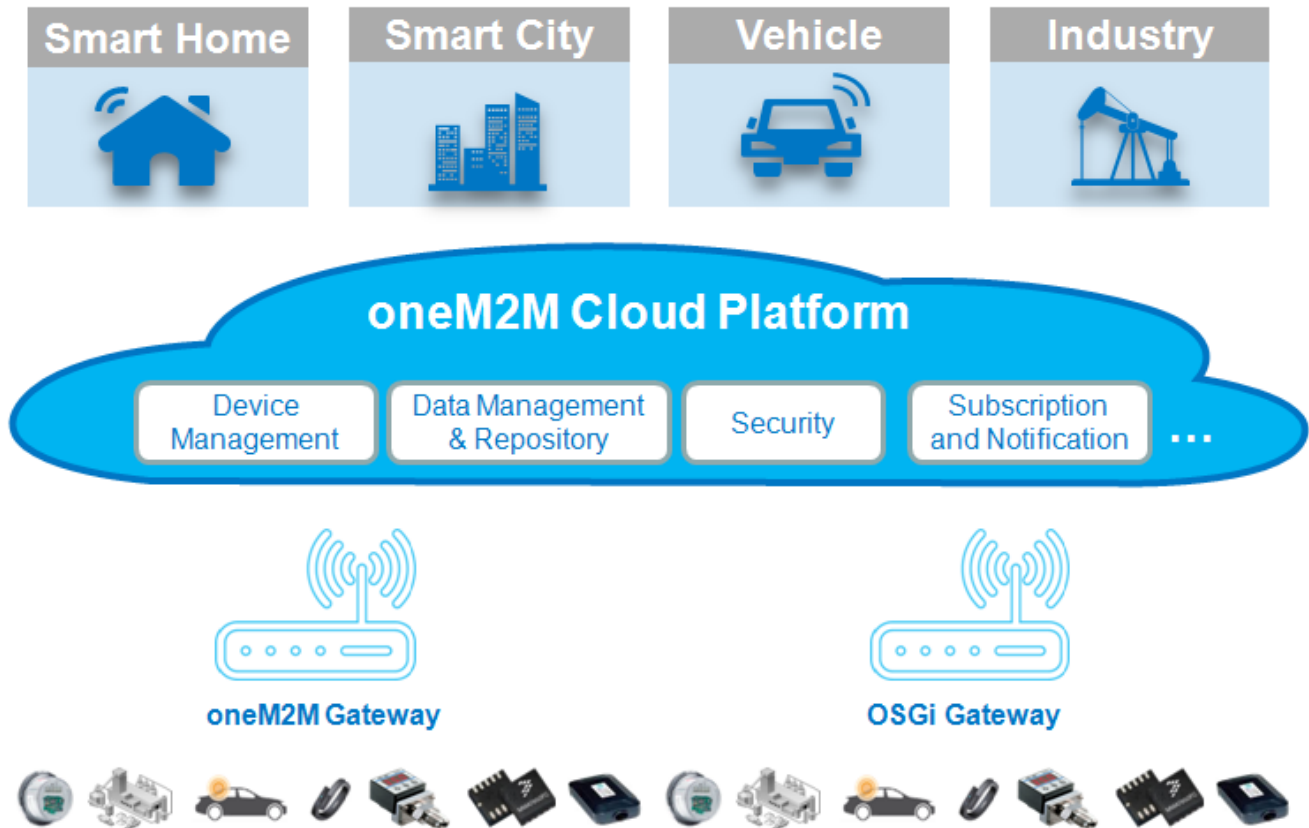


Fig 1

3 Problem Description

OSGi defines Device Abstraction Layer which provides a unified interface for OSGi application developers to interact with sensor, devices, etc. And also defines Configuration Admin service which allows operators to configure deployed bundles. Other OSGi standard device services (e.g. UPnP Device Service, EnOcean Device Service, Zigbee Device Service, SDT Device Service) and OSGi-based open source projects (e.g. Eclipse

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SmartHome, Kura) have the similar mechanisms. It is impossible to integrate these devices into oneM2M network by re-developing them as fully oneM2M compliance devices. The better way is to develop an oneM2M protocol interworking service which can interact with these device services and configuration admin service, expose these devices and configurations as oneM2M resources to oneM2M network without affecting the exist implementation of OSGi devices.

There are two interworking scenarios. One is to consider OSGi gateways as an oneM2M AE who communicates with CSE through Mca reference point, as shown in Fig 2. The other one is to consider OSGi gateways as an oneM2M CSE who communicates with other CSE through Mcc reference point and communicates with AE through Mca reference point, as shown in Fig 3.

The interworking service requested in this RFC would give developers a common way of developing such service.

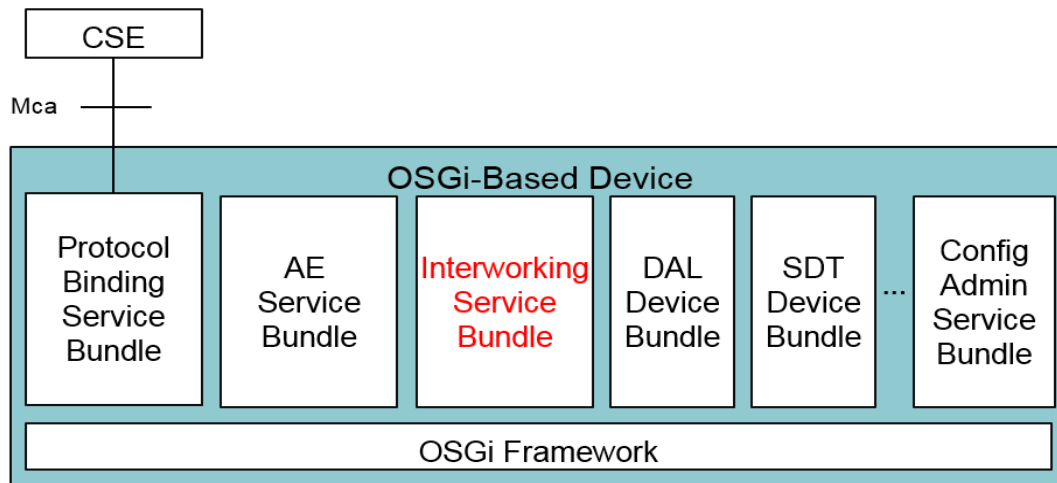


Fig 2

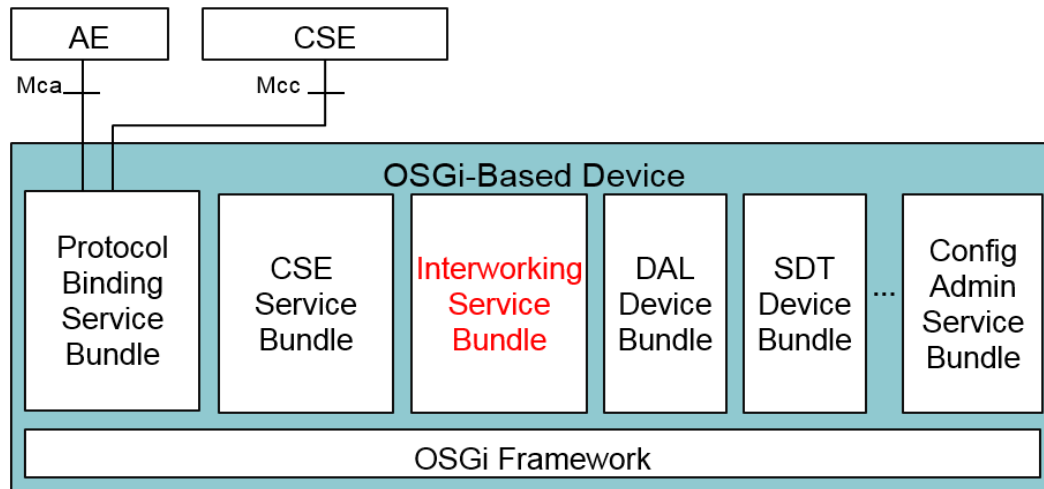


Fig 3

4 Requirements

R1: The solution MUST provide a standard service for exposing Device service and Configuration Admin service as oneM2M resources to oneM2M network without any modification of Device Service and Configuration admin service.

R2: The solution MUST provide a set of rules to map between Device service and oneM2M resource for Interworking service developers.

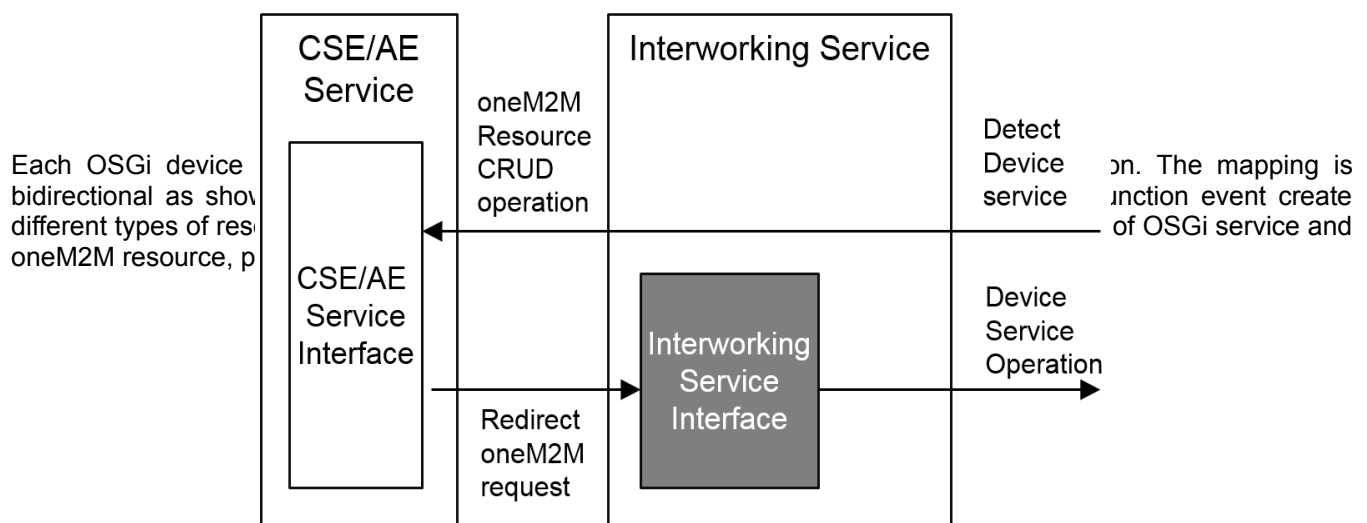
R3: The solution MUST provide a set of rules to map between Configuration Admin service and oneM2M resource for Interworking service developers.

R4: The solution MUST define API for configuring the Interworking service.

R5: The solution MUST be independent of specific transport protocol between OSGi devices and oneM2M devices.

5 Technical Solution

The Interworking service is responsible for the interoperation between OSGi and oneM2M devices. It listens to the service registry, obtains device service objects, converts java objects to oneM2M resources and calls the oneM2M CSE/AE interface to create/update/delete resources on oneM2M side. Each interworking service has a unique pointOfAccess property, marks the oneM2M resources by specifying this property at creation time. The interworking service also provides interfaces for oneM2M CSE/AE to invoke the service operations.



OSGi Device	oneM2M Resource
Register service	Create resource
Unregister service	Delete resource
Modify service property	Update resource
Generate device function event	Create resource

The interworking service is used to be detected by oneM2M CSE/AE, distinguished by the different pointOfAccess property. The operation doExecute is called when oneM2M CSE/AE needs to retarget requests to the address specified in property pointOfAccess.

```
public interface InterworkingService {  
  
    public static final String POINT_OF_ACCESS = "onem2m.resource.poa";  
  
    public ResponsePrimitiveDTO doExecute(RequestPrimitiveDTO request);  
}
```

6 Data Transfer Objects

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

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

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

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

7 Javadoc

OSGi Javadoc

17-9-20 5:32PM

Package Summary		Page
org.osgi.service.onem2m	oneM2M Service Package Version 1.0.	9
org.osgi.service.onem2m.dto	Service oneM2M Data Transfer Objects Package Version 1.0.	12

Package org.osgi.service.onem2m

oneM2M Service Package Version 1.0.

See:

[Description](#)

Interface Summary		Page
InterworkingService	Public interface of oneM2M interworking proxy entity service.	11

Package org.osgi.service.onem2m Description

oneM2M 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.onem2m.service; version="[1.0,2.0)"
```

Example import for providers implementing the API in this package:

```
Import-Package: org.osgi.onem2m.service; version="[1.0,1.1)"
```

Interface InterworkingService

org.osgi.service.onem2m

```
public interface InterworkingService
```

Public interface of oneM2M interworking proxy entity service.

Field Summary		Page
String	POINT_OF_ACCESS The service property value contains the IPE's point of access.	11

Method Summary		Page
ResponsePrimitiveDTO	doExecute (RequestPrimitiveDTO request) Executes a resource request and return a response	11

Field Detail

POINT_OF_ACCESS

```
public static final String POINT_OF_ACCESS
```

The service property value contains the IPE's point of access. It's a mandatory property. The value type is `java.lang.String`.

Method Detail

doExecute

```
ResponsePrimitiveDTO doExecute (RequestPrimitiveDTO request)
```

Executes a resource request and return a response

Returns:

The response of the resource request.

Package org.osgi.service.onem2m.dto

Service oneM2M Data Transfer Objects Package Version 1.0.

See:

[Description](#)

Class Summary		Page
AttributeDTO	A representation of a declared attribute parameter.	13
FilterCriteriaDTO	A representation of a declared filter criteria.	14
PrimitiveContentDTO	A representation of a declared primitive content.	18
RequestPrimitiveDTO	A representation of a declared request primitive.	19
ResponsePrimitiveDTO	A representation of a declared response primitive.	25
ResponseTypeInfoDTO	A representation of a declared response type.	28

Package org.osgi.service.onem2m.dto Description

Service oneM2M Data Transfer Objects 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.onem2m.dto; version="[1.0,2.0) "
```

Example import for providers implementing the API in this package:

```
Import-Package: org.osgi.service.onem2m.dto; version="[1.0,1.1) "
```

Class AttributeDTO

[org.osgi.service.onem2m.dto](#)

```
java.lang.Object
└─ org.osgi.dto.DTO
    └─ org.osgi.service.onem2m.dto.AttributeDTO
```

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

A representation of a declared attribute parameter.

Since:

1.0

Field Summary		Pag e
String	name The name of the attribute.	13
Object	value The value of the attribute.	13

Constructor Summary	Pag e
AttributeDTO ()	13

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

Field Detail

name

```
public String name
```

The name of the attribute.

value

```
public Object value
```

The value of the attribute.

Constructor Detail

AttributeDTO

```
public AttributeDTO ()
```

Class FilterCriteriaDTO

[org.osgi.service.onem2m.dto](#)

```
java.lang.Object
└─ org.osgi.dto.DTO
    └─ org.osgi.service.onem2m.dto.FilterCriteriaDTO
```

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

A representation of a declared filter criteria.

Since:

1.0

Field Summary		Pag e
List< AttributedDTO >	attribute The values of the resource attributes.	16
List<String>	contentType The contentType attribute of the resource matches the specified value.	16
String	createdAfter The value of the createdBefore property.	15
String	createdBefore The value of the createdBefore property.	15
String	expireAfter The value of the expireAfter property.	16
String	expireBefore The value of the expireBefore property.	16
BigInteger	filterUsage Indicates how the filter criteria is used.	17
List<String>	labels The labels attributes of the resource matches the specified value.	16
BigInteger	limit The maximum number of resources to be returned in the response.	17
String	modifiedSince The value of the modifiedSince property.	15
BigInteger	resourceType The value of the resourceType property.	16
BigInteger	sizeAbove The value of the sizeAbove property.	16
BigInteger	sizeBelow The value of the sizeBelow property.	16
BigInteger	stateTagBigger The value of the stateTagBigger property.	15
BigInteger	stateTagSmaller The value of the stateTagSmaller property.	15

String	unmodifiedSince The value of the unmodifiedSince property.	15
--------	---	----

Constructor Summary	<i>Page</i>
FilterCriteriaDTO()	17

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

Field Detail

createdBefore

public String **createdBefore**

The value of the createdBefore property.

createdAfter

public String **createdAfter**

The value of the createdBefore property.

modifiedSince

public String **modifiedSince**

The value of the modifiedSince property.

unmodifiedSince

public String **unmodifiedSince**

The value of the unmodifiedSince property.

stateTagSmaller

public BigInteger **stateTagSmaller**

The value of the stateTagSmaller property.

stateTagBigger

public BigInteger **stateTagBigger**

The value of the stateTagBigger property.

expireBefore

```
public String expireBefore
```

The value of the expireBefore property.

expireAfter

```
public String expireAfter
```

The value of the expireAfter property.

labels

```
public List<String> labels
```

The labels attributes of the resource matches the specified value.

resourceType

```
public BigInteger resourceType
```

The value of the resourceType property.

sizeAbove

```
public BigInteger sizeAbove
```

The value of the sizeAbove property.

sizeBelow

```
public BigInteger sizeBelow
```

The value of the sizeBelow property.

contentType

```
public List<String> contentType
```

The contentType attribute of the resource matches the specified value.

attribute

```
public List<AttributeDTO> attribute
```


The values of the resource attributes.

filterUsage

```
public BigInteger filterUsage
```

Indicates how the filter criteria is used.

limit

```
public BigInteger limit
```

The maximum number of resources to be returned in the response.

Constructor Detail

FilterCriteriaDTO

```
public FilterCriteriaDTO()
```

Class PrimitiveContentDTO

[org.osgi.service.onem2m.dto](#)

```
java.lang.Object
└─ org.osgi.dto.DTO
    └─ org.osgi.service.onem2m.dto.PrimitiveContentDTO
```

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

A representation of a declared primitive content.

Since:
1.0

Field Summary		Page
List<Object>	any The content that is carried in the Content parameter of the original request message.	18

Constructor Summary		Page
PrimitiveContentDTO ()		18

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

Field Detail

any

```
public List<Object> any
```

The content that is carried in the Content parameter of the original request message.

Constructor Detail

PrimitiveContentDTO

```
public PrimitiveContentDTO()
```

Class RequestPrimitiveDTO

[org.osgi.service.onem2m.dto](#)

```
java.lang.Object
├── org.osgi.dto.DTO
│   └── org.osgi.service.onem2m.dto.RequestPrimitiveDTO
```

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

A representation of a declared request primitive.

Since:

1.0

Field Summary		Page
Object	content The value of content property.	21
boolean	deliveryAggregation The value of deliveryAggregation property.	22
BigInteger	discoveryResultType The value of discoveryResultType property.	23
String	eventCategory The value of eventCategory property.	22
FilterCriteriaDTO	filterCriteria The value of filterCriteria property.	23
String	from The value of from property.	20
String	groupRequestIdentifier The value of groupRequestIdentifier property.	22
boolean	mqttResponseExpected	24
String	mqttTopic The value of mqttTopic property.	23
String	mqttUri The value of mqttUri property.	23
String	name The value of name property.	21
BigInteger	operation The value of operation property.	20
String	operationExecutionTime The value of operationExecutionTime property.	22
String	originatingTimestamp The value of originatingTimestamp property.	21
PrimitiveContentDTO	primitiveContent The value of PrimitiveContent property.	21
Map<String,List<String>>	queryStrings The value of queryStrings property.	23

String	requestContentType The value of requestContentType property.	23
String	requestExpirationTimestamp The value of requestExpirationTimestamp property.	21
String	requestIdentifier The value of requestIdentifier property.	21
BigInteger	resourceType The value of resourceType property.	21
ResponseTypeInfoDTO	responseType The value of responseType property.	22
BigInteger	resultContent The value of resultContent property.	22
String	resultExpirationTimestamp The value of resultExpirationTimestamp property.	21
Duration	resultPersistence The value of resultPersistence property.	22
String	returnContentType The value of returnContentType property.	23
String	targetId The value of targetId property.	23
String	to The value of to property.	20

Constructor Summary

	Page
RequestPrimitiveDTO ()	24

Methods inherited from class org.osgi.dto.DTO

toString

Field Detail

operation

```
public BigInteger operation
```

The value of operation property.

to

```
public String to
```

The value of to property.

from

```
public String from
```

The value of from property.

requestIdentifier

public String **requestIdentifier**

The value of requestIdentifier property.

resourceType

public BigInteger **resourceType**

The value of resourceType property.

name

public String **name**

The value of name property.

content

public Object **content**

The value of content property.

primitiveContent

public [PrimitiveContentDTO](#) **primitiveContent**

The value of PrimitiveContent property.

originatingTimestamp

public String **originatingTimestamp**

The value of originatingTimestamp property.

requestExpirationTimestamp

public String **requestExpirationTimestamp**

The value of requestExpirationTimestamp property.

resultExpirationTimestamp

public String **resultExpirationTimestamp**

The value of resultExpirationTimestamp property.

operationExecutionTime

```
public String operationExecutionTime
```

The value of operationExecutionTime property.

responseType

```
public ResponseTypeInfoDTO responseType
```

The value of responseType property.

resultPersistence

```
public Duration resultPersistence
```

The value of resultPersistence property.

resultContent

```
public BigInteger resultContent
```

The value of resultContent property.

eventCategory

```
public String eventCategory
```

The value of eventCategory property.

deliveryAggregation

```
public boolean deliveryAggregation
```

The value of deliveryAggregation property.

groupRequestIdIdentifier

```
public String groupRequestIdIdentifier
```

The value of groupRequestIdIdentifier property.

filterCriteria

```
public FilterCriteriaDTO filterCriteria
```

The value of filterCriteria property.

discoveryResultType

```
public BigInteger discoveryResultType
```

The value of discoveryResultType property.

returnContentType

```
public String returnContentType
```

The value of returnContentType property.

requestContentType

```
public String requestContentType
```

The value of requestContentType property.

queryStrings

```
public Map<String,List<String>> queryStrings
```

The value of queryStrings property.

targetId

```
public String targetId
```

The value of targetId property.

mqttTopic

```
public String mqttTopic
```

The value of mqttTopic property.

mqttUri

```
public String mqttUri
```

The value of mqttUri property.

mqttResponseExpected

```
public boolean mqttResponseExpected
```

Constructor Detail

RequestPrimitiveDTO

```
public RequestPrimitiveDTO()
```


Class ResponsePrimitiveDTO

[org.osgi.service.onem2m.dto](#)

```
java.lang.Object
└─ org.osgi.dto.DTO
    └─ org.osgi.service.onem2m.dto.ResponsePrimitiveDTO
```

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

A representation of a declared response primitive.

Since:

1.0

Field Summary		Page
PrimitiveContentDTO	content The value of content property.	26
String	contentType The value of contentType property.	27
String	eventCategory The value of eventCategory property.	27
String	from The value of from property.	26
String	location The value of location property.	27
Object	objContent The value of objContent property.	26
String	originatingTimestamp The value of originatingTimestamp property.	26
String	requestIdentifier The value of requestIdentifier property.	26
BigInteger	responseStatusCode The value of responseStatusCode property.	26
String	resultExpirationTimestamp The value of resultExpirationTimestamp property.	27
String	to The value of to property.	26

Constructor Summary		Page
ResponsePrimitiveDTO()		27

Methods inherited from class org.osgi.dto.DTO

toString

Field Detail

responseStatusCode

```
public BigInteger responseStatusCode
```

The value of responseStatusCode property.

requestIdentifier

```
public String requestIdentifier
```

The value of requestIdentifier property.

objContent

```
public Object objContent
```

The value of objContent property.

content

```
public PrimitiveContentDTO content
```

The value of content property.

to

```
public String to
```

The value of to property.

from

```
public String from
```

The value of from property.

originatingTimestamp

```
public String originatingTimestamp
```

The value of originatingTimestamp property.

resultExpirationTimestamp

```
public String resultExpirationTimestamp
```

The value of resultExpirationTimestamp property.

eventCategory

```
public String eventCategory
```

The value of eventCategory property.

location

```
public String location
```

The value of location property.

contentType

```
public String contentType
```

The value of contentType property.

Constructor Detail

ResponsePrimitiveDTO

```
public ResponsePrimitiveDTO()
```

Class ResponseTypeInfoDTO

[org.osgi.service.onem2m.dto](#)

```
java.lang.Object
├─ org.osgi.dto.DTO
│   └─ org.osgi.service.onem2m.dto.ResponseTypeInfoDTO
```

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

A representation of a declared response type.

Since: 1.0

Field Summary		Page
List<String>	notificationURI The value of notificationURI property.	28
BigInteger	responseType The value of responseType property.	28

Constructor Summary	Page
ResponseTypeInfoDTO ()	28

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

Field Detail

responseType

```
public BigInteger responseType

The value of responseType property.
```

notificationURI

```
public List<String> notificationURI

The value of notificationURI property.
```

Constructor Detail

ResponseTypeInfoDTO

```
public ResponseTypeInfoDTO ()
```

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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

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

10 Document Support

10.1 References

- [1]. Bradner, S., Key words for use in RFCs to Indicate Requirement Levels, RFC2119, March 1997.
- [2]. Software Requirements & Specifications. Michael Jackson. ISBN 0-201-87712-0
- [3]. oneM2M Release 2 specifications, TS 0001 Functional Architecture v2.10.0

*Add references simply by adding new items. You can then cross-refer to them by choosing <Insert><Cross Reference><Numbered Item> and then selecting the paragraph. **STATIC REFERENCES (I.E. BODGED) ARE NOT ACCEPTABLE, SOMEONE WILL HAVE TO UPDATE THEM LATER, SO DO IT PROPERLY NOW.***

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10.3 Acronyms and Abbreviations

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