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/.

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 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*	*Initial Document* *Seven Gan, Huawei, seven.ganlu@huawei.com*

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.

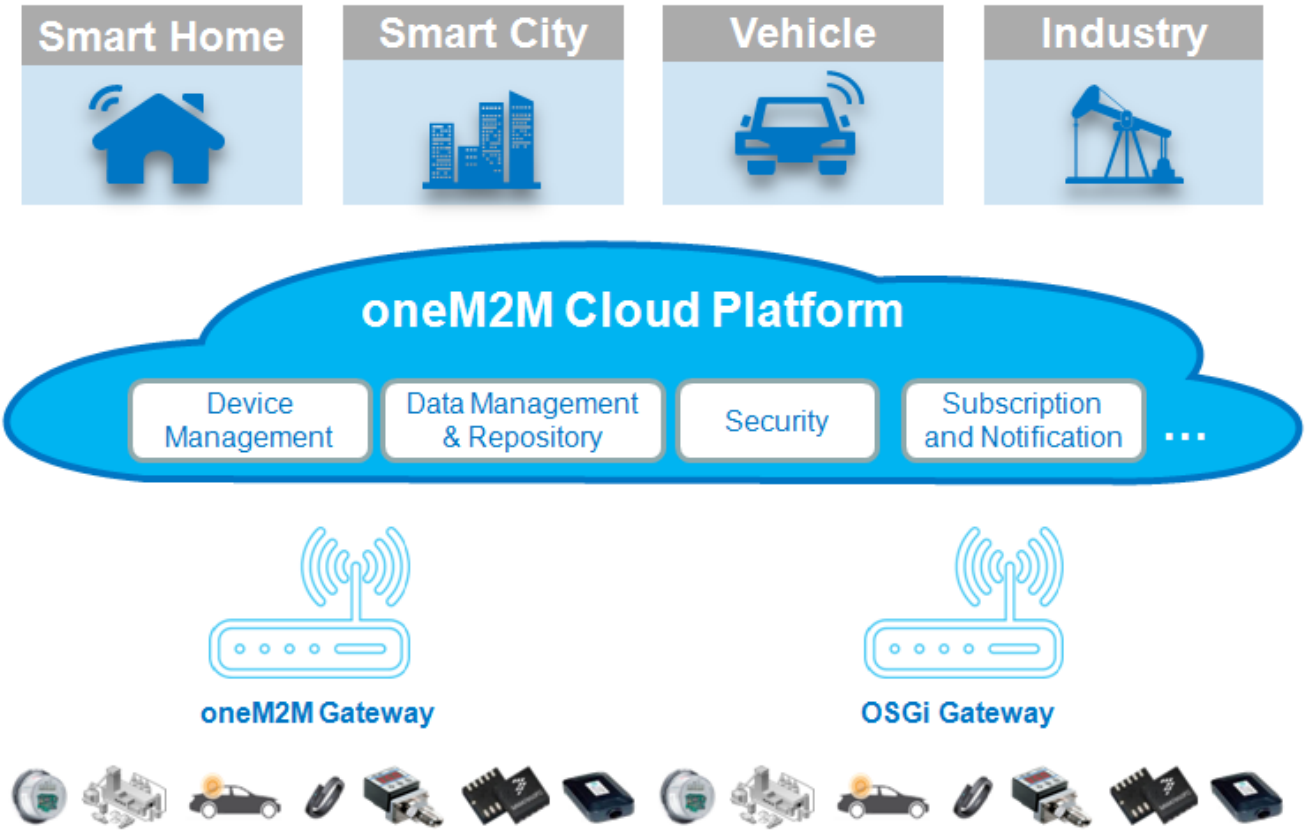


Fig 1

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

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.

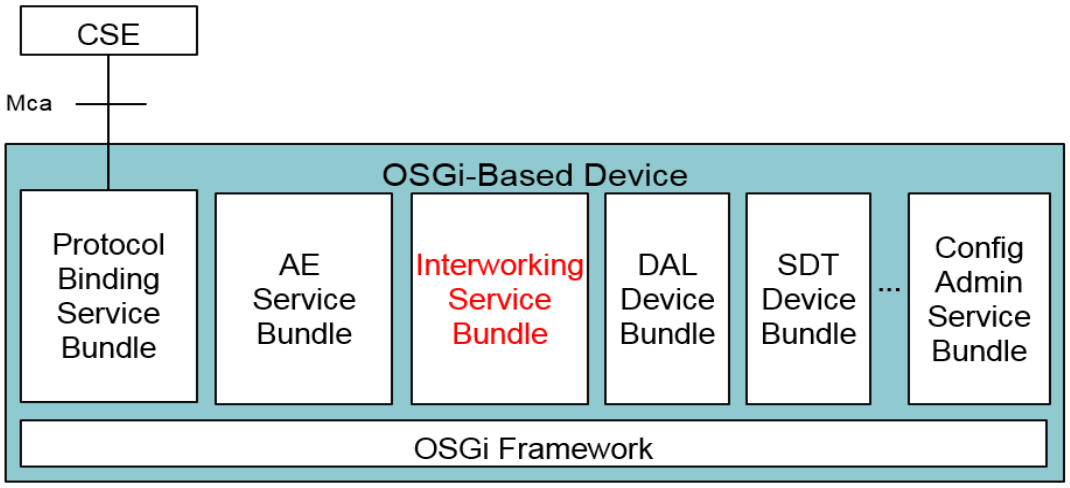


Fig 2

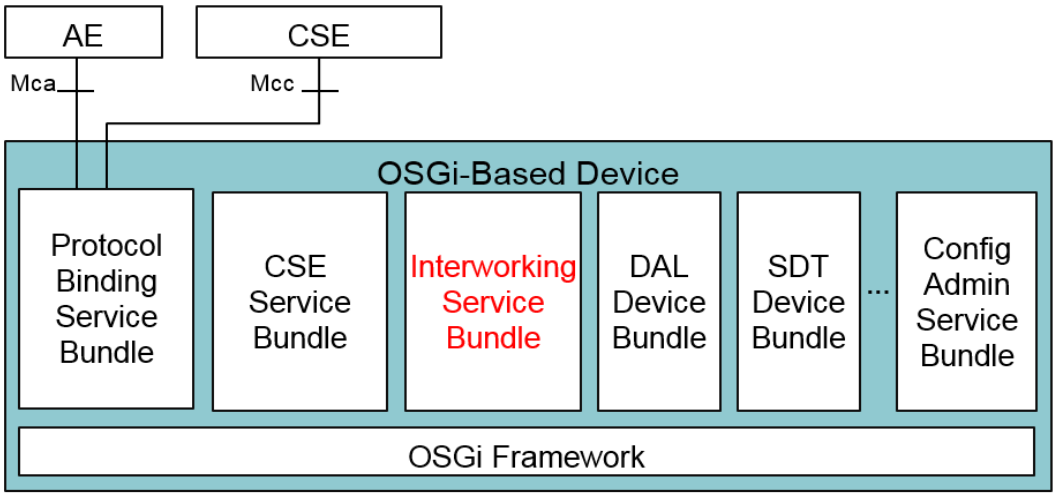


Fig 3

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.*

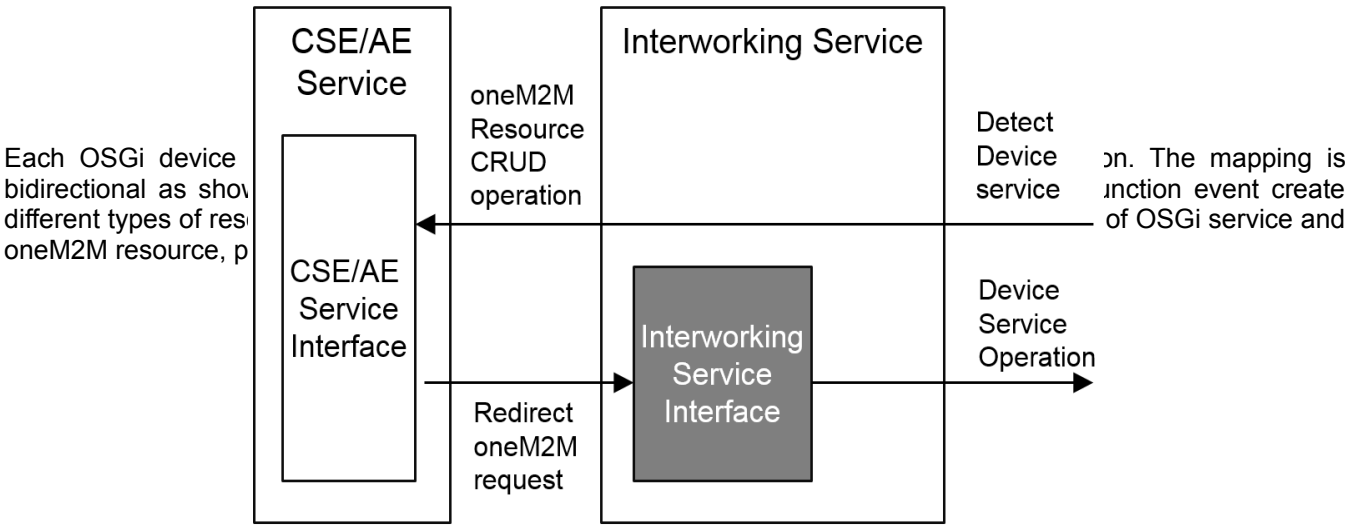
R3: The solution MUST *provide a set of rules to map between Configuration Admin service and oneM2M resource for Interworking service developers.*

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.



Each OSGi device
bidirectional as shov
different types of res
oneM2M resource, p
ɔn. The mapping is
ɹnction event create
of OSGi service and

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		Page
String	**name** The name of the attribute.	13
Object	**value** The value of the attribute.	13

Constructor Summary	Page
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		Page
List<AttributeDTO>	**attribute** The values of the resource attributes.	16
List<String>	**contentType** The contentInfo 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	Page
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 contentInfo 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.

---

groupRequestIdentifier

`public String` **`groupRequestIdentifier`**

The value of groupRequestIdentifier 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()
```

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 chosing <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.***

10.2 Author's Address

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10.3 Acronyms and Abbreviations

10.4 End of Document