

1 **OPENADE 1.0 SERVICE DEFINITION - COMMON**

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15 foundation for an interoperable Smart Grid.

16

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17 **Document History**

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18 **Revision History**

19 Date of this revision: Apr. 15, 2010

Revision Number	Revision Date	Revision By	Summary of Changes	Changes marked
0.5	2/25/10	Steve Van Ausdall	Initial draft discussion version.	N
0.6	3/1/10	Steve Van Ausdall	Additional details about defined resources	N
0.8	4/8/10	Steve Van Ausdall	Simplified, following approved plan	Y
0.9	4/15/10	Steve Van Ausdall	Addressed comments raised in walkthrough and from Jeff Kenward.	Y

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20 **Open Issues Log**

21 Last updated: Apr. 15, 2010

Issue	Issue Date	Provided By	Summary of the Issue
6	4/9/10	Jeff Kenward	<a href="#">OpenADE SD Core - Finalize ServiceSupplier and CustomerAuthorization</a>
7	4/9/10	Shawn Hu	<a href="#">OpenADE SD - which fields to use for IDs and links</a>
8	4/13/10	Steve Van Ausdall	<a href="#">OpenADE SD - Register, Certificate, and Test</a>
9	4/13/10	Steve Van Ausdall	<a href="#">Alignment of REST and WS</a>

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### 85 1 INTRODUCTION

86 Access to energy management resources is of paramount interest to consumers and Smart Grid service providers.  
87 In order to provide access to customer data, energy service providers can implement these reference best practice  
88 proposals and get access to early implementations. As the standards development organizations recommend  
89 alterations, stakeholders will decide how to handle these changes. If possible, all changes will be made as  
90 enhancements, so that existing implementations can continue to function or be upgraded independently of others.

91 OpenADE represents the internet data service provided by energy service providers. It is the goal of OpenSG to  
92 promote interoperability by providing an easy to use, simple set of commonly available technologies. Toward this  
93 end, our direction is to define XML formats for payload data that could be used with a resource oriented  
94 architecture.

95 Extensions to support on-demand access to resources using REST are contained in "OpenSG OpenADE SD – REST".  
96 This document is focused on common authorization, payload definition, and batch transfer of all resources  
97 updated since the last transfer.

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115 be complete, or that any claims in such list are, in fact, Essential Claims.

#### 116 1.1.2 CIM OBJECT MODELS

117 Information on the management of rights and governance for IEC can be found at the page below.

118 <http://www.iec.ch/tctools/patent-guidelines.htm>

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119 The recommendations herein build on work owned by the IEC. Required extensions identified in this  
120 recommendation will be submitted to the IEC, and will be tracked for inclusion in the model.

### 1.1.3 SERVICE RESOURCE DEFINITIONS

122 If necessary, UCAIug is willing to work with standards development organizations to incorporate additional aspects  
123 of this recommendation into a standard, including the specification of how to use profiled (restricted) CIM objects  
124 within a RESTful HTTP environment, and possibly the resource definitions themselves.

## 1.2 REFERENCED SPECIFICATIONS

- 126 • [1] OpenADE B&UR 1.0 -  
127 [http://osgug.ucaiug.org/sghsystems/OpenADE/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%](http://osgug.ucaiug.org/sghsystems/OpenADE/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsgsystems%2fOpenADE%2fShared%20Documents%2fBusiness%20and%20User%20Requirements)  
128 [2fsgsystems%2fOpenADE%2fShared%20Documents%2fBusiness%20and%20User%20Requirements](http://osgug.ucaiug.org/sghsystems/OpenADE/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsgsystems%2fOpenADE%2fShared%20Documents%2fBusiness%20and%20User%20Requirements)
- 129 • [2] OpenADE SRS 1.0 -  
130 [http://osgug.ucaiug.org/sghsystems/OpenADE/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%](http://osgug.ucaiug.org/sghsystems/OpenADE/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsgsystems%2fOpenADE%2fShared%20Documents%2fSRS)  
131 [2fsgsystems%2fOpenADE%2fShared%20Documents%2fSRS](http://osgug.ucaiug.org/sghsystems/OpenADE/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsgsystems%2fOpenADE%2fShared%20Documents%2fSRS)
- 132 • [3] IEC CIM (TC 57 61968/61970) - <http://tc57.iec.ch>
- 133 • [4] OAuth - <http://tools.ietf.org/html/draft-hammer-oauth-10>

## 1.3 REFERENCED GUIDANCE

- 136 • [G1] 3PDA – Security Profile for Third Party Data Access (ASAP-SG)  
137 [http://osgug.ucaiug.org/utilisec/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2futilisec%2f](http://osgug.ucaiug.org/utilisec/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2futilisec%2fShared%20Documents%2fThird%20Party%20Data%20Access%20Security%20Profile)  
138 [hared%20Documents%2fThird%20Party%20Data%20Access%20Security%20Profile](http://osgug.ucaiug.org/utilisec/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2futilisec%2fShared%20Documents%2fThird%20Party%20Data%20Access%20Security%20Profile)
- 139 • [G2] OpenSG OpenADE SD – REST Extensions  
140 [http://osgug.ucaiug.org/sghsystems/OpenADE/Shared%20Documents/Service%20Definition/OpenADE%20](http://osgug.ucaiug.org/sghsystems/OpenADE/Shared%20Documents/Service%20Definition/OpenADE%201.0%20Service%20Definition/OpenSG%20OpenADE%20SD%20-%20REST%20v0.8.doc)  
141 [1.0%20Service%20Definition/OpenSG%20OpenADE%20SD%20-%20REST%20v0.8.doc](http://osgug.ucaiug.org/sghsystems/OpenADE/Shared%20Documents/Service%20Definition/OpenADE%201.0%20Service%20Definition/OpenSG%20OpenADE%20SD%20-%20REST%20v0.8.doc)

## 1.4 NAMESPACES

143 The subject of namespaces is important, because the namespace identifies the domain managing the definitions of  
144 protocol resources and formats. OpenSG proposes to use the namespace below.

145 `http://osgug.ucaiug.org/ns/2010/oade`

146 Namespaces already defined elsewhere and used directly within reference service definitions will remain where  
147 they are, and will reference the identified body.

148

## 2 RESOURCES

150 Some of the design decisions are being driven by the desire to make it possible to provide a RESTful interface for  
151 the available data objects. Specifically, each object resource uses a unique URI as an identifier (mRID). Eventually,

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152 this may be used to access those resources. However, for now they should be thought of simply as unique  
153 identifiers.

154 Since this document is the first to define the general-purpose conventions, several resources were identified to  
155 allow consumers to gain access to the resources they want. These are listed below.

- 156 • **Registration** – To request access to the services
- 157 • **Certificate** – To enable encryption and complete registration
- 158 • **Test** – To test credentials for protected access
- 159
- 160 • **Authorization** – To exchange tokens for authorizations
- 161 • **AccessToken** – To get authorized request token
- 162 • **Notification** – To get notifications of updates

163 In addition, the following “data” resources are currently in scope, as defined in [1] OADE-B&UR and [2] OADE-SRS.  
164 They will be delivered via the client Notification service in a set of (chunked) batch XML files.

- 165 • **MeterReading** – Represents a collection of readings associated with a specific user key and meter point
  - 166 ○ **IntervalReading** – A durational measurement
  - 167 ○ **Reading** – An instantaneous measurement
- 168 • **ReadingType** – Represents a type of reading (e.g. hourly kWh) used by a MeterReading
- 169 • **ServiceSupplier** – The supplier of energy service
- 170 • **CustomerAuthorisation** – Represents the agreement to share data with the 3<sup>rd</sup> Party
- 171 • **ServiceDeliveryPoint** – The point at which the meter takes readings
- 172

## 173 2.1 SECURITY

174 Because these services define resources that could be used to cause damage, access must be restricted to only  
175 those data objects that have been authorized. The security guidance specified in [G1] 3PDA is addressed through  
176 the use of [4] Open Authorization, which is proposed as the method for requesting and acquiring these  
177 authorizations.

178 Implementers can support other mechanisms, as long as the result of the process is a shared key associated with  
179 user-specific resources.

### 180 2.1.1 AUTHENTICATION

181 Authentication is a process through which an identity is proven. Users may have an identity at each domain  
182 involved in sharing their data, or they may use a federated identity managed at a separate domain. These  
183 identities are associated at each domain with specific authorizations. OpenADE does not require a specific method  
184 for authentication, but does require an authentication method that provides a reliable, secure way for customers  
185 to protect access to their information.



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### 186 2.1.2 AUTHORIZATION

187 Authorization is the process of requesting and granting access to protected user resources. OpenADE shall conform  
 188 to [4] OAuth as the primary method, to allow for the creation and management of revocable user-resource-specific  
 189 access keys. Consumer Request Parameters shall be passed in the HTTP Authorization header as defined by the  
 190 [OAuth HTTP Authorization Scheme](#).

### 191 2.2 MESSAGE DOCUMENT FORMAT

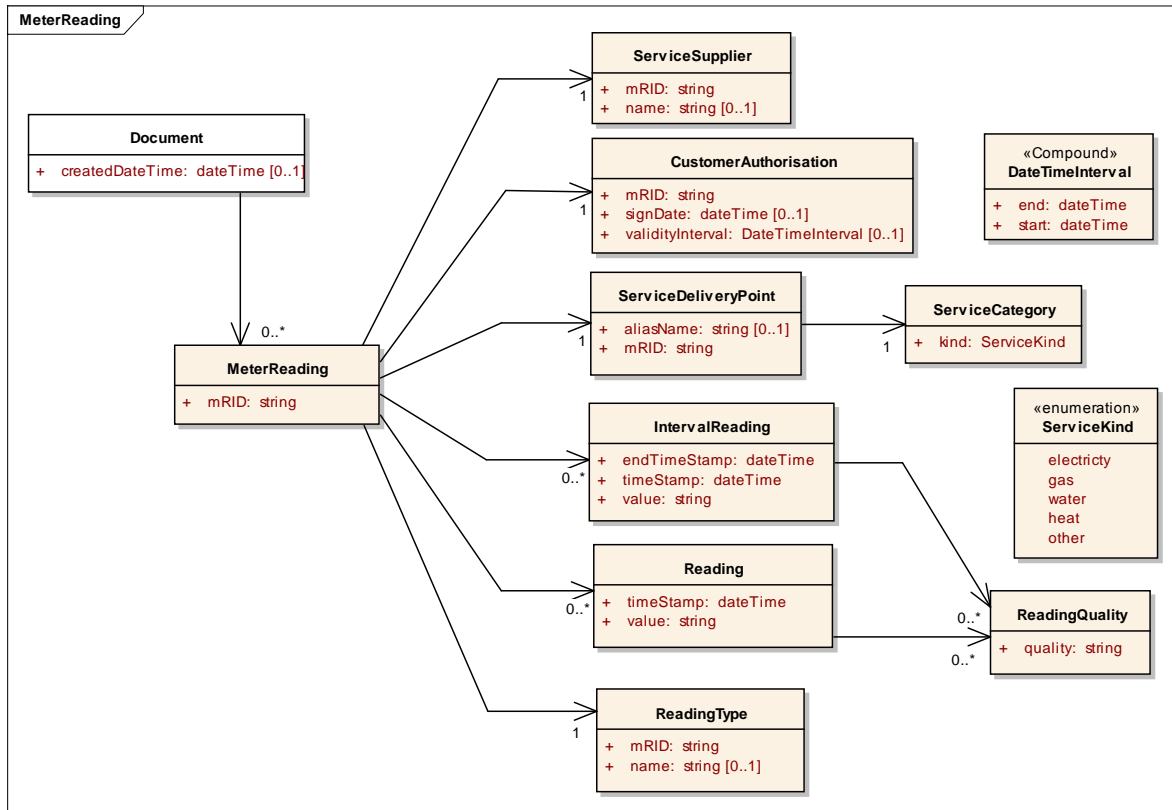
192 “Message document” refers to the type of XML returned by resource requests. This initial release of OpenADE uses  
 193 CIM-based XML, according to the schema provided.

### 194 2.3 PAYLOAD ENTITIES

195 Payload entities will conform to the message document schema. They will contain an XML schema representation  
 196 of CIM classes.

197 The batch payload defined allows a number of object instances to be included in a single transfer. Subscription will  
 198 be automatic, based on the resources authorized by the user.

199 A logical view of the schema for the initial payload structure is shown below. An XSD is provided as well in  
 200 Appendix A. The model is also posted to the OpenADE Sharepoint.



201

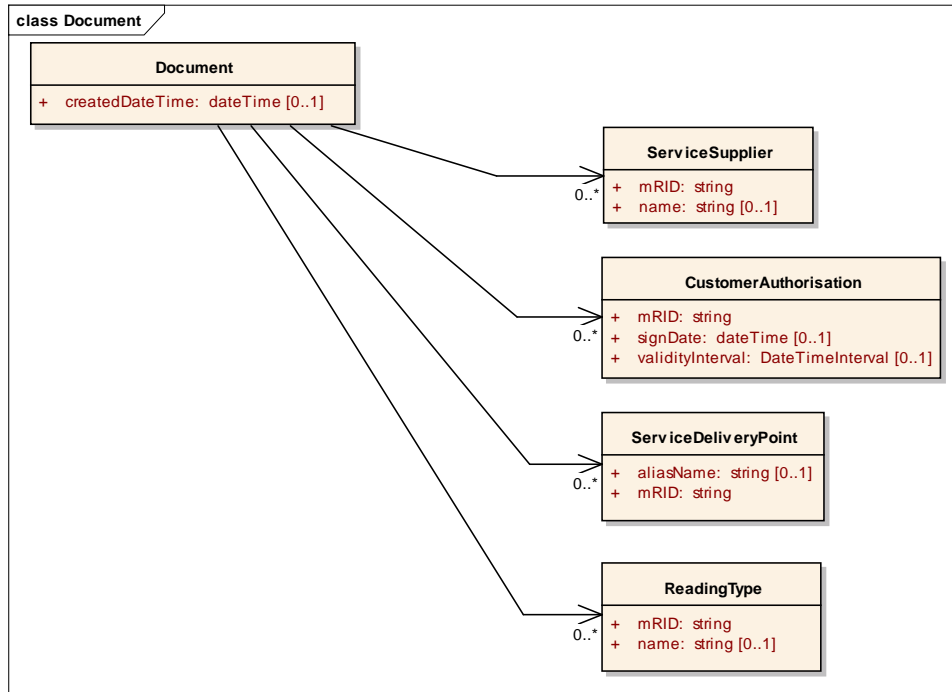
202

Figure 1: Batch Payload Logical UML Data Model Diagram

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203 In addition, the schema supports sending the following objects directly under Document, for updates to  
204 authorizations and other purposes.



205

206

Figure 2: Additional Options for Batch Payload UML Data Model Diagram

207

### 208 2.3.1 RESOURCES

209 Domain data objects build on the IEC CIM model. In general, resources will be named using the CIM class. For  
210 listings of fields, see the details for each resource, defined in Section 10.

211 The example uses the “fully expanded” style, with containment. Note that each “MeterReading” is associated with  
212 only one ReadingType, so will only contain IntervalReadings or Readings, not both. The schema can also be used to  
213 send only the atomic elements (identifiedObjects) that have changed, with references (mRID) in MeterReading.

214 An example is shown below.

215

```
216 <?xml version="1.0" encoding="UTF-8"?>
217 <Document xmlns="http://osgug.ucaiug.org/ns/2010/oade">
218   <createdDateTime>2001-12-18T09:30:47Z</createdDateTime>
219   <MeterReading>
220     <mRID>3456</mRID>
221     <IntervalReading>
222       <timeStamp>2001-12-17T09:30:47Z</beginTimeStamp>
223       <endTimeStamp>2001-12-17T10:30:47Z</endTimeStamp>
224       <value>3.14</value>
225     </IntervalReading>
226     <IntervalReading>
227       <timeStamp>2001-12-17T10:30:47Z</beginTimeStamp>
228       <endTimeStamp>2001-12-17T11:30:47Z</endTimeStamp>
229       <value>3.2</value>
230     </IntervalReading>
```

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```
231     <ReadingType>
232         <mRID>7.6.7.1.0.12.0.0.0.3.72</mRID>
233         <name>Hourly Interval Delivered Energy (kWh)</name>
234     </ReadingType>
235     <CustomerAuthorisation>
236         <mRID>23049857203</mRID>
237         <signDate>2001-11-16T09:30:47Z</signDate>
238         <validityInterval>
239             <end>2002-11-17T09:30:47Z</end>
240             <start>2000-11-17T09:30:47Z</start>
241         </validityInterval>
242     </CustomerAuthorisation>
243     <ServiceSupplier>
244         <mRID>utility.com</mRID>
245         <name>Utility Company</name>
246     </ServiceSupplier>
247     <ServiceDeliveryPoint>
248         <aliasName>My House</aliasName>
249         <mRID>98374</mRID>
250         <ServiceCategory>
251             <kind>electricity</kind>
252         </ServiceCategory>
253     </ServiceDeliveryPoint>
254 </MeterReading>
255 </Document>
256
```

### 257 3 PATTERNS

258 This section contains guidance and decisions on how message exchanges flow for the general scenarios below.

#### 259 3.1 EVENT NOTIFICATION (PUB/SUB)

260 The publish / subscribe pattern is incredibly useful, and is used as the only delivery method. Clients will  
261 automatically be subscribed to user data as specified during authorization, and server will deliver via client  
262 Notification.

#### 263 3.2 BATCH TRANSFERS

264 A file for each data service consumer shall be provided, through which all subscribed content will be returned in a  
265 single transfer (or series of large chunks). This mechanism allows any resource type to be included within a single  
266 file.

### 267 4 DISCOVERY

268 Discovery of available resources is not specified in this document. REST and WS profiles may include the ability to  
269 retrieve the list of supported operations and/or resource types, and allow clients to request authorization for  
270 those they support.

### 271 5 METADATA

272 No metadata publication is specified in this document, but REST and WS profiles may include this information.

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### 273 6 EXTENSIBILITY

274 Extensions to the CIM objects will be associated with specific versions of the namespace, specified in the version  
275 attribute of the schema element. However, schemas will not be backwards and forwards compatible. Clients could  
276 choose to ignore XML elements that are not recognized. Clients will need to be updated in order to accept new  
277 schema elements in future versions.

### 278 7 VERSIONING

279 As additional capabilities are added to the interface definition, the minor version number of the definition will be  
280 incremented.

```
281 <xs:schema targetNamespace="http://osgug.ucaiug.org/ns/2010/oade"  
282 xmlns:m="http://osgug.ucaiug.org/ns/2010/oade" xmlns:xs="http://www.w3.org/2001/XMLSchema"  
283 elementFormDefault="qualified" version="1.0">
```

### 284 8 CONCURRENCY

285 No data shall be directly editable by clients, so concurrency controls are not included in this document.

### 286 9 FUNCTIONAL AREAS

#### 287 9.1 COMMON

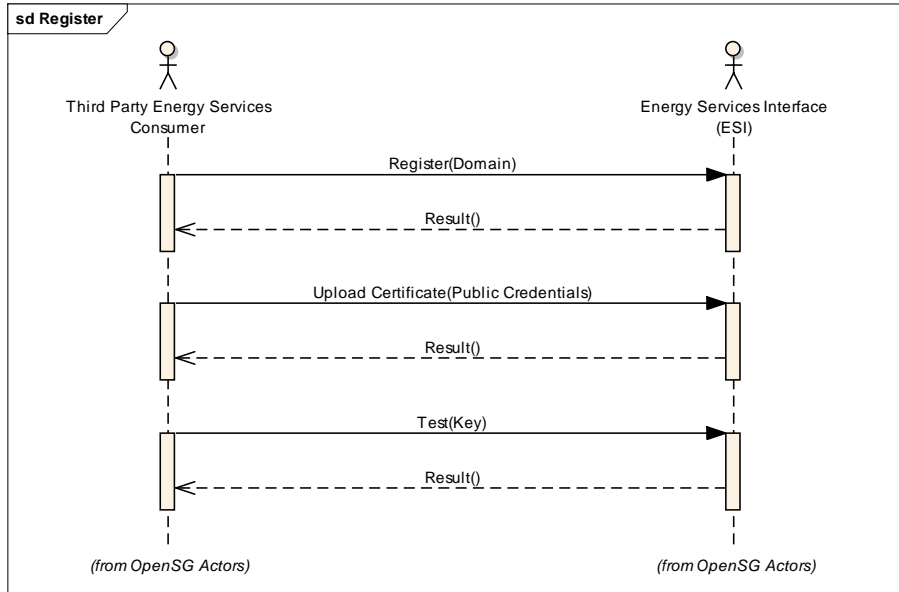
288 The flows in this section represent general-purpose functions that are needed for all protected resource  
289 publications.

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290 9.1.1.1 **REGISTER** - (SEQUENCE DIAGRAM)

291 Addresses OpenSG OpenADE 1.0 SRS 3.2.1, bullet 1.1

292 *Note that this flow may be moved to a future revision based on the resolution of Issue # 8. If it is removed, these*  
293 *steps would need to be handled using manual processes to configure each 3<sup>rd</sup> Party.*



294

295

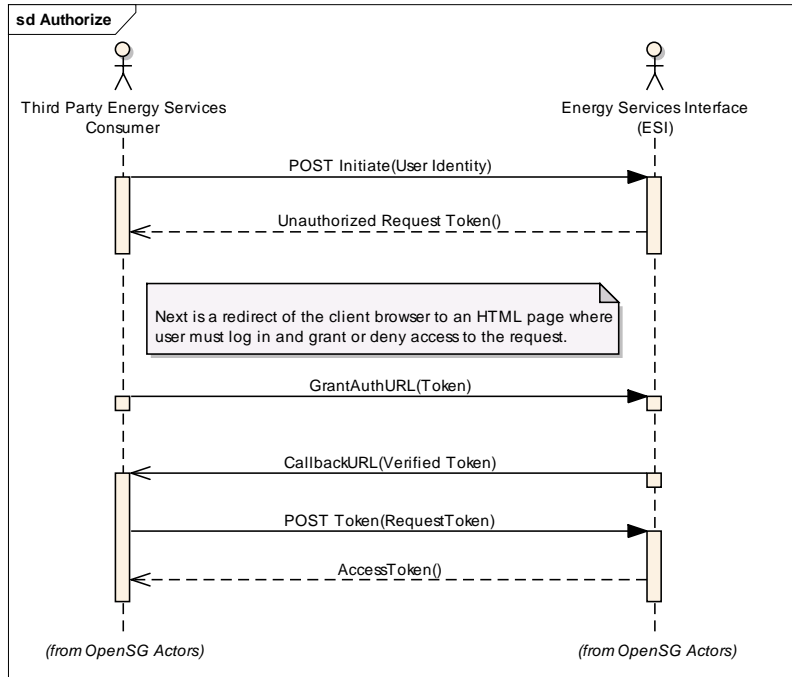
**Figure 3: Register Sequence Diagram**

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296 **9.1.2 AUTHORIZE - (SEQUENCE DIAGRAM)**

297 Addresses OpenSG OpenADE 1.0 SRS 3.2.1, bullet 2.1



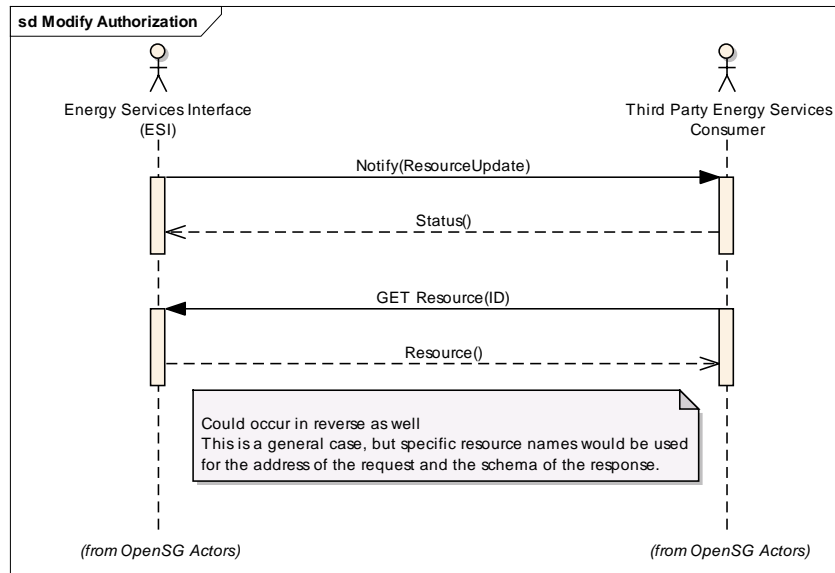
298

299

Figure 4: Authorize Sequence Diagram

300 **9.1.3 MODIFY AUTHORIZATION - (SEQUENCE DIAGRAM)**

301 Addresses OpenSG OpenADE 1.0 SRS 3.2.1, bullet 2.2, 2.3



302

303

Figure 5: Modify Authorization Sequence Diagram

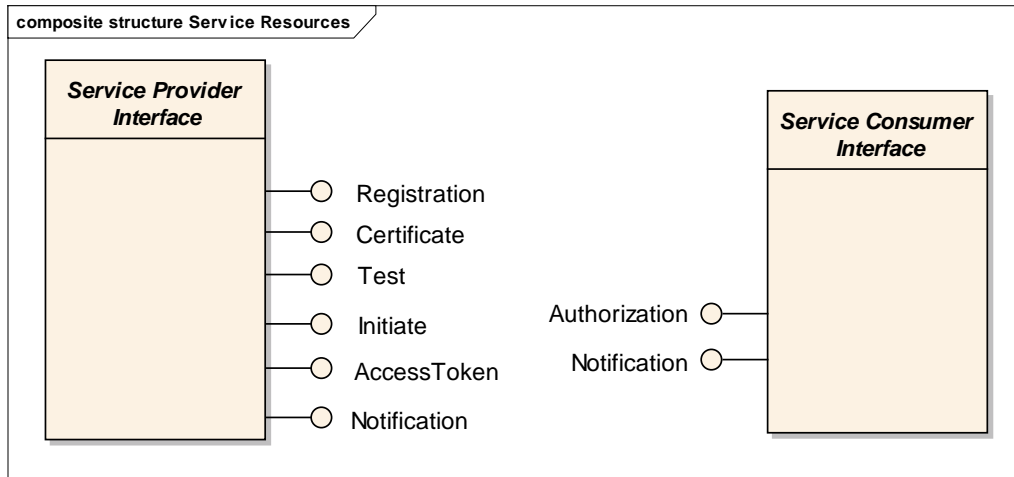
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### 304 9.2 METERING CONSUMPTION

### 305 10 RESOURCE DEFINITIONS

306 The following diagram provides an overview of the service resources defined. Of course, the service consumer also  
 307 has to implement client requests for required interfaces, in order to access the resources provided by the provider.



308

309

Figure 6: Service Resource Interfaces

310 The following table lists the resources defined for OpenADE.

Logical Resource Name	Consumer Operation	Implementer	Description
Register	Registration	Utility	Register domain for access to services
Certificate	Certificate	Utility	Transfer public credentials to secure subsequent requests
Test	Test	Utility	Test access using security key
Auth Request Token	Initiate	Utility	Get an unauthorized request token
Auth Authorization	Authorization	3rd Party	Post the signed authorization for associated token
Auth Access Token	AccessToken	Utility	Get the authorized request token
Notification	Notification	Both	Get notifications such as user modified authorization

311

Table 1: Resource Operations

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### 312 10.1 RESOURCE DETAILS

313 Many of the resources below are necessary to support initial setup and authorization. Implementations shall  
314 conform to referenced specifications for details on these interfaces. Clarifications and refinements made to  
315 support these service resources are denoted where necessary.

#### 316 10.1.1 REGISTRATION

317 The registration resource allows 3<sup>rd</sup> Party consumers to register their domain for access to services. Until  
318 registered and accepted, requests to service resources will be denied.

Schema	Use	Element
Registration	POST Input	Domain

#### 319 10.1.2 CERTIFICATE

320 The Certificate resource allows 3<sup>rd</sup> Parties to securely upload their public credentials, which are required for  
321 subsequent requests.

Schema	Use	Element
Certificate	POST Input	Certificate

#### 322 10.1.3 TEST

323 This is a protected resource to be used to verify and test credentials and setup of secure channels.

Schema	Use	Element
Test	GET Input	Key
Test	GET Input	Resource
Test	GET Output	Status Code

#### 324 10.1.4 INITIATE

325 Initiate is used to request an unauthorized request token. The exact format and specifics of this exchange are  
326 covered in [4] OAuth.

Schema	Use	Element
Initiate	Input	Realm
Initiate	Input	oauth_consumer_key
Initiate	Input	oauth_signature_method
Initiate	Input	oauth_timestamp
Initiate	Input	oauth_nonce
Initiate	Input	oauth_callback
Initiate	Input	oauth_signature
Initiate	Output	http_response_code
Initiate	Output	oauth_token
Initiate	Output	oauth_token_secret
Initiate	Output	oauth_callback_confirmed



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#### 327 10.1.5 AUTHORIZATION

328 This resource is used to post the signed authorization for the associated token to the 3<sup>rd</sup> Party. The exact format  
329 and specifics of this exchange are covered in [4] OAuth.

Schema	Use	Element
Authorization	Input	oauth_token
Authorization	Input	oauth_verifier

#### 330 10.1.6 ACCESS TOKEN

331 This resource allows the 3<sup>rd</sup> Party to get the authorized request token. A different key is created for each  
332 authorized resource, so in the case of Meter Readings, individual service point channels would have separate keys.  
333 The exact format and specifics of this exchange are covered in [4] OAuth.

334 After this permanent access token has been exchanged, the resources granted to the named 3<sup>rd</sup> party shall be  
335 added to their subscription, and all unspent authorized data shall be transferred in subsequent batch files.

336 The user should also be notified that this access token request is complete, and provide a link to the authorization  
337 page.

Schema	Use	Element
AccessToken	Output	Realm
AccessToken	Output	oauth_consumer_key
AccessToken	Output	oauth_token
AccessToken	Output	oauth_signature_method
AccessToken	Output	oauth_timestamp
AccessToken	Output	oauth_nonce
AccessToken	Output	oauth_verifier
AccessToken	Output	oauth_signature

#### 338 10.1.7 METER READING

339 This data resource represents a collection of readings, related to a specific channel at a specific service delivery  
340 point. Meters may provide readings of different values, such as KWh and Voltage. Each could be authorized  
341 separately or as a group by the user. Individual meter readings are represented by Meter Readings, which can be a  
342 value measured over a specified time interval, or an instantaneous reading.

343 The MeterReading structure presented here is based on the schema developed within IEC 61968-9, however it is  
344 not directly compatible, due to the need for some additional data elements.

Schema	Element	Description
Notification (Consumption)	Document	Parent class for different groupings of information collected and managed as a part of a business process. It will frequently contain references to other objects, such as assets, people and power system resources.
Document	createdDateTime	Date and time that this document was created.
Document	MeterReading	Set of values obtained from the meter.
MeterReading	mRID	Meter reading identifier
MeterReading	Reading	Specific value measured by a meter or other asset. Each Reading is associated with a specific ReadingType.

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Schema	Element	Description
Reading	timeStamp	The date and time of a reading
Reading	value	Value in type of string
Reading	ReadingQuality	Quality of a specific reading value or interval reading value. Note that more than one Quality may be applicable to a given Reading. Typically not used unless problems or unusual conditions occur (i.e., quality for each Reading is assumed to be 'Good' unless stated otherwise in associated ReadingQuality).
ReadingQuality	quality	
MeterReading	IntervalReading	Data captured at regular intervals of time. Interval data could be captured as incremental data, absolute data, or relative data. The source for the data is usually a tariff quantity or an engineering quantity. Data is typically captured in time-tagged, uniform, fixed-length intervals of 5, 10, 15, 30, or 60 minutes.  Note: Interval Data is sometimes also called "Interval Data Readings" (IDR).
IntervalReading	timeStamp	The beginning date and time of an interval reading
IntervalReading	endTimeStamp	The ending date and time of an interval reading
IntervalReading	value	Value in type of string
IntervalReading	ReadingQuality	
MeterReading	ReadingType	Type of data conveyed by a specific Reading.
ReadingType	mRID	From IEC TC57 61968-9 Annex C.3.1 [...] This result is to have a Name with 11 fields: (sample values for Instantaneous demand) 1. TimeAttribute (=12 instantaneous) 2. DataQualifier (=0 n/a) 3. AccumulationBehaviour (=6 indicating) 4. FlowDirection (=1 forward) 5. UomCategorySubclass (=0 n/a) 6. UomCategoryIndex (=8 demand) 7. MeasurementCategory (=0.0 n/a) 8. Enumeration 9. Phase (=0 n/a to all phases) 10. Multiplier (=3 kilo) 11. UnitOfMeasure (=38 w)
ReadingType	name	Name of a reading type such as daily consumption
MeterReading	CustomerAuthorization	Holds an authorization for access to specific user-private data granted to a 3rd Party service provider. [OpenADE Extension]
CustomerAuthorisation	mRID	A unique identifier of the CustomerAuthorisation
CustomerAuthorisation	signDate	Date this agreement was consumated among associated persons and/or organisations.
CustomerAuthorisation	validityInterval	Date and time interval this agreement is valid (from going into effect to termination).
validityInterval	start	Date and time that this interval started.
validityInterval	end	Date and time that this interval ended.
MeterReading	ServiceSupplier	Organisation that provides services to Customers.
ServiceSupplier	mRID	A unique identifier of the ServiceSupplier
MeterReading	ServiceDeliveryPoint	Logical point on the network where the ownership of the service changes hands. It is one of potentially many service points within a ServiceLocation, delivering service in accordance with a CustomerAgreement. Used at the place where a meter may be installed.
ServiceDeliveryPoint	aliasName	A name the customer has approved to share for this ServiceDeliveryPoint.
ServiceDeliveryPoint	mRID	A unique identifier of the ServiceDeliveryPoint
ServiceDeliveryPoint	ServiceCategory	Category of service provided to the customer.
ServiceCategory	kind	Kind of service.

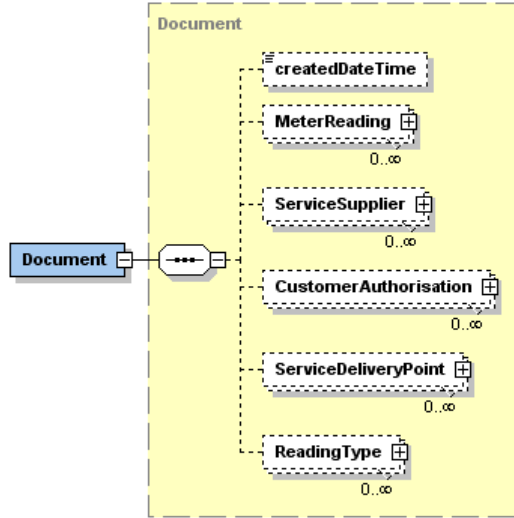
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Table 2: Batch Resources Schema Elements

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The CIM schema for this resource is shown below.

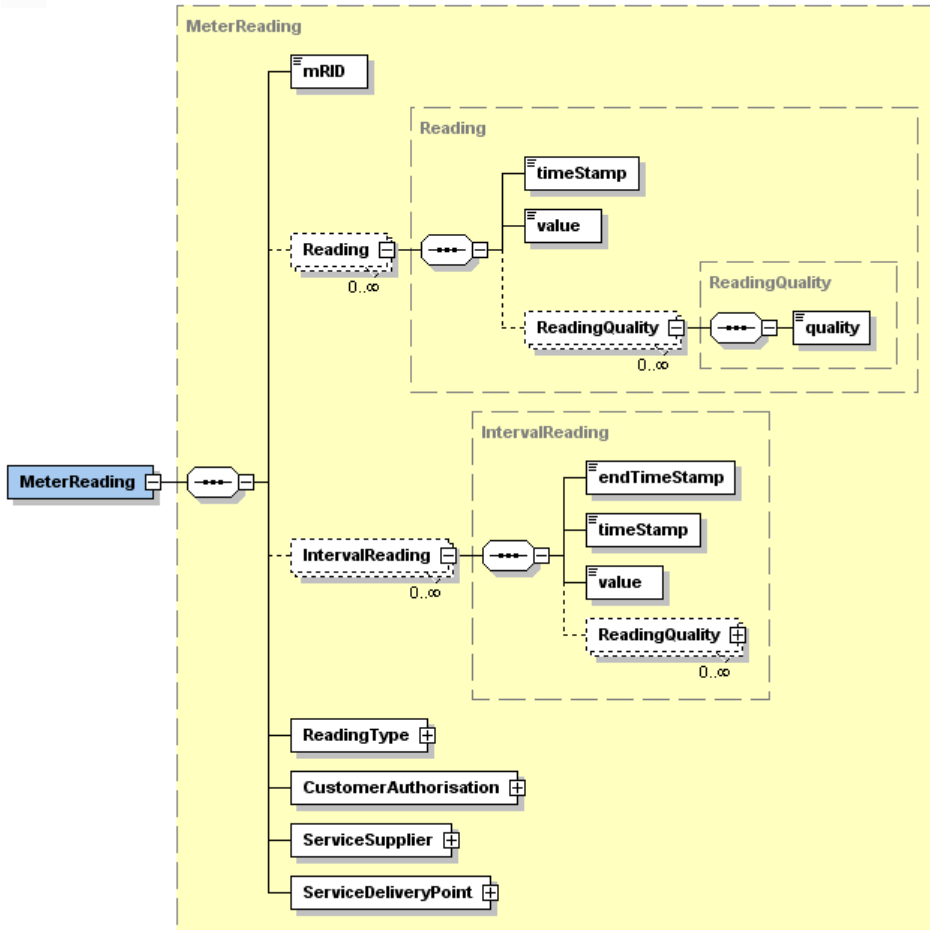
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Figure 7: Document Schema – Collapsed

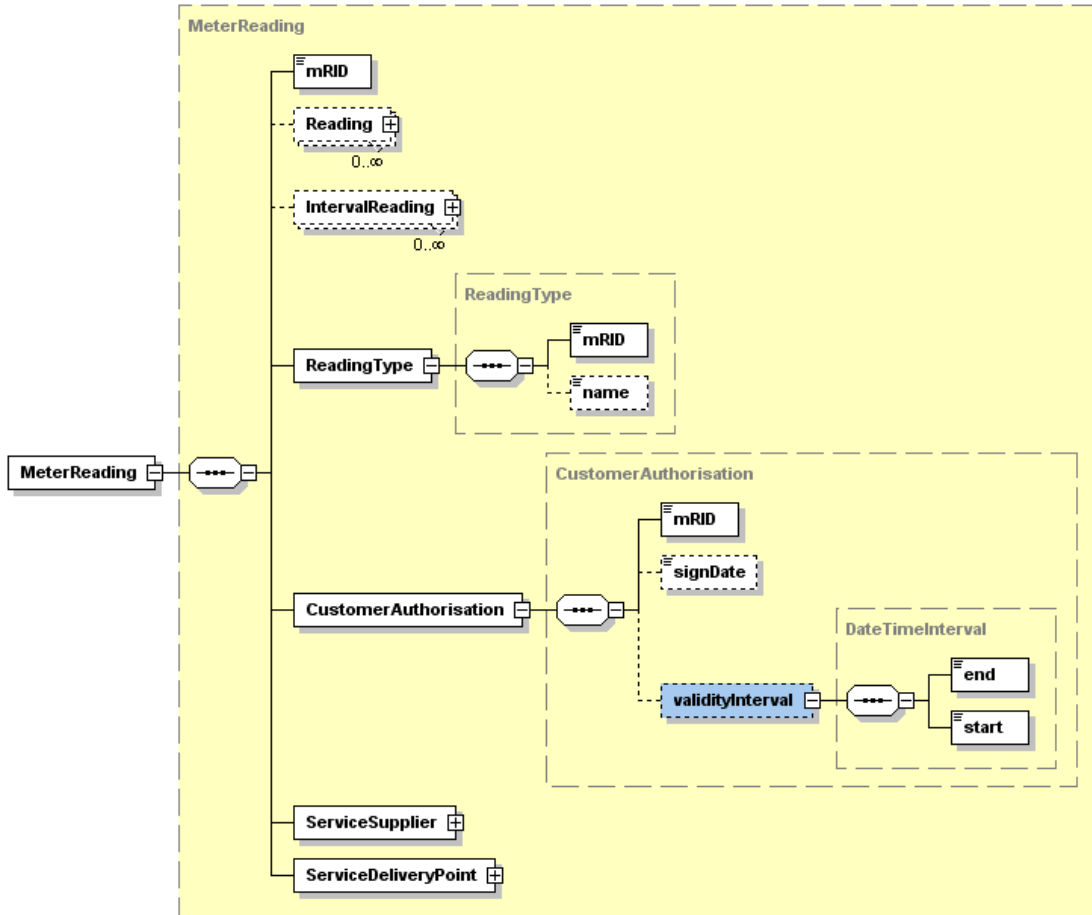


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Figure 8: MeterReading Schema – Expanded 1

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Figure 9: MeterReading Schema – Expanded 2

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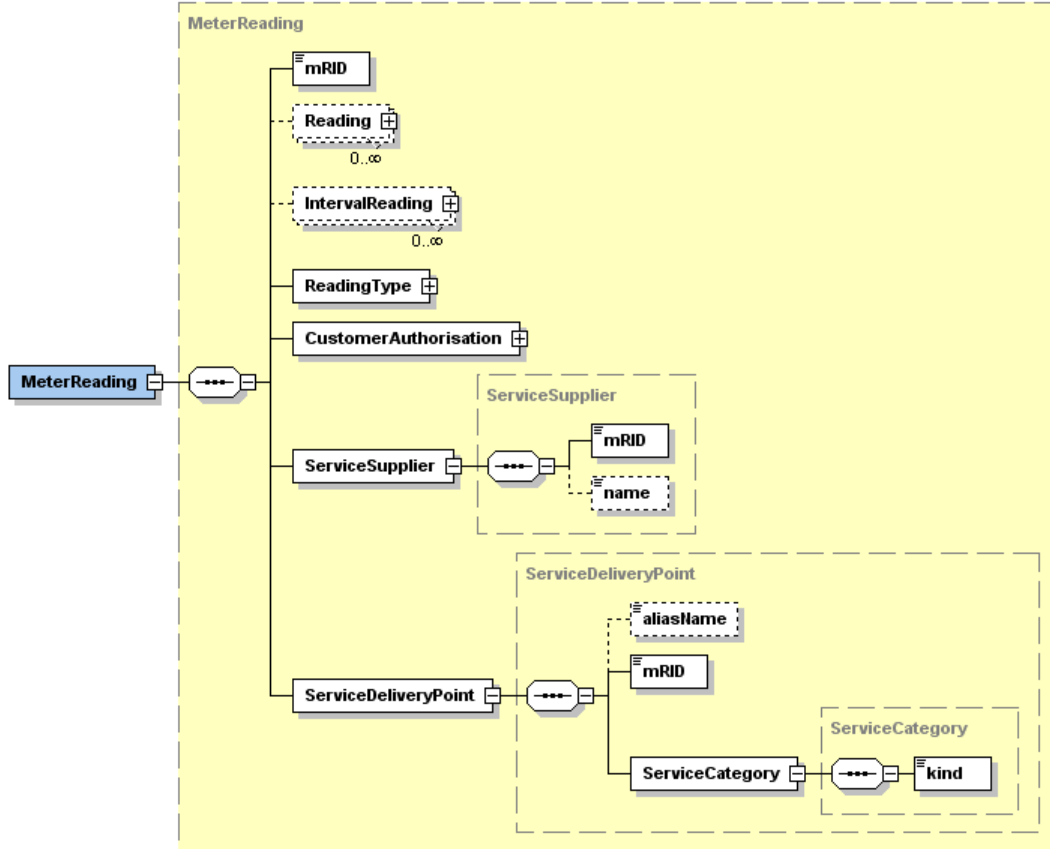


Figure 10: MeterReading Schema – Expanded 3

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356 **10.1.8 NOTIFICATION**

357 Notifications are to be used to announce the creation or modification of resources. Based on the design pattern  
 358 chosen for each information exchange, notification may or may not be required.

Schema	Use	Element
Notification	POST Input	Document

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**11 APPENDIX A**



**OpenADE SD Common.zip**

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