# OPENADE 1.0 SERVICE DEFINITION - CORE

*VERSION:* ***DRAFT V0.8***

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# Acknowledgements

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- Chad Maglaque from Microsoft
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- Mark Ortiz from Consumers Energy
- Shawn Hu from Xtensible Solutions / SCE
- Steve Van Ausdall from Xtensible Solutions / SCE

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# Document History

## Revision History

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| 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 |

## Open Issues Log

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|---|---|---|---|
| | | | |

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# 1 INTRODUCTION

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

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

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

## 1.1 RIGHTS / MANAGEMENT / GOVERNANCE

### 1.1.1 INTELLECTUAL PROPERTY RIGHTS

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### 1.1.2 CIM OBJECT MODELS

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

Information on the management of rights and governance can be found at the page below.
http://www.iec.ch/tctools/patent-guidelines.htm

### 1.1.3 SERVICE RESOURCE DEFINITIONS

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

## 1.2 REFERENCED STANDARDS

- [1] OpenADE B&UR 1.0 - http://osgug.ucaiug.org/sgsystems/OpenADE/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsgsystems%2fOpenADE%2fShared%20Documents%2fBusiness%20and%20User%20Requirements
- [2] OpenADE SRS 1.0 - http://osgug.ucaiug.org/sgsystems/OpenADE/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsgsystems%2fOpenADE%2fShared%20Documents%2fSRS
- [3] IEC CIM (TC 57 61968/61970) - http://tc57.iec.ch
- [4] OAuth - http://oauth.net/
- [5] HTTP(S) – IETF RFC 2616

## 1.3 REFERENCED GUIDANCE

- [G1] 3PDA – Security Profile for Third Party Data Access (ASAP-SG)
- [G2] OpenSG OpenADE SD – REST Extensions

## 1.4 NAMESPACES

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

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

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

# 2 RESOURCES

Some of the design decisions are being driven by the desire to make it possible to provide a RESTful interface for the available data objects. Specifically, each object resource uses a unique URI as an identifier (mRID). Eventually, this may be used to access those resources. However, for now they should be thought of simply as unique identifiers.

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

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

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

- **MeterReading** – Represents a collection of readings associated with a specific user key and meter point
- **ReadingType** – Represents a type of reading (e.g. hourly kWh) used by a MeterReading

## 2.1 SECURITY

Because these services define resources that could be used to cause damage, access must be restricted to only those data objects that have been authorized. [4] Open Authorization is proposed as the method for requesting and acquiring these authorizations. However, implementers can implement other mechanisms, as long as the result of the process is a shared key associated with user-specific resources.

### 2.1.1 AUTHENTICATION

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

### 2.1.2 AUTHORIZATION

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

## 2.2 STATUS / RETURN CODES

The normal HTTP ([5] RFC 2616) response codes are to be used

## 2.3 MESSAGE DOCUMENT FORMAT

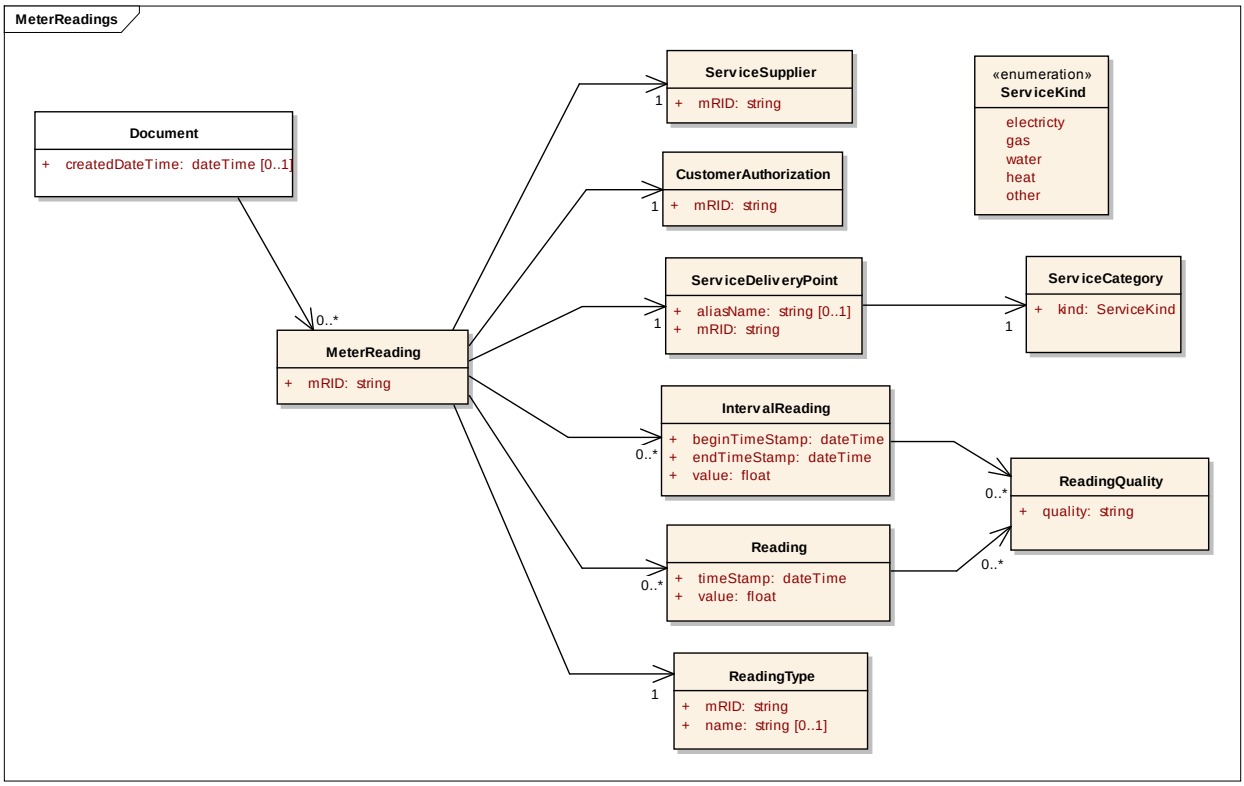
"Message document" refers to the type of XML returned by resource requests. This initial release of OpenADE uses CIM-based XML, according to the schemas provided.

## 2.4 PAYLOAD ENTITIES

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

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

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




### 2.4.1 RESOURCES

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

An example is shown below.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:Document xmlns:m="http://osgug.ucaiug.org/ns/2010/oade">
    <m:createdDateTime>2001-12-16T09:30:47Z</m:createdDateTime>
    <m:MeterReading>
        <m:mRID>3456</m:mRID>
        <m:IntervalReading>
            <m:beginTimeStamp>2001-12-17T09:30:47Z</m:beginTimeStamp>
            <m:endTimeStamp>2001-12-17T10:30:47Z</m:endTimeStamp>
            <m:value>3.14159E0</m:value>
        </m:IntervalReading>
        <m:IntervalReading>
            <m:beginTimeStamp>2001-12-17T10:30:47Z</m:beginTimeStamp>
            <m:endTimeStamp>2001-12-17T11:30:47Z</m:endTimeStamp>
            <m:value>3.14159E0</m:value>
        </m:IntervalReading>
        <m:ReadingType>
            <m:mRID>7.6.7.1.0.12.0.0.0.3.72</m:mRID>
            <m:name>Hourly Interval Delivered Energy (kWh)</m:name>
        </m:ReadingType>
        <m:CustomerAuthorization>
            <m:mRID>23049857203</m:mRID>
        </m:CustomerAuthorization>
        <m:ServiceSupplier>
            <m:mRID>utility.com</m:mRID>
        </m:ServiceSupplier>
        <m:ServiceDeliveryPoint>
            <m:aliasName>My House</m:aliasName>
            <m:mRID>98374</m:mRID>
            <m:ServiceCategory>
                <m:kind>electricty</m:kind>
            </m:ServiceCategory>
        </m:ServiceDeliveryPoint>
    </m:MeterReading>
</m:Document>
```

# 3 PATTERNS

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

## 3.1 CREATING, UPDATING, DELETING

The POST method is to be used for creation of new entries, PUT and DELETE are not used. Direct access to resources such as MeterReading could be implemented as in [G2] OpenADE SD - REST.

## 3.2 EVENT NOTIFICATION (PUB/SUB)

The publish / subscribe pattern is incredibly useful, and is used as the only delivery method. Clients will automatically be subscribed to user data as specified during authorization.

## 3.3 BATCH TRANSFERS

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

# 4 DISCOVERY

Discovery of available resources is not supported in this version. Subsequent releases may include the ability to retrieve the list of supported resource types, and allow clients to request authorization for those they support.

# 5 METADATA

No metadata publication is supported in this version.

# 6 EXTENSIBILITY

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

# 7 VERSIONING

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

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

# 8 CONCURRENCY

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

# 9 FUNCTIONAL AREAS

## 9.1 COMMON

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

### 9.1.1 REGISTER - (SEQUENCE DIAGRAM)

Addresses OpenSG OpenADE 1.0 SRS 3.2.1, bullet 1.1

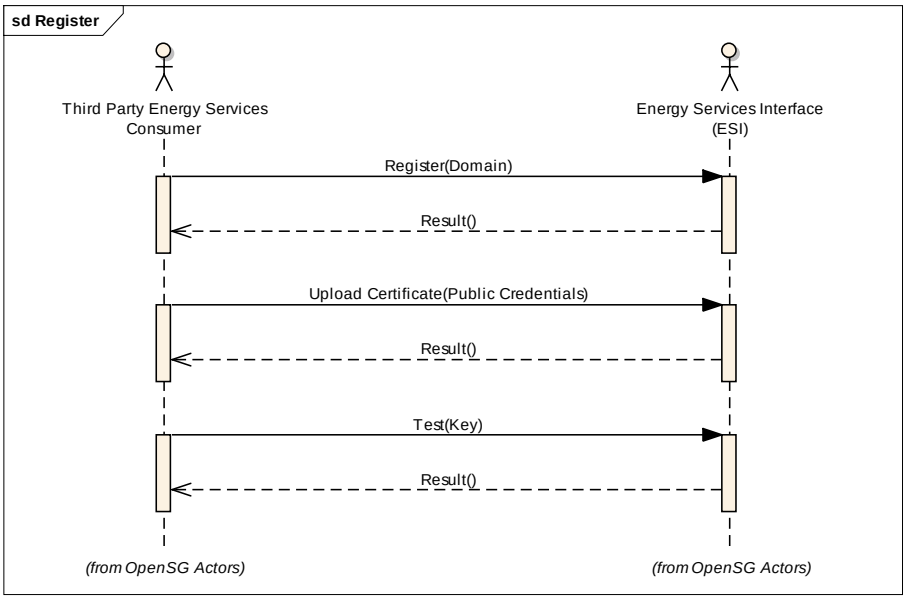



**Figure 1: Register Sequence Diagram**

### 9.1.2 AUTHORIZE - (SEQUENCE DIAGRAM)

Addresses OpenSG OpenADE 1.0 SRS 3.2.1, bullet 2.1

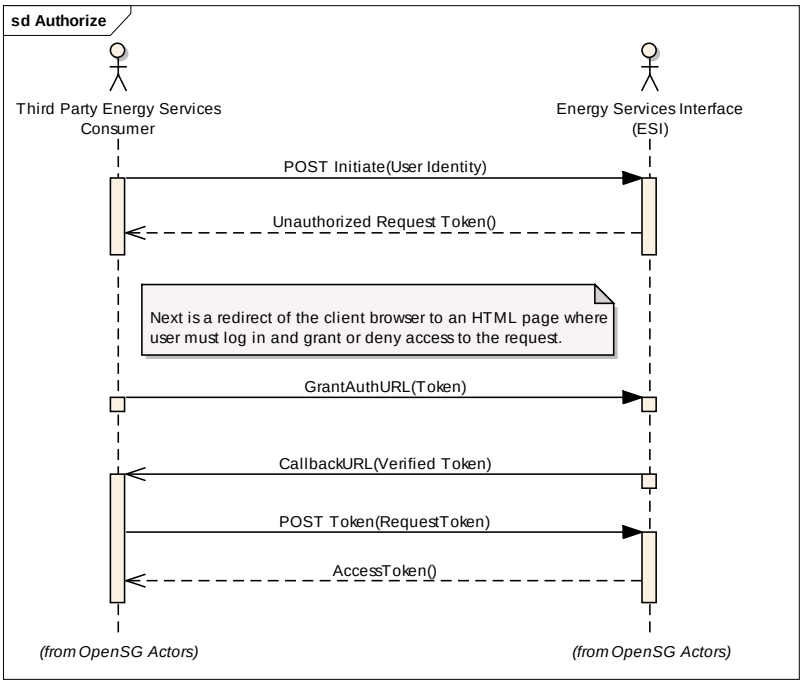



**Figure 2: Authorize Sequence Diagram**

### 9.1.3 MODIFY AUTHORIZATION - (SEQUENCE DIAGRAM)

Addresses OpenSG OpenADE 1.0 SRS 3.2.1, bullet 2.2, 2.3

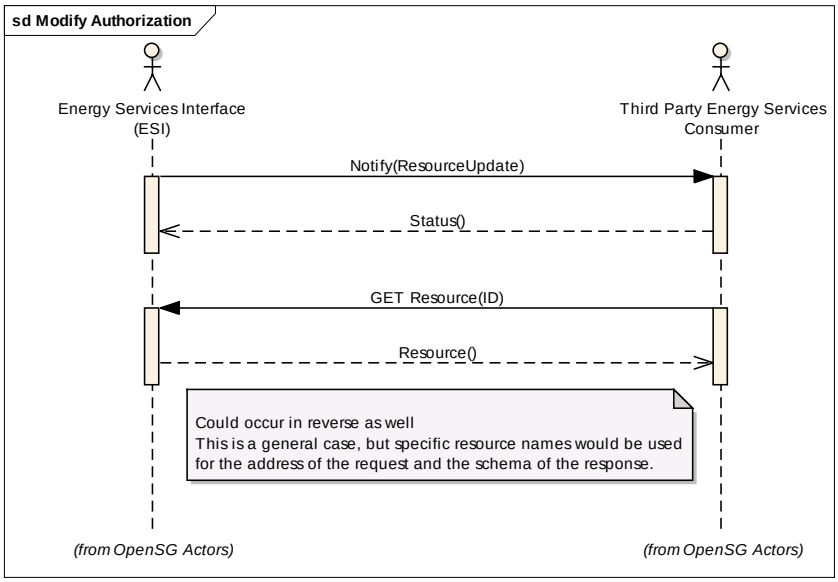



Figure 3: Modify Authorization Sequence Diagram

## 9.2 METERING CONSUMPTION

# 10 RESOURCE DEFINITIONS

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

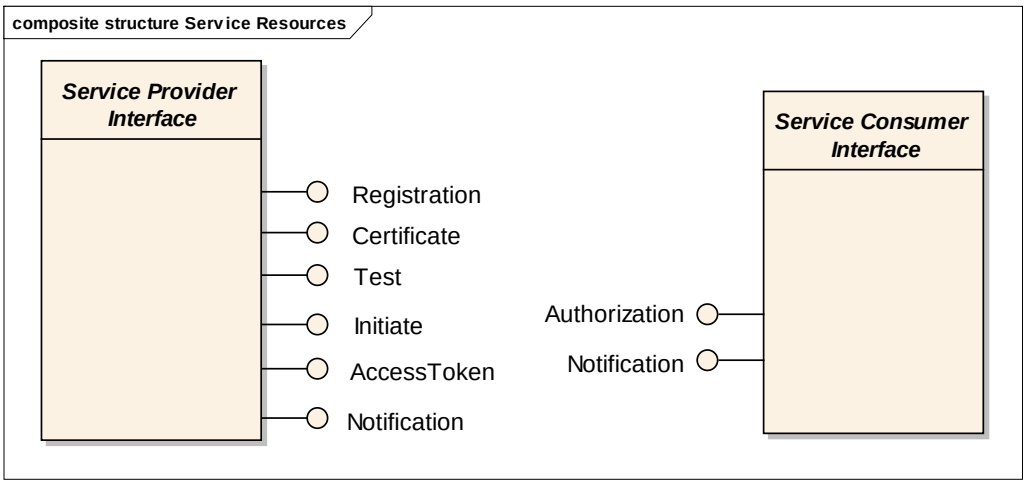



Figure 4: Service Resource Interfaces

The following table lists the resources defined for OpenADE.

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

## 10.1 RESOURCE DETAILS

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

### 10.1.1 REGISTRATION

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

| Schema | Use | Element |
|---|---|---|
| Registration | POST Input | Domain |

### 10.1.2 CERTIFICATE

The Certificate resource allows 3rd Parties to securely upload their public credentials, which are required for subsequent requests.

| Schema | Use | Element |
|---|---|---|
| Certificate | POST Input | Certificate |

### 10.1.3 TEST

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 |

### 10.1.4 INITIATE

Initiate is used to request an unauthorized request token.

| 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 |

### 10.1.5 AUTHORIZATION

This resource is used to post the signed authorization for the associated token to the 3rd Party.

| Schema | Use | Element |
|---|---|---|
| Authorization | Input | oauth_token |
| Authorization | Input | oauth_verifier |

### 10.1.6 ACCESS TOKEN

This resource allows the 3rd Party to get the authorized request token. A different key is created for each authorized resource, so in the case of Meter Readings, individual service point channels would have separate keys.

| 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 |

### 10.1.7 METER READING

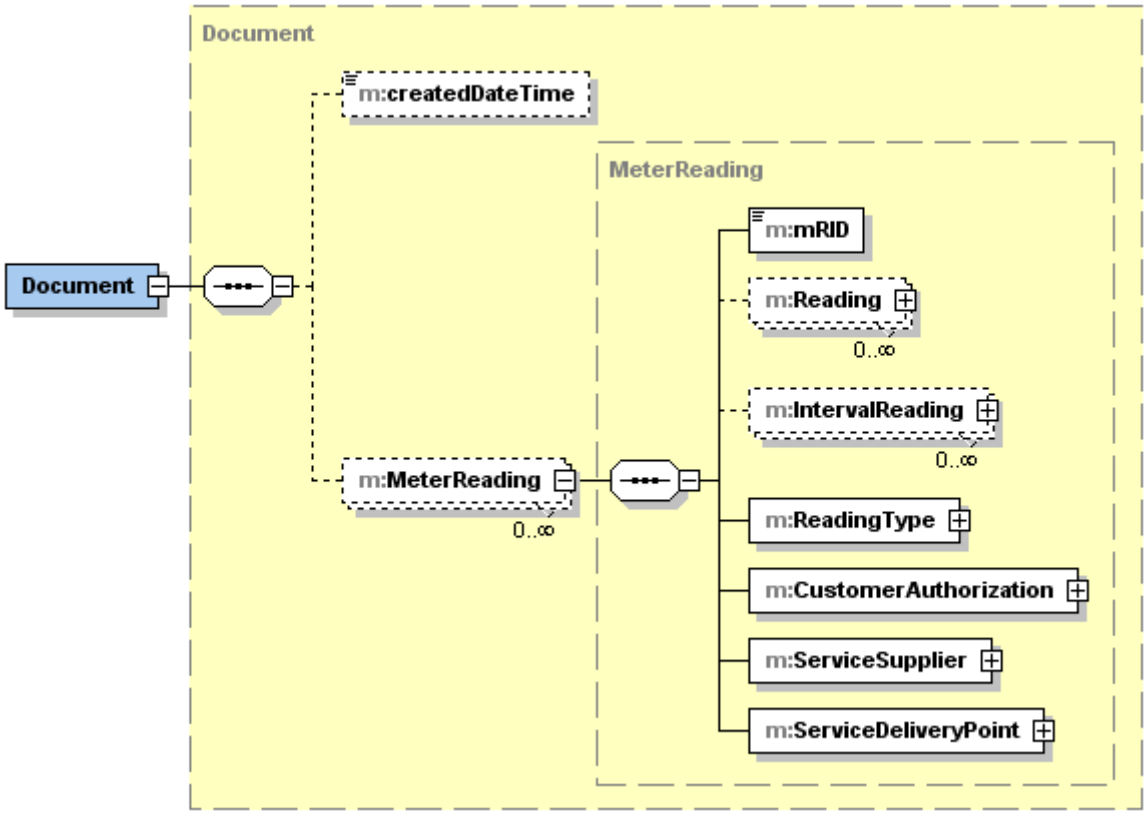
This data resource represents a collection of readings, related to a specific channel at a specific service delivery point. Meters may provide readings of different values, such as KWh and Voltage. Each could be authorized

separately or as a group by the user. Individual meter readings are represented by Meter Readings, which can be a value measured over a specified time interval, or an instantaneous reading.

| 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. |
| Reading | timeStamp | The date and time of a reading |
| Reading | value | Value in type of float |
| 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 unsed 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.<br><br>Note: Interval Data is sometimes also called "Interval Data Readings" (IDR). |
| IntervalReading | beginTimeStamp | 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 float |
| IntervalReading | ReadingQuality | |
| MeterReading | ReadingType | Type of data conveyed by a specific Reading. |
| ReadingType | mRID | From IEC TC57 61968-9 Annex C.3.1<br>[…] This result is to have a Name with 11 fields: (sample values for Instantaneous demand)<br>1. TimeAttribute (=12 instantaneous)<br>2. DataQualifier (=0 n/a)<br>3. AccumlationBehaviour (=6 indicating)<br>4. FlowDirection (=1 forward)<br>5. UomCategorySubclass (=0 n/a)<br>6. UomCategoryIndex (=8 demand)<br>7. MeasurementCategory (=0.0 n/a)<br>8. Enumeration<br>9. Phase (=0 n/a to all phases)<br>10. Multiplier (=3 kilo)<br>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] |
| CustomerAuthorization | mRID | A unique identifier of the CustomerAuthorization |
| 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 |

| Schema | Element | Description |
|---|---|---|
| ServiceDeliveryPoint | ServiceCategory | Category of service provided to the customer. |
| ServiceCategory | kind | Kind of service. |

1 The CIM schema for this resource is shown below.




2

3 Figure 5: MeterReading Schema – Collapsed

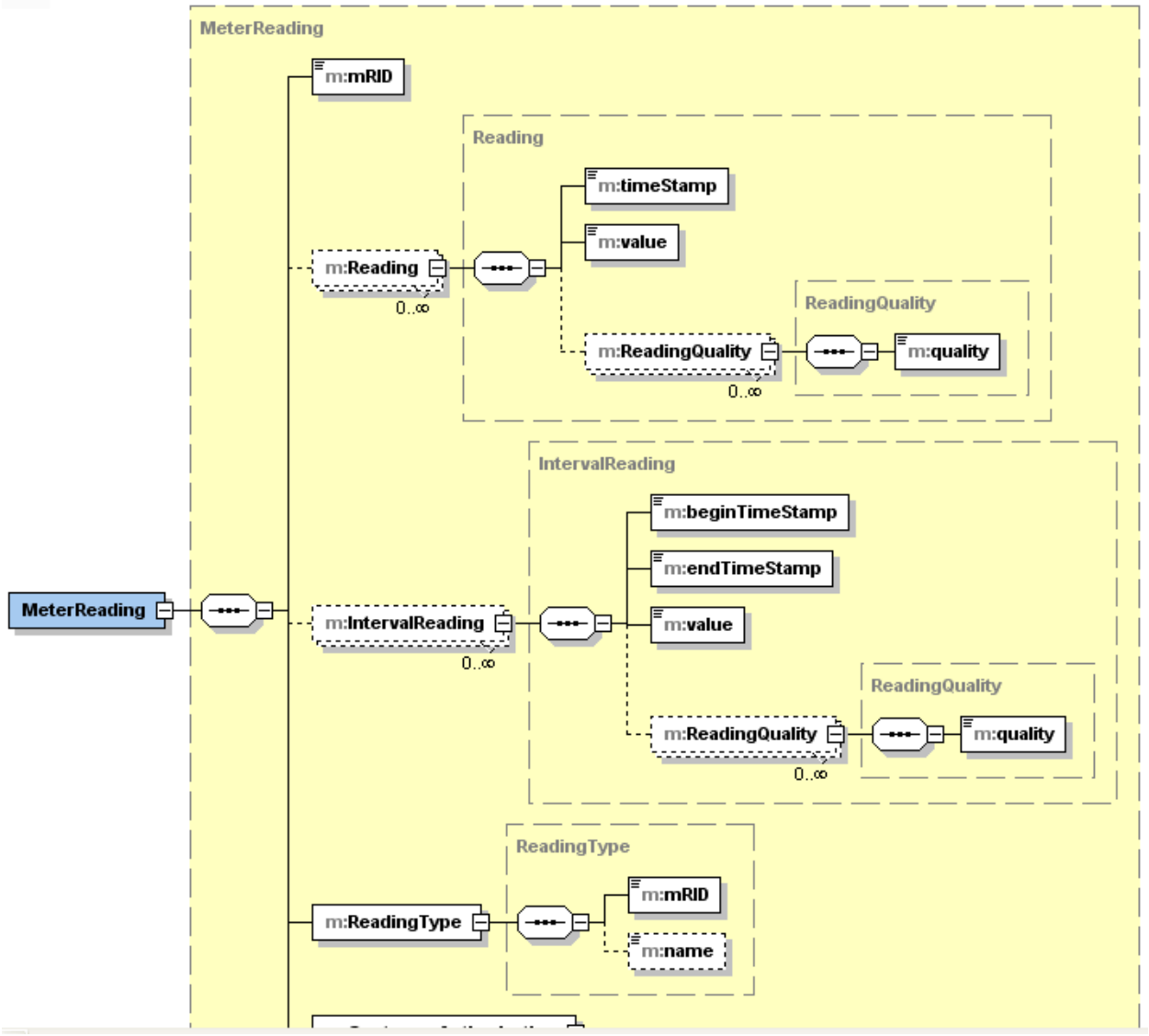



Figure 6: MeterReading Schema – Expanded 1

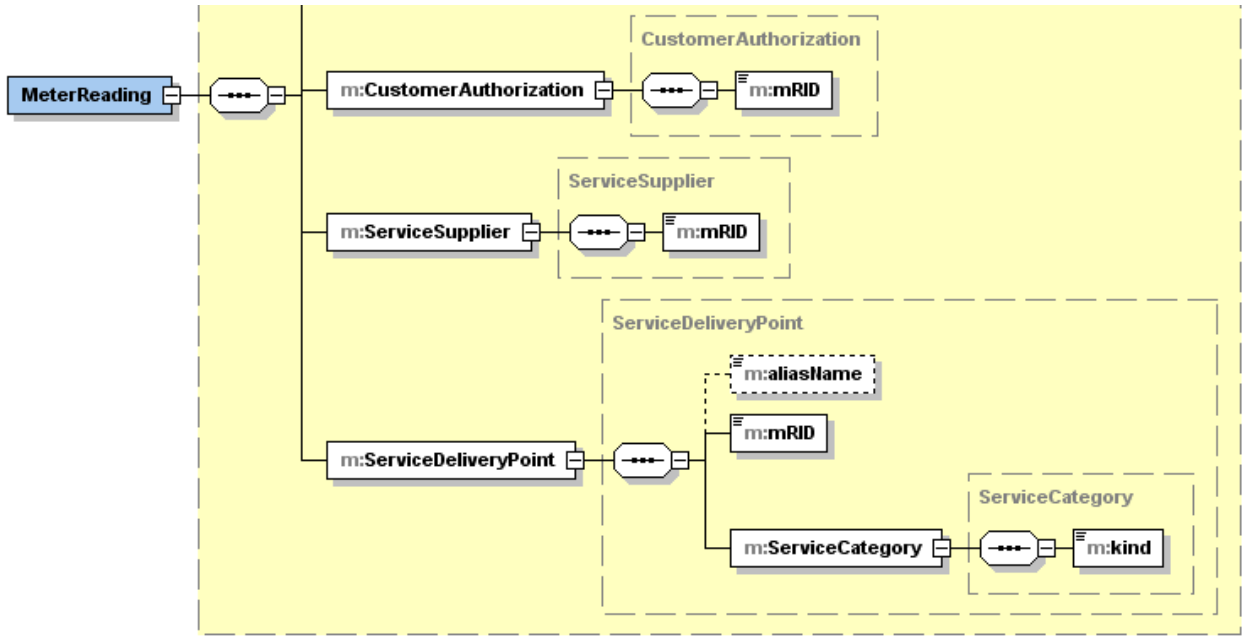



Figure 7: MeterReading Schema – Expanded 2

### 10.1.8 NOTIFICATION

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

| Schema | Use | Element |
|---|---|---|
| Notification | POST Input | Document |

## 11 TRACEABILITY

### 11.1 TBD

## 12 APPENDIX A

OpenADE SD Core.zip