OPENADE 1.0 SERVICE DEFINITION - COMMON

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17 # Document History

18 ## Revision History

19 Date of this revision: Apr. 22, 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	N
0.9	4/15/10	Steve Van Ausdall	Addressed comments raised in walkthrough and from Jeff Kenward.	N
0.92	4/22/10	Steve Van Ausdall	Additional changes from SD team	Y

20 ## Open Issues Log

21 Last updated: Apr. 22, 2010

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

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1 INTRODUCTION

Access to energy management resources is of paramount interest to consumers and Smart Grid service providers. In order to provide access to customer data, energy service providers can implement these reference best practice 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 service 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 XML formats for payload data that could be used with either a resource-oriented architecture or service-oriented architecture.

Extensions to support on-demand access to resources using REST are contained in “OpenSG OpenADE SD – REST”. Extensions to support WS-I Basic Profile web service operations are contained in “OpenSG OpenADE SD – Web Services”. This document is focused on common authorization and payload definition.

The REST document contains more details, because REST is more of a style, not a specification, and so requires more definition, while web services are more formally specified, and also the WS document refers to the AMI-ENT IEC 61968-1-2 profile to drive naming patterns of operations and other aspects.

1.1 RIGHTS / MANAGEMENT / GOVERNANCE

1.1.1 INTELLECTUAL PROPERTY RIGHTS

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1.1.2 CIM OBJECT MODELS

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

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.

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 a standard, including the specification of how to use profiled (restricted) CIM objects within different environments, and possibly the information object definitions themselves.

1.2 REFERENCED SPECIFICATIONS

- [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://tools.ietf.org/html/draft-hammer-oauth-10
- [5] IEC TC57 WG14 61968-1-2 – Profile for use of CIM with WS-I Basic Profile

1.3 REFERENCED GUIDANCE

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

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/2010/06/oade
```

Namespaces already defined elsewhere and used directly within reference service definitions will remain where they are, and will reference the identified body. Extensions to the schema that are backwards and forwards compatible will not change the namespace, but will include a version number inside the definition.

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.

- **Authorization** – To exchange tokens for authorizations
- **AccessToken** – To get authorized request token
- **Notification** – To get notifications of updates

In addition, the following "data" objects 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
  - **IntervalReading** – A durational measurement
  - **Reading** – An instantaneous measurement
- **ReadingType** – Represents a type of reading (e.g. hourly kWh) used by a MeterReading
- **ServiceSupplier** – The supplier of utility service
- **CustomerAuthorisation** – Represents the agreement to share data with the 3rd Party
- **ServiceDeliveryPoint** – The point at which the readings were obtained
- **MeterAsset** – The measurement device that captured the readings

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. The security guidance specified in [G1] 3PDA is addressed through the use of [4] Open Authorization, which is proposed as the method for requesting and acquiring these authorizations.

Implementers can support 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 an authentication method that 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 the OAuth HTTP Authorization Scheme.

2.2 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 schema provided.

2.3 PAYLOAD ENTITIES

Payload entities will conform to the message document schema. They will contain an XML 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, as defined in the implemented WS or REST profile, 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.

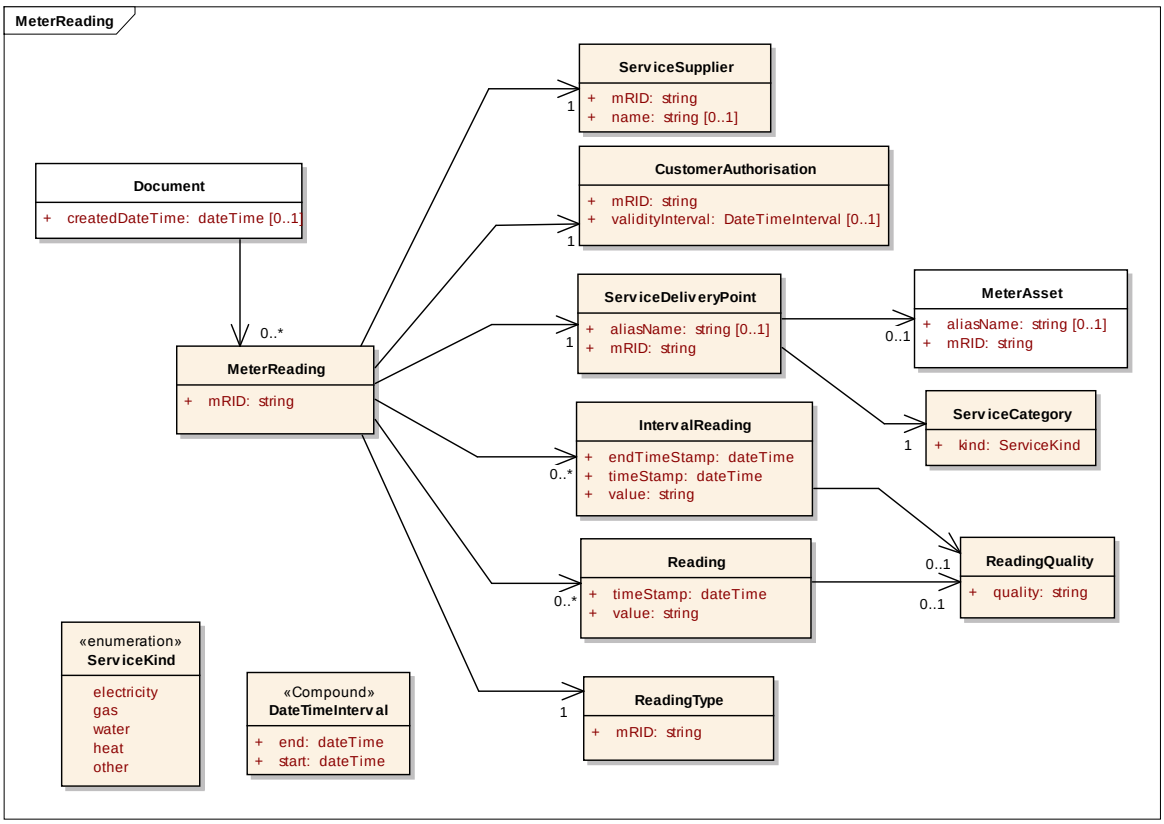


Figure 1: Batch Payload Logical UML Data Model Diagram

2.3.1 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.

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

An example is shown below.

```
<?xml version="1.0" encoding="UTF-8"?>
<Document xmlns="http://osgug.ucaiug.org/ns/2010/06/oade">
    <createdDateTime>2001-12-18T09:30:47Z</createdDateTime>
    <MeterReading>
        <mRID>3456</mRID>
        <IntervalReading>
            <timeStamp>2001-12-17T09:30:47Z</beginTimeStamp>
            <endTimeStamp>2001-12-17T10:30:47Z</endTimeStamp>
            <value>3.14</value>
        </IntervalReading>
        <IntervalReading>
            <timeStamp>2001-12-17T10:30:47Z</beginTimeStamp>
            <endTimeStamp>2001-12-17T11:30:47Z</endTimeStamp>
            <value>3.2</value>
            <ReadingQuality>
                <quality>interpolated</quality>
            </ReadingQuality>
        </IntervalReading>
        <ReadingType>
            <mRID>7.6.7.1.0.12.0.0.0.3.72</mRID>
        </ReadingType>
        <CustomerAuthorisation>
            <mRID>23049857203</mRID>
            <validityInterval>
                <end>2002-11-17T09:30:47Z</end>
                <start>2000-11-17T09:30:47Z</start>
            </validityInterval>
        </CustomerAuthorisation>
        <ServiceSupplier>
            <mRID>utility.com</mRID>
            <name>Utility Company</name>
        </ServiceSupplier>
        <ServiceDeliveryPoint>
            <aliasName>My House</aliasName>
            <mRID>98374</mRID>
            <ServiceCategory>
                <kind>electricity</kind>
            </ServiceCategory>
            <MeterAsset>
                <aliasName>Premise Meter</aliasName>
                <mRID>10298374</mRID>
            </MeterAsset>
        </ServiceDeliveryPoint>
    </MeterReading>
</Document>
```

3 PATTERNS

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

3.1 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, and server will deliver via client Notification.

3.2 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 allows any resource type to be included within a single file.

4 DISCOVERY

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

5 METADATA

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

6 VERSIONING

As additional capabilities are added to the interface definition, the minor version number of the definition will be incremented. If compatibility with existing counterparts must be broken, the namespace and the major version number will be updated, as per [9] 61968-1-2.

```
<xs:schema targetNamespace="http://osgug.ucaiug.org/ns/2010/06/oade"
xmlns:m="http://osgug.ucaiug.org/ns/2010/06/oade" xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified" version="1.0">
```

7 EXTENSIBILITY

To enable backwards and forwards compatibility, schema validation should be turned off in operational systems to allow new schema elements to pass without update or rebuild. These unrecognized elements shall be ignored.

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. Note that operations to support 3rd Party registration, certificate transfer, and test of configuration

were decided to be premature for this initial version, since those steps will require manual processes anyway, and volume will be low. They may be specified in a future release.

Definition of the methods to be used to transfer payload data are specified in REST and WS documents.

9.1.1 AUTHORIZE - (SEQUENCE DIAGRAM)

Addresses OpenSG OpenADE 1.0 SRS 3.2.1, bullet 2.1

Note that this diagram attempts to depict the process described in [4] OAuth. It is thought to be accurate, but if any discrepancies exist, obviously the OAuth description is the source, so should be followed. This is provided merely to assist in understanding the overall flow.

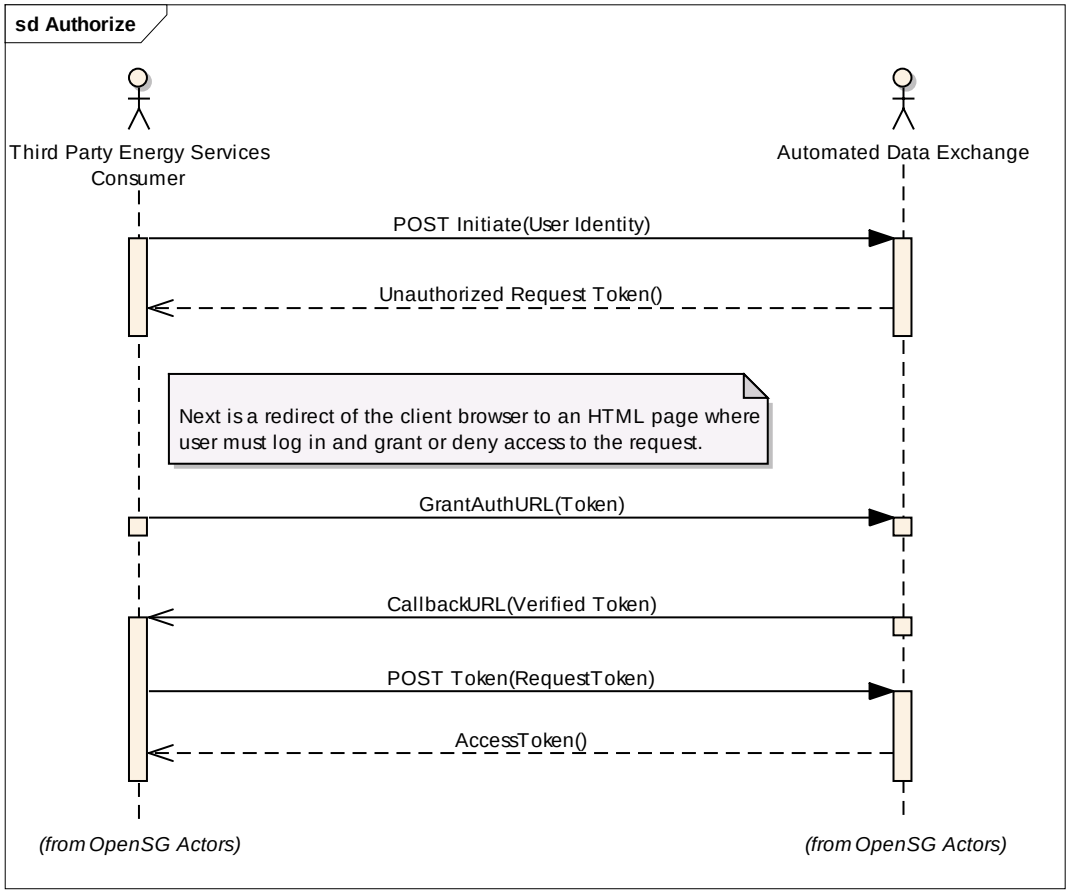
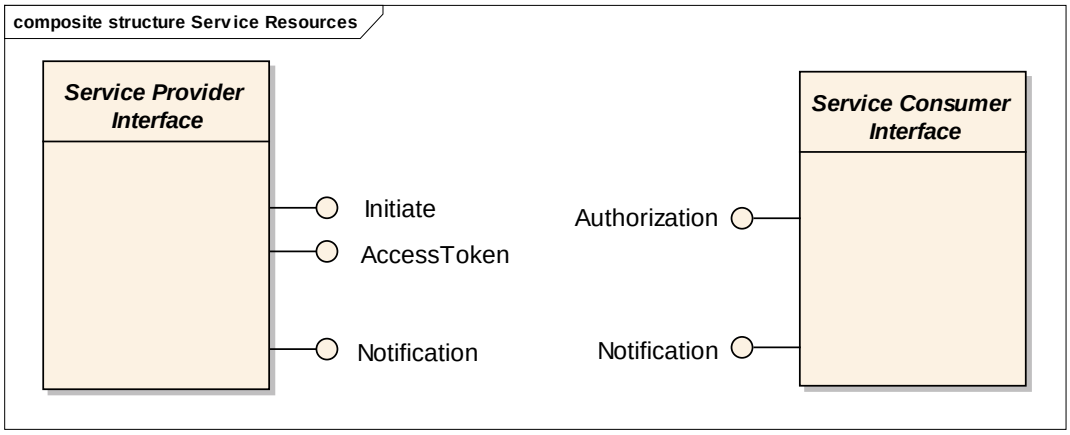


Figure 2: Authorize Sequence Diagram

10 SERVICE 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 provided interfaces, in order to access the resources.



293

294 Figure 3: Service Resource Interfaces

295 The following table lists the resources defined for OpenADE.

Logical Resource Name	Consumer Operation	Implementer	Description
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	See WS or REST profile	Both	Transfer authorized data, specified in REST or WS profiles

296 Table 1: Resource Operations

297 ## 10.1 RESOURCE DETAILS

298 The resources described below are necessary to support authorization. Implementations shall conform to
299 referenced specifications for details on these interfaces. Clarifications and refinements made to support these
300 service resources are denoted where necessary.

301 ### 10.1.1 INITIATE

302 Initiate is used to request an unauthorized request token. The exact format and specifics of this exchange are
303 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

Schema	Use	Element
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

10.1.2 AUTHORIZATION

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

Schema	Use	Element
Authorization	Input	oauth_token
Authorization	Input	oauth_verifier

10.1.3 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. The exact format and specifics of this exchange are covered in [4] OAuth.

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

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

10.1.4 METER READING

This data resource represents a collection of readings, related to a specific channel at a specific service delivery point and metering device. 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 IntervalReadings, which represent a measurement over a specified time interval, or Reading for instantaneous measurements.

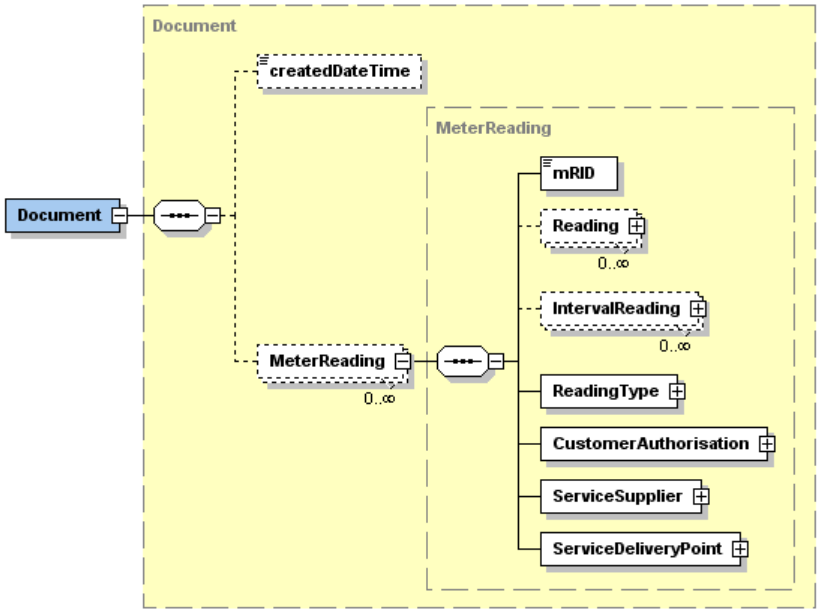
The MeterReading structure presented here is based on the schema developed within IEC 61968-9, however it is not directly compatible, due to the need for some additional data elements. It is, however, conformant to the more general CIM UML model. Extensions to the model are marked with [ADE Extension] in the description.

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 string
Reading **IntervalReading**	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	Quality, to be specified if different than 'Good'.
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 [OpenADE Extension]
IntervalReading	value	Value in type of string
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. AccumlationBehaviour (=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)
MeterReading	CustomerAuthorisation	Holds an authorization for access to specific user-private data granted to a 3rd Party service provider. [OpenADE Extension – specialization of Agreement]
CustomerAuthorisation	mRID	A unique identifier of the CustomerAuthorisation
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
ServiceSupplier	name	A human-readable name for 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.
ServiceDeliveryPoint	MeterAsset	Physical asset that performs the metering role, could be an end-use measurement device. Used for measuring consumption and detection of events.
MeterAsset	aliasName	A name the customer has approved to share for this MeterAsset.
MeterAsset	mRID	An identifier unique to this measurement point within this context.

323 Table 2: Batch Resources Schema Elements

324 The CIM schema for this resource is shown below.



325

326 Figure 4: Consumption Schema – Collapsed

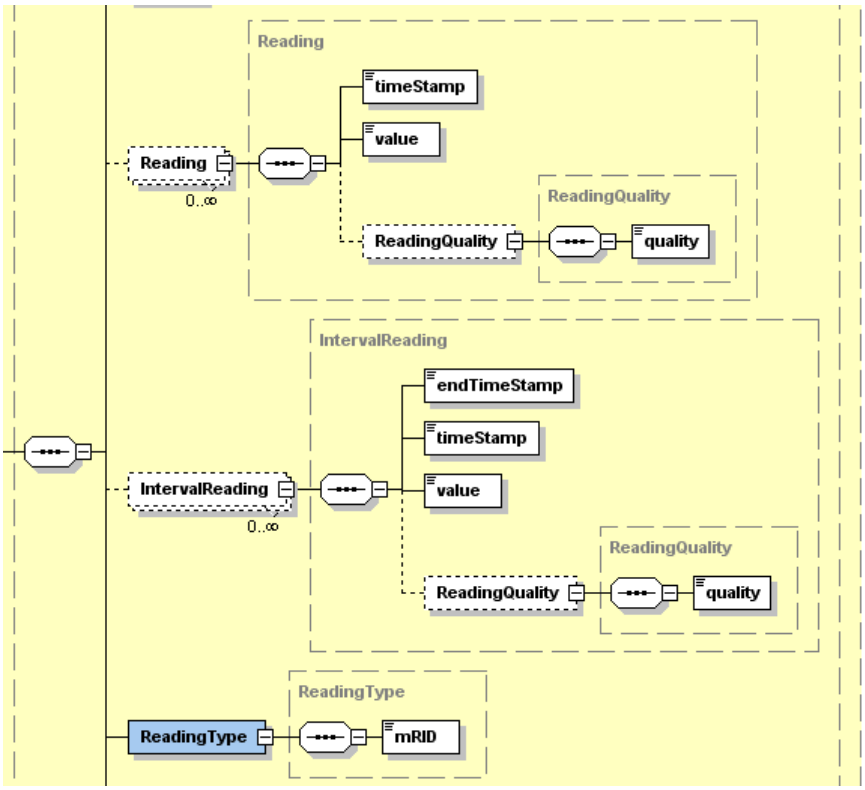


Figure 5: MeterReading Schema – Expanded 1

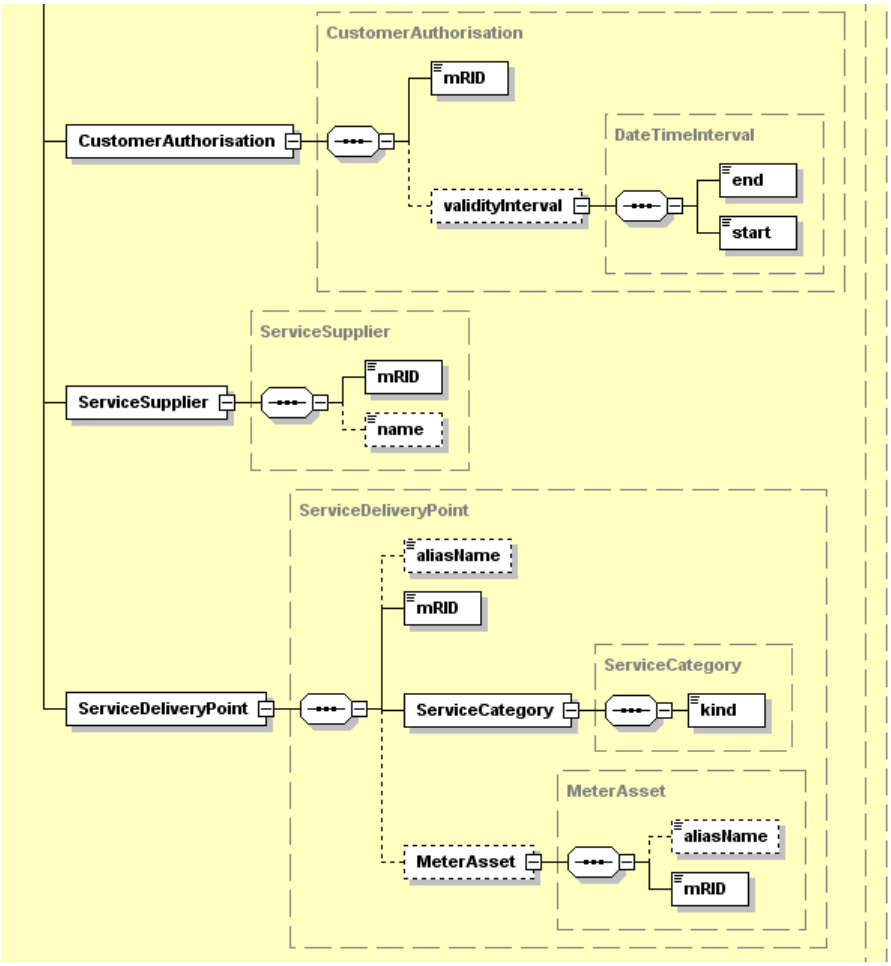


Figure 6: MeterReading Schema – Expanded 2

10.1.4.1 READINGTYPES

There are numerous reading types defined by IEC TC57 WG14. The types to be used for OpenADE are listed below. Types beginning with "12" shall use Reading to specify the instantaneous measurement. All other types shall use IntervalReading, using the endTimeStamp to indicate the end of the measurement period. DeltaData types ("0.0.4") shall be used for irregular durations, such as billing periods, and Incremental IntervalData types ("0.6.7") shall be used for regular intervals such as 15-minute. Although other types are defined by 61968-9, only those shown below shall be used for OpenADE.

ReadingType/mRID	ReadingType/Name
0.6.7.1.0.12.0.0.0.3.73	Incremental IntervalData Forward Energy (kVArh)
0.6.7.1.0.12.0.0.0.3.72	Incremental IntervalData Forward Energy (kWh)
0.6.7.4.0.12.0.0.0.3.73	Incremental IntervalData Net Energy (kVArh)
0.6.7.4.0.12.0.0.0.3.72	Incremental IntervalData Net Energy (kWh)
0.6.7.19.0.12.0.0.0.3.73	Incremental IntervalData Reverse Energy (kVArh)
0.6.7.19.0.12.0.0.0.3.72	Incremental IntervalData Reverse Energy (kWh)
0.6.7.20.0.12.0.0.0.3.73	Incremental IntervalData Total Energy (kVArh)

ReadingType/mRID	ReadingType/Name
0.6.7.20.0.12.0.0.0.3.72	Incremental IntervalData Total Energy (kWh)
0.0.4.1.0.12.0.0.0.3.73	DeltaData Forward Energy (kVArh)
0.0.4.1.0.12.0.0.0.3.72	DeltaData Forward Energy (kWh)
0.0.4.4.0.12.0.0.0.3.73	DeltaData Net Energy (kVArh)
0.0.4.4.0.12.0.0.0.3.72	DeltaData Net Energy (kWh)
0.0.4.19.0.12.0.0.0.3.73	DeltaData Reverse Energy (kVArh)
0.0.4.19.0.12.0.0.0.3.72	DeltaData Reverse Energy (kWh)
0.0.4.20.0.12.0.0.0.3.73	DeltaData Total Energy (kVArh)
0.0.4.20.0.12.0.0.0.3.72	DeltaData Total Energy (kWh)
11.8.6.1.0.8.0.0.0.3.38	Daily-Shifted Maximum Indicating Forward Demand (kW)
12.0.6.1.0.8.0.0.0.3.38	Instantaneous Indicating Forward Demand (kW)

Table 3: ReadingType values

11 APPENDIX A

11.1 CONSUMPTION XSD AND EXAMPLE

The file embedded below contains the XML Schema Definition (XSD) described in this document, and the example.

OpenADE SD Common.zip