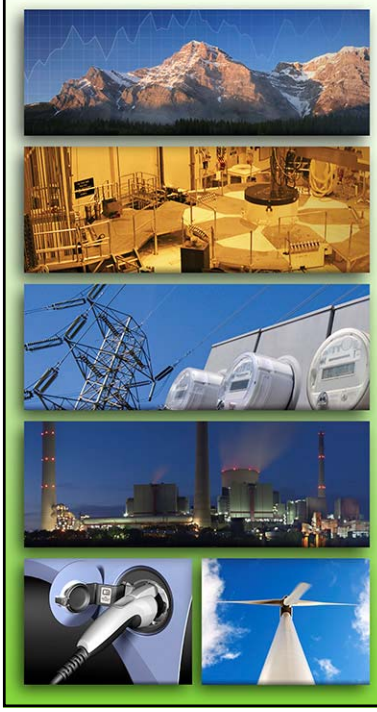

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Common Information Model (CIM) and MultiSpeak for Smart Grid

John J. Simmins, Ph.D.
Senior Project Manager
Smart Grid Demonstration Advisory Meeting
June 10, 2010

Outline

- Introduction to MultiSpeak® and IEC 61968 CIM
- Need for Interoperability
- Plans for 2009 Interop Testing
- Efforts to Promote Interoperation
  - Standards Harmonization
  - Industry Efforts
  - Comparison of MultiSpeak® and IEC 61968 CIM message structures.

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Introduction to MultiSpeak®

- Developed by National Rural Electric Cooperative Association (NRECA) in collaboration with key industry vendors
- Covers applications of interest to distribution utilities
- Standard is mature, but scope is continuing to grow
- In use at hundreds of utilities
- Mature interoperability testing program, applies to all interfaces
- Implemented using XML; web services and batch transport profiles defined
- More information and specification available at www.MultiSpeak.org

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MultiSpeak V4 Plans

- Internationalization
  - International telephone and address fields
  - Unit/value pairs with wide selection of units
  - Supports all ISO 4217 currency codes
- Adds work management and AVL
- Adds support for engineering model catalogs
- Adds CIM CPSM-compatible transmission model
- Will add in CIM CDPSM as unbalanced profile is completed

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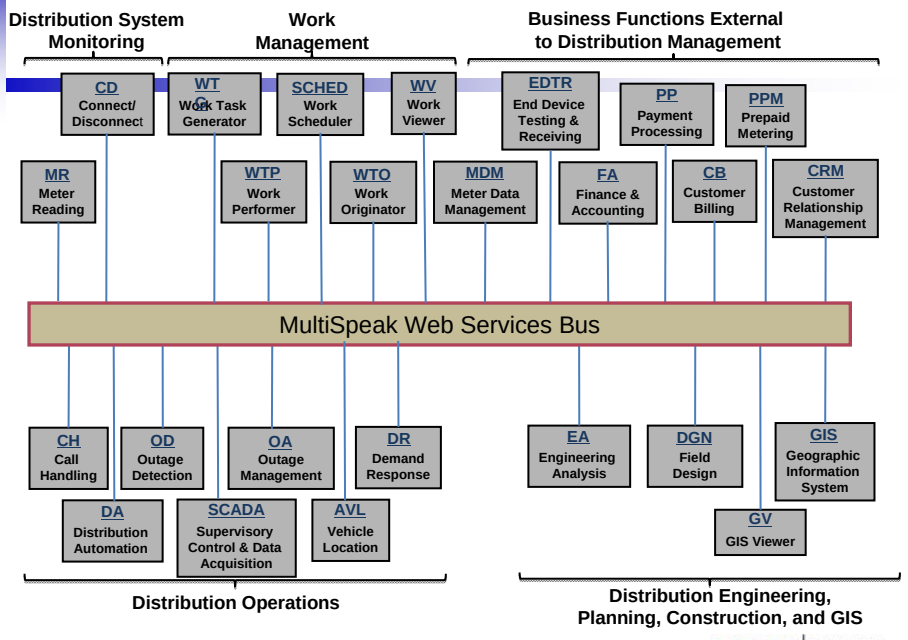

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Introduction to IEC 61968

- Maintained by IEC TC57, WG14
- Scope is larger than MultiSpeak, but is less mature
- Implementations based on CIM data model in place at dozens of utilities
- Implementation is messaging-based and transport agnostic, currently no transport profiles defined
- Interoperability testing is in place for two parts 9 and 13.
- Core CIM in IEC 61970; distribution extensions in IEC 61968
- For more information see: http://iectc57.ucaiug.org

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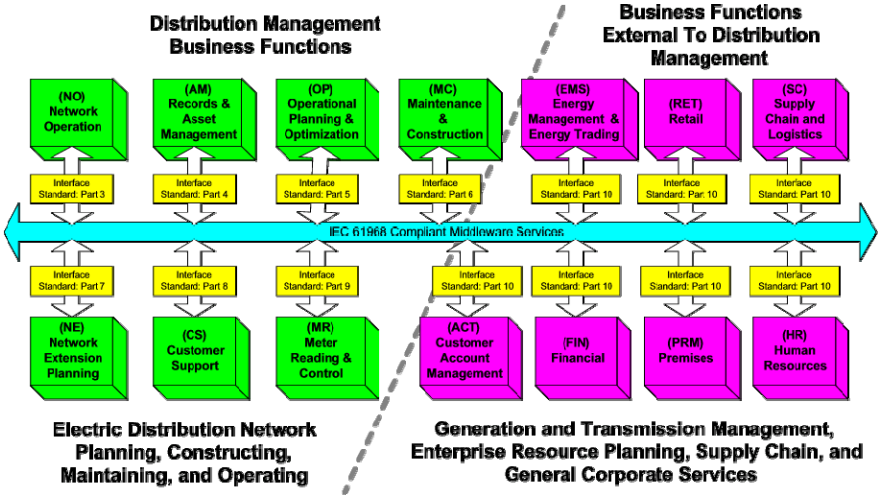
IEC 61968 Reference Architecture



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The Need for Interoperability

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Plans For MultiSpeak/IEC CIM Harmonization

•Separate standards continue to be a stumbling block for utility implementations.

•Implementations in process trying to bridge the standards and look for best of both worlds.

•MultiSpeak V4.0 and future releases will move towards IEC CIM where appropriate.

•V4.0 is internationalized and supports an IEC CIM-compatible power system model.

•IEC and MultiSpeak jointly will develop international standards leading to harmonized profiles.

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Need for Interoperability

- Utilities want to implement the best of both standards
- Utilities want to avoid stranded investment
- Vendors want to avoid the need to develop and maintain dual interfaces
- At some utilities both CIM-compatible and MultiSpeak-compatible products will need to co-exist and interoperate
- Standards bodies want to learn from the work done by the other camp and incorporate additional functionality

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Harmonizing Data Models

- Approach to include CIM CPSM/CDPSM into MultiSpeak data model:
  - Add optional CIM IdentifiedObject (naming) fields to base MultiSpeak objects
  - Where similar objects exist in MultiSpeak, create superset object to include CIM-specific fields
  - Where objects do not exist, use CIM object extended to have MultiSpeak naming fields
  - Maintain extended CIM objects in separate schema and namespace for maintainability

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Plans for 2010 Interoperability Testing

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Plans for 2010 Interop Testing

- Joint CIM/MultiSpeak V4 Interop Testing Planned for Fourth Quarter 2010:
  - IEC 61968 – 9, Meter Reading and Control Profile
  - IEC 61968 – 13, CIM CPSM Transmission Network Model Exchange Profile

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Efforts to Promote Interoperability

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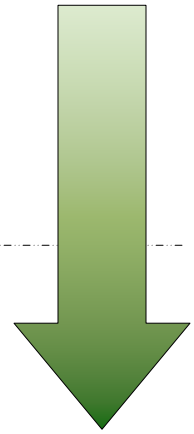
Abstract to Detail

- Standards Bodies
- Business Case
- Conceptual Architecture
- Use Cases
- Integration Requirements
- Sequence Diagram
- Patterns
- Services
- WSDL



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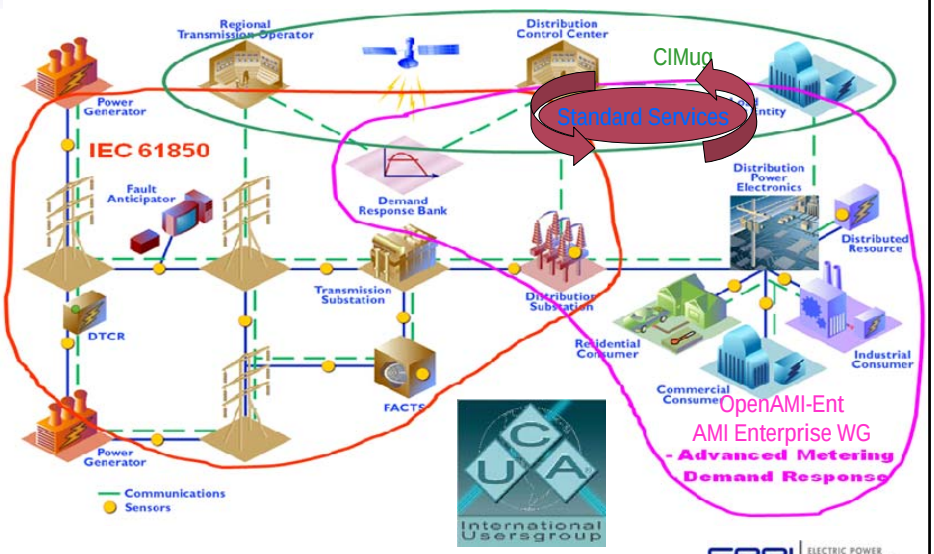
Leveraging the Overlap: UCAIug Groups – AMI & CIM

Standards Bodies
Business Case
Conceptual Architecture
Use Cases
Integration Requirements
Patterns
Sequence Diagram
Services
WSDL



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Key Collaboration Concept

Standards Bodies
Business Case
Conceptual Architecture
Use Cases
Integration Requirements
Patterns
Sequence Diagram
Services
WSDL

- **Standard building blocks** are defined by CIMug and the affiliated IEC working groups along with other relevant industry groups (e.g., Open Applications Group (OAG), MultiSpeak, OGC)
- **Requirements (use cases)** are gathered from helpful sources
  - Various industry initiatives such as those led by EPRI
  - Utilities like SCE, AEP, EDF, ESB, etc.
  - Alliances such as the HomePlug and ZigBee Smart Energy Alliance
- The AMI Enterprise Task Force (Open AMI Ent) articulates **Common industry practices** that satisfy **requirements** through the use of **standard building blocks**.
  - Recommended extensions and changes to standard building blocks are provided back to appropriate standards bodies.

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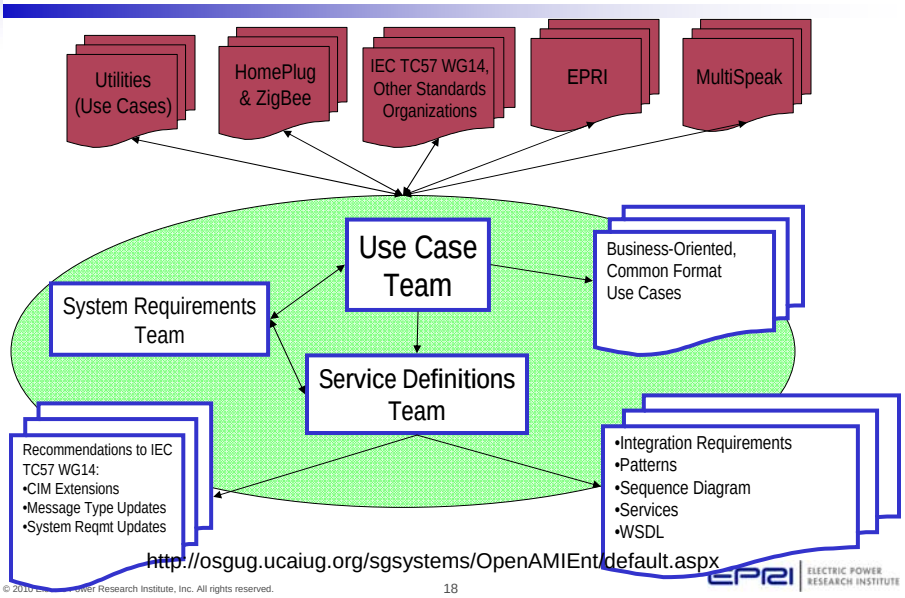
AMI Enterprise Task Force



http://osgug.ucaiug.org/sgsystems/OpenAMIEnt/default.aspx

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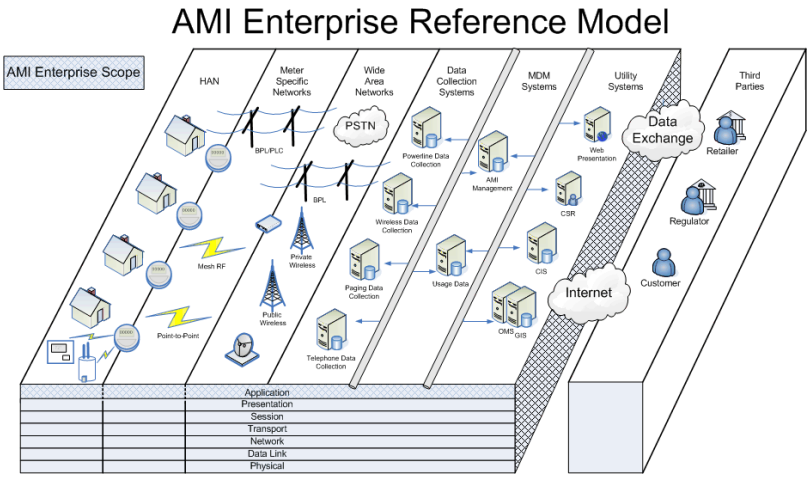
Scope

Standards Bodies
Business Case
Conceptual Architecture
Use Cases
Integration Requirements
Patterns
Sequence Diagram
Services
WSDL



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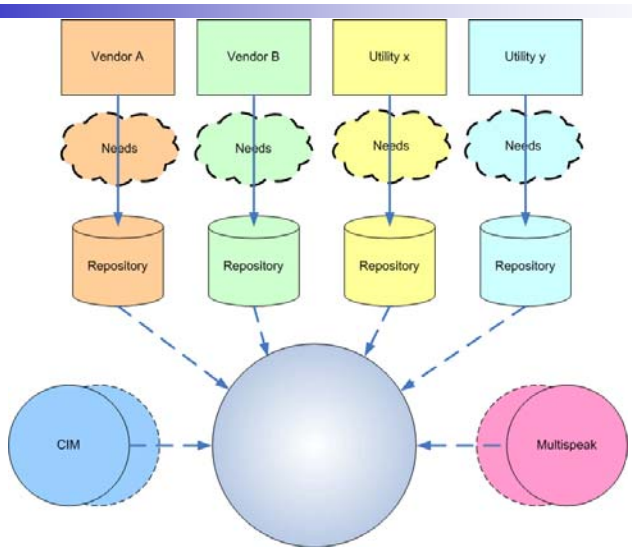
Moving To A Common Language

Standards Bodies
Business Case
Conceptual Architecture
Use Cases
Integration Requirements
Patterns
Sequence Diagram
Services
WSDL



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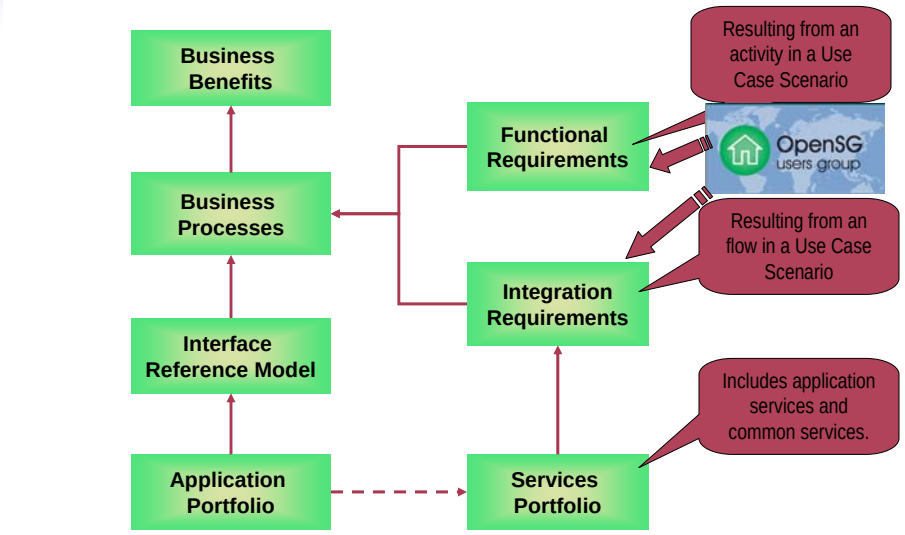
Requirements Traceability

Standards Bodies
Business Case
Conceptual Architecture
Use Cases
Integration Requirements
Patterns
Sequence Diagram
Services
WSDL



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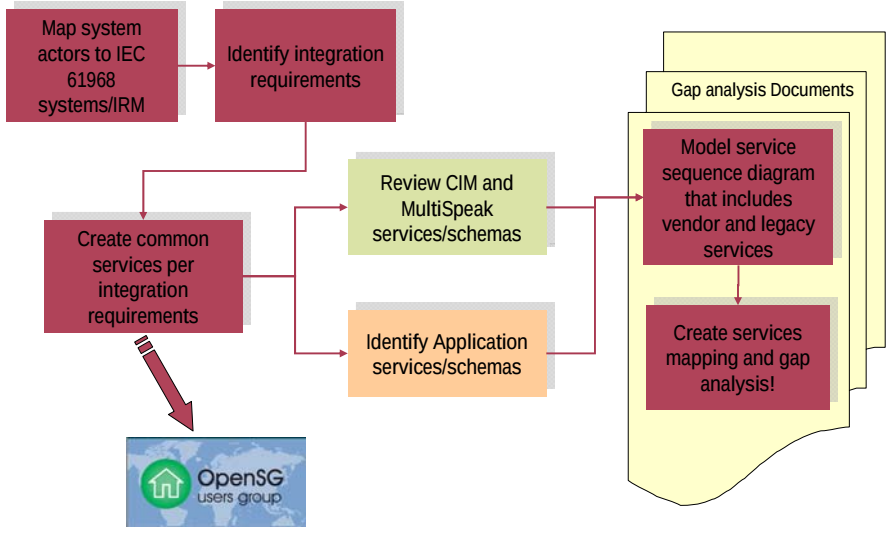
Services Gap Analysis Steps

Standards Bodies
Business Case
Conceptual Architecture
Use Cases
Integration Requirements
Patterns
Sequence Diagram
Services
WSDL



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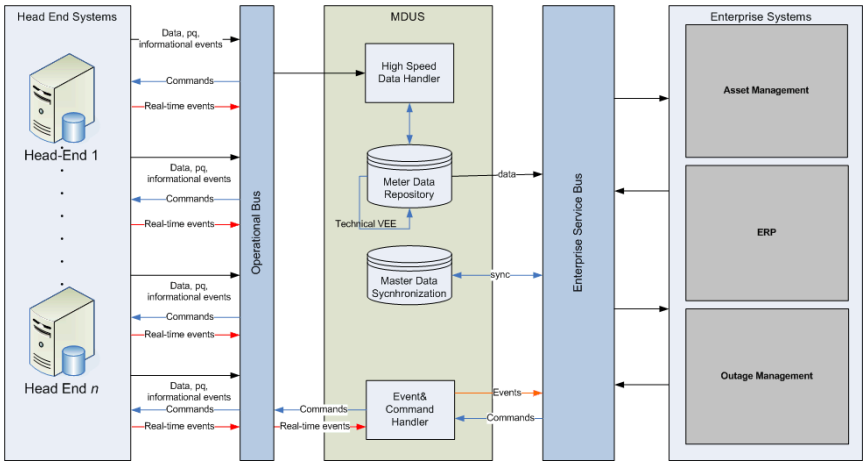
Context – Conceptual Architecture



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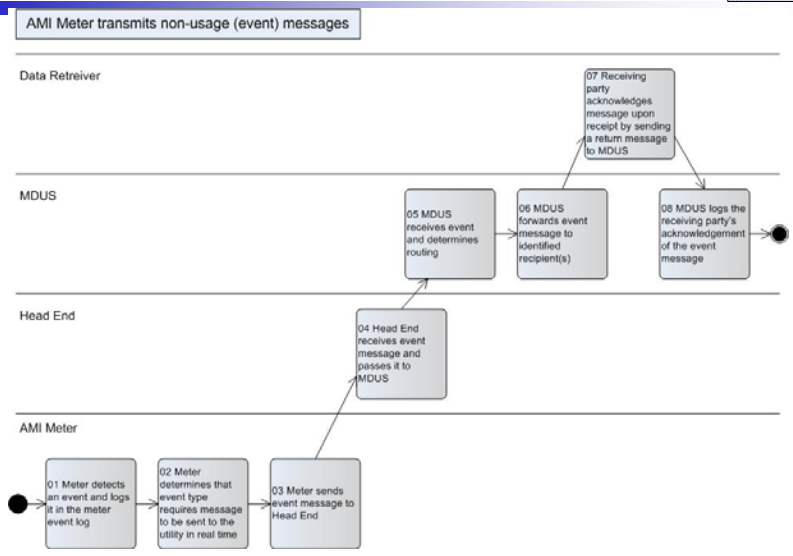
Use Case – B1.3



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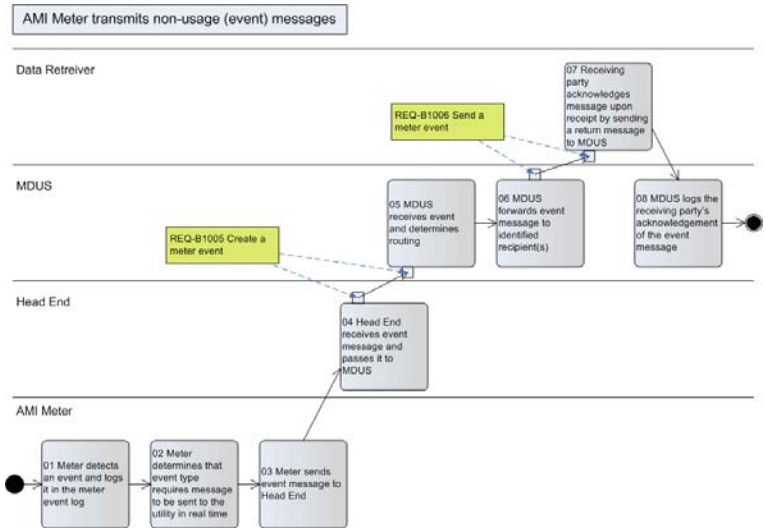
Integration Requirements



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Operation Naming Patterns

Operation Naming Patterns utilizing IEC 61968 verb (Reference #9):

CREATE	CLOSED
CREATED	CANCELED
CHANGE	DELETED
CHANGED	SHOW
CANCEL	REPLY
CLOSE	SUBSCRIBE
DELETE	UNSUBSCRIBE
GET	

<IEC Verb><Information Object>_<Service Pattern Name>

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Service Naming Patterns

Service Naming Patterns:

- **Send –** to provide (send) information (message) for public (enterprise) consumption.
- **Receive** – to receive information (message) from an external source.
- **Publish** – to provide (send) information (message) for public (enterprise) consumption.
- **Subscribe** – to receive information (message) from an external source.
- **Request** – to request another party to perform a specific service
- **Reply** – to confirm the execution of a service on behalf of the provider, and return specific results.
- **Retrieve –** to request information
- **Show –** to provide information as the result of a request or unsolicited
- **Execute –** to run a service provided to the public

<Service Pattern Name><Information Object>

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MultiSpeak Message Patterns

Operation Naming Patterns:

Request/Response	<Verb><Object><Parameters>
Publish/Subscribe	<Object><Parameter><Verb>
Initiate/Cancel Actions	<Verb><Object><Parameters>

MultiSpeak Service Naming Verbs:

Request/Response Verbs	Publish/Subscribe Verbs	Initiate/Cancel Verbs		
Get	Notification	Cancel	Delete	Disable
	Transaction	Display	Enable	Establish
		Initiate	Insert	Modify
		Ping	Register	Request
		Schedule	Unregister	
		Update	Write	

GetCustomerByCustomerID

MeterAddNotification

InitiateGroupMeterRead

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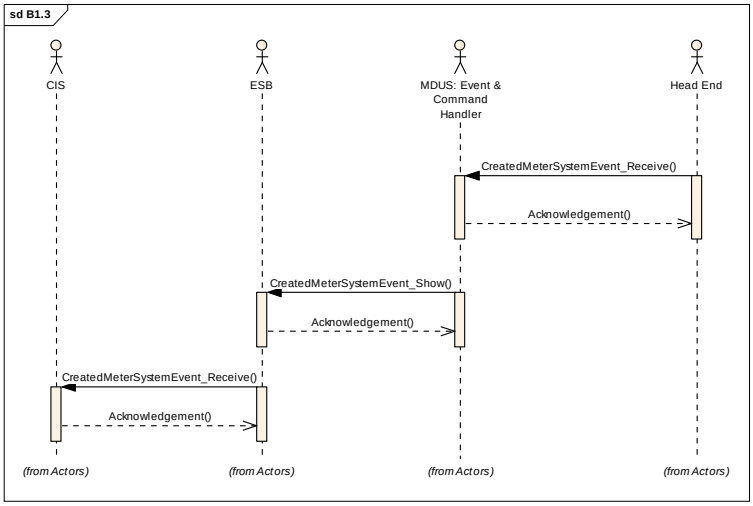
CIM Sequence Diagram



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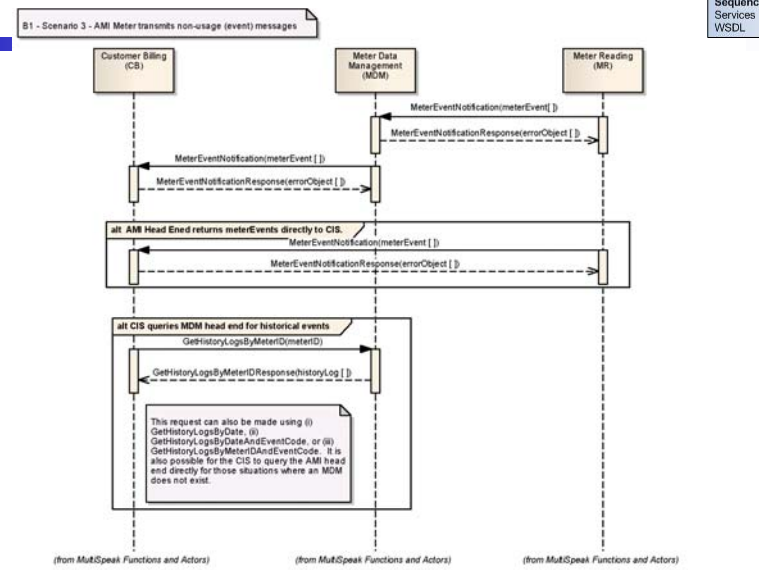
MultiSpeak Sequence Diagram



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Recommended Services

Notes	Service Name	Service Operation
Head End created a meter event and send to MDUS - ECH	ReceiveMeterSystemEvent	CreatedMeterSystemEvent_Receive

Service Consumer (Outbound)	Service Provider (Inbound - WS)	Information Object	Service Pattern	Msg Exchange Pattern (MEP)
Head End	MDUS:ECH	MeterSystemEvent.xsd	Receive	Two Way Request

Notes	Service Name	Service Operation
MDUS - ECH shows meter event	ShowMeterSystemEvent	CreatedMeterSystemEvent_Show

Service Consumer (Outbound)	Service Provider (Inbound - WS)	Information Object	Service Pattern	Msg Exchange Pattern (MEP)
MDUS:ECH	ESB	MeterSystemEvent.xsd	Send	Two Way Request

Notes	Service Name	Service Operation
CIS receives meter event	ReceiveMeterSystemEvent	MeterEventCreated_Receive

Service Consumer (Outbound)	Service Provider (Inbound - WS)	Information Object	Service Pattern	Msg Exchange Pattern (MEP)
ESB	CIS	MeterSystemEvent.xsd	Receive	Two Way Request

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Services

- Services provided by MDUS (“Receive” service):
  - Service: ReceiveMeterSystemEvent.wsdl
    - **Operation**: CreatedMeterSystemEvent_Receive
    - **Operation**: ChangedMeterSystemEvent_Receive
    - **Operation**: CanceledMeterSystemEvent_Receive
- Services provided by ESB (“Show” service):
  - Service: ShowMeterSystemEvent.wsdl
    - **Operation**: CreatedMeterSystemEvent_Show
    - **Operation**: ChangedMeterSystemEvent_Show
    - **Operation**: CanceledMeterSystemEvent_Show
- Services provided by CIS (or any interested systems) (“Receive” service):
  - Service: ReceiveMeterSystemEvent.wsdl
    - **Operation**: CreatedMeterSystemEvent_Receive
    - **Operation**: ChangedMeterSystemEvent_Receive
    - **Operation**: CanceledMeterSystemEvent_Receive

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WSDL (Proof of Concept)


```
<?xml version="1.0" encoding="UTF-8"?>
<wsdl:definitions name="ReceiveMeterSystemEvent"
targetNamespace="http://ce.corp.com/ei/2008/06/ReceiveMeterSystemEvent.wsdl"
xmlns:http="http://schemas.xmlsoap.org/wsdl/http/"
xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns="http://schemas.xmlsoap.org/wsdl/"
xmlns:wsi="http://ws-i.org/schemas/conformanceClaim/"
xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/"
xmlns:tm="http://microsoft.com/wsdl/mime/textMatching/"
xmlns:mime="http://schemas.xmlsoap.org/wsdl/mime/"
xmlns:tns="http://ce.corp.com/ei/2008/06/ReceiveMeterSystemEvent.wsdl"
xmlns:typeOrig="http://ce.corp.com/ei/2008/06"
xmlns:typeIn="http://ce.corp.com/ei/2008/06/MeterSystemEvent"
xmlns:typeOut="http://ce.corp.com/ei/2008/06/OutputData.xsd">
        <wsdl:documentation>A web service to receive MeterSystemEvent</wsdl:documentation>
        <!-- type elements define data types used in this wsdl document using xml schema -->
        <wsdl:types>
         <xs:schema targetNamespace="http://ce.corp.com/ei/2008/06/MeterSystemEvent">
                <xs:import namespace="http://ce.corp.com/ei/2008/06"
schemaLocation="MeterSystemEvent.xsd"/>
```

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GetCustomerByCustId Method - Request

```
POST /MultiSpeak_V41_RC_d/CB_Server.asmx HTTP/1.1
Host: localhost
Content-Type: text/xml; charset=utf-8
Content-Length: length
SOAPAction: "http://www.multispeak.org/Version_4.0/GetCustomerByCustId"
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:soap="http://sch
<soap:Header>
<MultiSpeakMsgHeader Version="string" UserID="string" Pwd="string"
AppName="string" AppVersion="string" Company="string" DefaultCurr…….
</soap:Header>
<soap:Body>
<GetCustomerByCustId xmlns="http://www.multispeak.org/Version_4.0">
<custId>string</custId>
</GetCustomerByCustId>
</soap:Body>
</soap:Envelope>
```

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GetCustomerByCustId Method - Response

HTTP/1.1 200 OK
Content-Type: text/xml; charset=utf-8
Content-Length: **length**

```
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap="http://sch
<soap:Header>
<MultiSpeakMsgHeader Version="string" UserID="string" Pwd="string" AppName="string" AppVersion="string" Company="string"
DefaultCurr…
</soap:Header>
<soap:Body>
<GetCustomerByCustIdResponse xmlns="http://www.multispeak.org/Version_4.0">
<GetCustomerByCustIdResult>
<dBAName>string</dBAName>
<specialNeeds>string</specialNeeds>
<accounts>
<account>
<customerID>string</customerID>
<accountsReceivable xsi:nil="true" />
<billingCycle>string</billingCycle>
<budgetBill>string</budgetBill>
<paymentDueDate>string</paymentDueDate>
<lastPaymentDate>string</lastPaymentDate>
<lastPaymentAmount xsi:nil="true" />
<billDate>string</billDate>

Additional customer stuff here …

</GetCustomerByCustIdResult>
</GetCustomerByCustIdResponse>
</soap:Body>
</soap:Envelope>
```

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Benefits to each Utility

- As utilities pull in the same direction, de facto standards are created that are based on industry standards; economies of scale should yield:
  - Improved vendor response & support
  - Reduced product procurement costs
  - Reduced effort for requirements analysis and design
  - Reduced risk of overlooking requirements
    - That are expensive to retrofit later
  - Reduced life-cycle costs

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Acknowledgements

- Gary McNaughton – Cornice Engineering
- Greg Robinson – Xtensible Solutions
- Gerald Gray – CIMple Solutions

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Questions?

Together…Shaping the Future of Electricity

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