OMS CIM Smart Grid Integration

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Introduction

• Seattle City Light (SCL) embarked on several technology investments to support a transformation of business capabilities in the municipally-owned utility. The core investments focused on implementing software solutions for an Outage Management System (OMS)

• Specifically, the plan called for the use of IEC-61968 and IEC-61970 information models as a foundation for messaging in the integrations involved with the OMS

• The plan identified the adoption of industry standards and best practices as fundamental prerequisites to success in these technology initiatives
Seattle City Light, a department of City of Seattle, is one of the nation’s largest municipal owned utilities

<table>
<thead>
<tr>
<th>Service Area Population</th>
<th>750,200</th>
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<tbody>
<tr>
<td>Service Area Size</td>
<td>131.31 sq. mi.</td>
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<tr>
<td>Personnel</td>
<td>1,750</td>
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<tr>
<td>Major Substations</td>
<td>15</td>
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<tr>
<td>Unit Substations</td>
<td>5</td>
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<tr>
<td>Commercial and Industrial Substation Transformers</td>
<td>56</td>
</tr>
<tr>
<td>Transmission Circuit Miles</td>
<td>656</td>
</tr>
<tr>
<td>Distribution Circuit Miles</td>
<td>2,515</td>
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<tr>
<td>Meters</td>
<td>400,000</td>
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Outage Management Strategy

- Storm Review recommendations included acquisition and implementation of OMS:
  - In 2008, Oracle selected as OMS vendor
  - In 2009, an integration team was selected
    - UISOL’s expertise was selected to provide OMS implementation and integration services
Information Technology Strategy

• Adopt industry standards and best practices
  • Business Process Modeling
  • UML Modeling
  • IEC-61968/IEC-61970

• Enterprise Integration
  • Service Oriented Architecture
  • Design for smart grid applications
OMS Technology Design Goals

- Define re-useable integration
- Focus on IEC-61968 CIM
- Define development process on a standard set of tools
- Use standard development processes
- Identify a fit/gap process for CIM extensions
Functional Overview
Development Process

- Functional Requirements to identify CIM messages for Integration
- Design Specification to map CIM for Integration between the systems used in integration
  - Integration process flow
  - Mapping of CIM / business rule processing
  - Integration class definitions
  - Process exception flow / Error handling
- Develop CIM messages, class definitions, and process flows
- Unit test the integration
IVR/OMS Functional Interaction

IVR acquires customer account and meter from CIS
- Extension of existing functionality

OMS provides to IVR customer any current known outage information at the time of the call
- The IEC-61968 CIM version 15 OutageReport

IVR provides to OMS the customer’s account number, meter identifier, contact phone #, and reason for call (outage type)
- The IEC-61968 CIM version 15 TroubleTicket
Outage Report Message Requirements

- **Outage Report:**
  - The number of customers that are impacted by the outage event
  - The estimated restoration time to restore the outage
Message Flow - ShowOutageReport

IVR System
- CustomerCall
  - createTroubleTicket
  - createOutageReport
  - showOutageReport

SOA System
- CP_SHOW_OUTAGESTATUS
  - showTroubleCustomer
  - select TROUBLE_AFFECTED_CUSTOMERS
    - result TROUBLE_AFFECTED_CUSTOMERS
  - showTroubleStatus
  - result TroubleStatus

NMS System
- TROUBLE_AFFECTED_CUSTOMERS
- TROUBLE_STATUS
  - select TROUBLE_STATUS
Trouble Ticket Requirements

- **Trouble Ticket:**
  - Required: customer name, account number, and meter number, a cause code of the outage (Light out, broken pole)
  - Optional: contact phone #
Message Flow - CreateTroubleTicket
IEC-61968 CIM Elements Used

Elements from Common Information Model

Mapping NMS-CIM-CIS

[Diagram showing elements and connections between Service Delivery Point, Name, and Phone]
Tool Chain – Message Schema

Enterprise Architect

CIM Tool

JDeveloper
<?xml version="1.0" encoding="UTF-8"?>
<ns0:TroubleTickets xmlns:ns0="http://seattle.gov/scl/2010/soa/xsd/ver1.0/TroubleTickets#">
    <ns0:CustomerAccount>
        <ns0:mRID>1-4x3a-4e7r53</ns0:mRID>
    </ns0:CustomerAccount>
    <ns0:ErpPerson>
        <ns0:lastName>SEATTLE CITY LIGHT SYSTEM CONTROL CENTER</ns0:lastName>
    </ns0:ErpPerson>
    <ns0:IncidentCode>
        <ns0:subCode>EOBL</ns0:subCode>
    </ns0:IncidentCode>
    <ns0:Meter>
        <ns0:mRID>512305585</ns0:mRID>
    </ns0:Meter>
    <ns0:StreetDetail>
        <ns0:addressGeneral>614 NW 46TH ST SVC A</ns0:addressGeneral>
    </ns0:StreetDetail>
    <ns0:TelephoneNumber>
        <ns0:areaCode>200</ns0:areaCode>
        <ns0:localNumber>7000005</ns0:localNumber>
    </ns0:TelephoneNumber>
    <ns0:TownDetail>
        <ns0:name>SEATTLE</ns0:name>
    </ns0:TownDetail>
    <ns0:TroubleTicket>
        <ns0:firstCallDateTime>2010-10-11T12:37:25.14-07:00</ns0:firstCallDateTime>
        <ns0:informAfterRestored>false</ns0:informAfterRestored>
    </ns0:TroubleTicket>
</ns0:TroubleTickets>
Challenges of the Implementation

- Mapping choices of CIM fields to OMS integration fields based on field names and definitions. Example:
  - Unambiguous Identification of the Meter (Meter Number):
    - IdentifiedObject::mRID: attribute inherited by all elements, convenient, uniquely identifies object within context, globally within the model
    - vs
    - Asset::serialNumber: attribute of asset, manufacturer’s serial number, adopted by SCL for meter number

- To have a more hierarchical CIM schema as apposed to a flat model.
  - A flat model was a result of the options selected to generate the schema from CIMTool. It may be difficult to change in the future to use a schema hierarchy as apposed to the flat model currently in use.
Challenges of the Implementation

• Future Versions of CIM
  • Upgrading to a new version of CIM and how it impacts the integration:
    • Changes to the CIM model may require the SCL model to change in order to be compliant with a new version of CIM

• Future functionality for CIM usage in the SCL model:
  • Asset Management Requirements
    • Work Order creation and its impact to the systems the integration is created for: (Oracle PeopleSoft, and Oracle WAMS)
    • Damage assessment integration between WAMS and OMS
  • Callback Requirements
    • Affects the existing TroubleTicket and OutageReport CIM schema
Successes of the OMS and IVR Integration

- Defined a standard process for the integration of systems at SCL for the OMS project
- Defined a standard set of development tools for integration
- Implemented an IVR and OMS integration using a standards based integration that can be re-used for other call taking systems at SCL.
Tools and Technologies used

- IEC CIM 61968 Version 15
- Oracle NMS and Oracle standard adaptors (non-CIM based)
- Oracle SOA and OSB
- Nortel MPS 5000 IVR
- Oracle WAMS
- Oracle PeopleSoft
- Enterprise Architect
- CIMTool
- Visio
System Live on 08-Oct-2010
Links

- Eclipse download: http://eclipse.org
- CIMTool download: http://cimtool.org
- CIM download: http://www.ucaiug.org/CI Mug/
- UISOL Website: http://uisol.com
- Oracle Website: http://www.oracle.com
Questions

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