Model Driven Integration Using CCAPI Technologies

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Agenda

• What is Model Driven Integration?
• Common Information Model
• Model Driven Messaging
• Model Aware APIs
• Utility Integration Bus (UIB)
What is Model Driven Integration?

An integration architecture that incorporates application independent information modeling consistently throughout all aspects of the integration infrastructure from messaging, APIs, and data representation.
Application Independence

• Models independent of specific application implementations or functions

• Models used for data exchange
  – No need to change the internal application model
Models

Common Information Model (CIM)
CIM was originally developed as part of EPRI’s Control Center API project (CCAPI) and is now being adapted globally within IEC.
Some CIM Users

- NERC
- WAPB
- WSCC
- CAISO
- MISO
- MAIN
- ERCOT
- NEPCO

- BC Hydro
- ComEd
- ConEd
- Consumers
- DTE
- Duke
- Entergy
- Southern
- EGAT
- Illinois Power
Traditional View Of SCADA Data

Client

Flat set of tags

Access by tag name

SCADA
CIM View Of SCADA Data

Hierarchy changes with network model changes

Device or other system related views supported

Access by Description

Client

Substation

SCADA

Bus

XFMR

XFMR

XFMR

XFMR
Accessing by Tag
Point-to-point Model Transformations

- SCADA
- EMS
- CIS
- Work Management
- Asset Management

N*(N-1) transformations
Use of a Common Data Exchange Model

SCADA
EMS
CIS

common data exchange model

Asset Management
Work Management
OMS

N transformations
Model Mapping Example

MASTER TREE

TARGET TREE

Class
Instance

Class
Instance

Property
Branch Mappings
tree Mappings

<table>
<thead>
<tr>
<th>Property</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIMInstance/Area1/N/Airport_Substation/Transformer1/State</td>
<td>PSEG.AHP/Battery/Transformer1/Status</td>
</tr>
<tr>
<td>CIMInstance/Area1/N/IndustrialBld_Substation/Transformer1/State</td>
<td>PSEG.AHP/Kilmer/Transformer1/Status</td>
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</tr>
</tbody>
</table>
Messaging
What is Messaging?

- Applications are decoupled from communications
- Provides execution time independence
- Scaleable from small to very large

Applications use messages to exchange data
Model Driven Messaging

- Messaging data derived from a common model.
- Enables automation of message definitions to meet model requirements.
- Can incorporate standardized message templates (e.g. WG14, Multispeak).
Model Driven Message Definition

1. Common Model using UML
2. Export and transform to XML Schema
3. Create Message Definitions
4. Import into messaging middleware

- Message Types
Model Driven Messages

• Implementation independent
• Consistent across applications
• Enables sharing of message processing among applications
• Reduces integration effort and maintenance
Directed Messaging

Message Bus

SCADA

Asset Management
Work Management
OMS
EMS
Publish/Subscribe

SCADA

Publish

Message Bus

Subscription

Asset Management

Work Management

OMS

EMS
Benefits of Publish/Subscribe

• Eliminates application dependency on specific sources and destinations.

• Lowers maintenance costs…easier to modify data flow.

• Improved Scalability.
Application Programming Interfaces (API)
Model Driven APIs

- The Application Programming Interface (API) presents application data within the context of a common model.

  - Data Access Facility (DAF)
  - Data Acquisition for Industrial Systems (DAIS)
  - Generic Interface Definition (GID).
DAF

• Standard interface to a model server for the purpose of initializing applications. Ex:
  – Topology processors
  – Archives
  – Other power system network model consumers such as third party data management tools
DAF Interface Provides

• Get/Set of model information

• Browsing of model to view relationships and access data

• Ability to enunciate model changes
DAIS Data Access

• Standard interface for accessing measurement data.
  • Based on OLE for process control (OPC).
  • Replaces Microsoft-specific programming idiom of OPC.
  • Can be used as the basis for a high speed C++ data access interface that is platform independent.
DAIS Browsing

• Supports browsing a hierarchical tree to find “items”.

• DAIS Item = Data item with value, quality, etc.

• Example Functions:
  • node_home()
  • item_home()
  • find_by_parent()
  • find_by_type()
  • get_pathname()
  • get_ids()
DAIS Data Access Functions

• Synchronous Read/Write:
  • sync_read()
  • sync_write()

• Asynchronous Read/Write:
  • async_read()
  • async_write()

• Callback functions:
  • on_data_change()
  • on_write_complete()
  • on_read_complete()
DAIS Alarming & Eventing

• Standard interface for alarms and events
  – Alarms may CIM elements
  – Events consist of CIM objects (e.g. Work order)

• Example Functions
  • get_filter ()
  • set_filter ()
  • get_state ()
  • set_state ()
  • query_available_filters ()
  • set_subscription ()
GID

- Applies DAF and DAIS to more use cases - very little new functions
- Enhances DAF with updates
- Enhances DAIS alarm and Eventing interface with more efficient subscription mechanism
Utility Integration Bus (UIB)
Utility Integration Bus (UIB)

- An integration platform that incorporates modeling concepts throughout:
  - Model awareness distributed across bus
  - Enforces common data exchange model consistently.
  - Model aware APIs.
  - Enables or provides high-level configuration, management, and analysis tools.
UIB Architecture

- SCADA
- GIS
- EAI Middleware
- APIs
- CIM
- DMS
- OMS
- WMS
Model Driven Integration = Interoperability

Application A
Client Process
Model Translation

Application B
Server Process
Model Translation

API
Utility Integration Bus
Message Bus - Middleware
Messages

Common Data Exchange Model
Thank You

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