Legacy Approach for Analytic Data Modeling

• Each group looks at its own application needs and develops a data model that is optimized for its own use:
  » Only data needed for its application is considered.
  » New data model elements are added as needed based on needs of individual applications.

• The “Ad-Hoc” Approach
Ad Hoc Approach for Line Rating Application

Line Rating Application
- Control Area
  - Corridor
    - Line Segment 1
    - Line Segment 2
      - Ambient Temp
      - Wind Speed
      - Wind Direction
      - Current
      - A Line
        - LineTemp
        - Sag
      - B Line
        - LineTemp
        - Sag

Data Store

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Ad Hoc Approach for Remedial Action Schemes

Remedial Action Application

- Corridor
- North-South Interconnect
  - Line Trip RAS
  - Generator Trip RAS
    - Airport Substation
    - Sydney Sub
    - West Dam Sub
    - East Wind Sub
    - Line Status
      - Current
      - Margin
    - Line Rating
    - RAS Arming

Same Object...Different Usage

Another Object Defined

Data Store

Line Rating App

C-RAS App

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Ad Hoc Approach for Disturbance Monitoring

Disturbance Monitor App

- Control Area
  - Airport Sub
    - Bus Monitoring
    - Battery
    - Breakers
    - Transformer
      - Voltage Level
      - 138KV
      - 69KV
      - DFR1
  - Sydney Sub
  - East Wind Sub
  - West Dam Sub

Same Object...Different Usage AGAIN

Disturbance Monitor

Data Store
Ad Hoc Approach for CBM Applications

Condition Based Maintenance

Circuit Breakers
- Sydney Sub
  - 69KV
  - 138KV
  - Breaker Q1A1
  - Breaker Q1A2
  - Breaker Q1A3
  - Breaker Q2B1
  - Breaker Q2B2
  - Last Operate
  - NumOperations

Transformers
- Sydney Sub
- West Wind Sub

Additional overlapping object definitions used

Disturbance Monitor

CBM

Data Store

C-RAS App

Line Rating App

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Impact of Ad Hoc Approach for Application Data Models

- Each Application has its own data model.
- Impact of cross-organizational integration and data sharing ignored.
- Each group is individually satisfied with their own custom view until.....

Data Store

CBM

Disturbance Monitor

C-RAS App

Line Rating App

Next App? How Many?
Change Happens

• Addressing change becomes too difficult when each application uses its own incompatible data modeling:
  » Business needs demand organizational changes and new levels of data sharing and integration.
  » New technology must be addressed (e.g. renewables, DER, “deregulation”, etc.

• Result: Application rewrites, reintegration, project delays, barriers to data sharing.

• The “Bigger” the data, the bigger the negative impact will be of not using a common data model.
How Does This Happen?

• Misunderstanding the Integration Use Case
  » The tendency is to focus only on the specific project at hand
  » Ignores the long-term cost and complexity of trying to do many projects

• Is this the use case that drives choices (for example)?
Here is the Real Use Case
CIM Is The Only Choice for the Model-Driven Utility

• Developing your own comprehensive utility data model to replace CIM will take many decades of effort
  • How many world-class experts can your utility hire to design this from scratch?

• CIM is specifically designed to be adapted to fit the needs of individual utility use cases:
  » Extensions and Profiles
  » Messages and Integration Patterns

• New applications can extend independently yet share the existing models where needs overlap without breaking existing applications and integration

• SISCO’s CIM Adapter for PI brings these benefits to the PI System

• CIM is not the easiest way to do any one thing. CIM is the only way to do everything.
The CIM Model-Driven Process

- CIM is flexible to accommodate:
  - Extensions for non-standard business needs
  - Eliminate the complexity of unused models
- Profiles are created based on use cases to address your specific needs
- Instances created to relate existing data to the CIM Profile schema
- Model used to configure analytics.
- Applications use models to access data eliminating custom tag name dependency.
CIM Adapter and PI AF Deliver Flexibility

- Multiple uses cases can be addressed with one profile.
- Multiple profiles can be supported for use cases that can’t share a profile.
- PI AF is flexible to support many models.
- A disciplined modeling process with SISCO CIM Adapter brings it all into the PI System.
Result of Integration with PI AF

Classes per CIM with Extensions

Substation with calculated differential frequency measurement from synchronizing relay

IEC 61850 Object Name:
AMHERST9_RSYN1$MX$DifHzClc$f
Result of Integration with PI AF

Angle separation across the Amherst Bowman line is \( \sim 8.5^\circ \)

NorthAMHE400BBOWM8/RSYN1$MX$DifAngClc$f
CIM Adapter Helps You Embrace Change

- The model driven process captures change and creates incremental updates.
- SISCO CIM Adapter incrementally updates PI AF models.
- The individual hierarchies can be updated and kept synchronized with each other.
PI AF with CIM Works Across Applications

- SISCO COMTRADE Utility brings disturbance data into the PI System using PI Event Frames
- CIM and PI AF models help correlate all the data in the context needed by the individual application needs.
Summary

• CIM is a pre-existing standardized utility oriented data model that provides a platform to build an application data model that addresses enterprise level needs.

• IEC 61850 provides a data model that provides context and meaning to telemetry data that can be associated to CIM

• PI AF and SISCO CIM Adapter provide an excellent foundation to support effective application of application data models for utilities.

Business Challenge

• Taking advantage of application data models that meets individual group needs while supporting enterprise wide integration and data sharing that can be adapted to changes.

Solution

• PI AF to organize all PI System data
• SISCO CIM Adapter to automate PI AF modeling
• CIM based model driven process to manage change

Results and Benefits

• A single enterprise level based for PI AF that can be optimized for individual application needs
• Flexibility to minimize effort adapting to change
Thank You

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