Profiles vs the Canonical Model

Version Management in CIM Architectures

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The 'Big Picture' Theme

Cost justification in CIM is often difficult, because the payoff often occurs outside the scope of a immediate objective.

CIM is not the easiest way to do anything – it is the easiest way to do everything!

Design Center

- A rule I learned about applying technology:
 - Understand the design center of the technology.
 - Use extreme caution if trying to apply the technology outside its design center.
- CIM Design Center
 - CIM standards aim to simplify integration of components and expand options for supply of components by standardizing information exchanges.
 - Reduce complexity with clear consistent semantic modeling among different points of integration.
 - Clarify data mastership across any domain.
 - Establishing data flow between components without directly coupling their design; i.e. 'arms-length' communication.
 - CIM employs a *canonical data model* (CDM) strategy for standardizing interfaces in the power system operations and planning domain.



Important terminology...

- *Semantics* refers to the meaning of a set of information.
- A *semantic model* is a structured description of the semantics of a set of information, using some information modeling language (e.g. UML).
 - A semantic model is 'metadata' 'data about data'.
 - Many different semantic models are possible for the same semantics, even within one modeling language.
 - Semantic modeling only represents information content it does not include formatting/encoding (syntactical) specifications.
- A *semantic transformation* is a procedure for converting a given semantic from one semantic model representation to another.
 - This should be distinguished from a syntactic transformation that converts from one format to another. (e.g. CSV to XML)



A *canonical data model* (CDM) is a semantic model chosen as a common dialect for a data exchange.



Unification of semantic integration standards occurs when profiles specifying individual exchanges derive their semantics from a common CDM.



CIM Design Center

- The CIM CDM is partitioned into sub-domains by IEC WGs.
 - These groups work hard to maintain a *unified* semantic model over the whole domain.
- 'Profiles' specify standards for particular business problems.
 - Profiles define how the semantics of an interface relate to the CDM.
 - Products implement support for profiles, not the CDM.
 - Testing occurs against profiles, not the CDM.
 - CIM compliance is defined against profiles, not the CDM.
 - There is no such thing as just 'CIM compliant'. You have to specify the profile.
- Do not expect CIM to make sense outside its design center.
 - If it's not needed an existing CIM interface, don't expect it to be in the model.
 - Don't expect that CIM is a good database schema.
 - Don't expect CIM to make a good class design for your application.
- If no CIM profile currently addresses my interface problem, what should I do?
 - Find out which CIM committee has your problem in scope.
 - Then help them create a profile. (We cannot design solutions without domain experts.)



Early View of CIM Profile Methodology





Profile Methodology Work

- CIM groups to date have been creating profiles without a common methodology.
 - However, some rules and tools have evolved. (e.g. CIMTool)
 - Typically,
 - Contextual semantic models specify the information structure of exchanged information in a profile.
 - Contextual semantic models are derived by specifying a subset of the CIM CDM.
 - Formatting has been controlled via RDF / XML in WG13 and XSD in WG14.
 - But different special problems have forced us toward other approaches as well.
- Recently, a committee has been formed to work on developing a more rigorous notion of profile methodology.
 - This is a work in progress.
- Probable direction of work...
 - Define different kinds of problems that we expect profiles to address.
 - Define recommended solution patterns for each kind of problem.
 - Create some sort of user guidance that informs a) how to recognize the type of problem, and b) how to use the CIM CDM to create a profile for that type of problem.



Differentiation of Problems (a work in progress)

Case 1: No special constraints on the form of the solution.

- We are free to design for maximum semantic clarity and consistency.
- Hopefully, this is the 'normal' circumstance.
- Case 2: Cost benefit demands accommodating existing product conventions to some extent.
 - Instance identification convention exists and certain messages within a closed environment must maintain this convention.
 - Example: 61968-9 metering needs to continue to use the existing meter identifiers.
- Case 3: Environmental constraints exist. (e.g. Real-time performance, message size, etc.)
 - China? ENTSO-E DACF?
 - Are the current data modularization and incremental update strategies adequate?
- Case 4: Harmonization with an existing semantic standard is required.
 - WG16 needed to leave the implementations of ENTSO-E messaging intact, but transformations to CIM were required.
 - CIM applications need to be able to interoperate with 61850 applications.



Profiles are often interdependent.





Transformations connect local semantics to standard profile semantics derived from CIM.

- Transform issues
 - Clarity
 - Simple, low cost implementation
 - Maintainability
 - Performance!





CIM Evolution

- CIM is designed to achieve consistent, high quality models across a large domain.
 - This mission requires that CIM is able to change as new interfaces are added.
 - It is not possible to preserve semantic quality if changes are restricted to additions.
 - At the global CIM level, change is embraced as long as it makes a significant contribution to semantic quality.
- Stability may be addressed as appropriate at profile levels.
 - Profiles are where the investment is made.
 - Each profile is derived from a version of the CIM CDM, but not all from the same version.
 - Changes to CIM do not necessarily require that the profile be updated.
 - Participants can determine when to update their profile.
- About Versioning...
 - CIM CDM and contextual models will change.
 - Profiles also change but not in lockstep with the CDM.
 - Where there are multiple consumers or producers for a profile, it probably is not practical to synchronize upgrades.



In the real world, semantic models and standards need to evolve.



Version migration within a profile.





Using CIM as an Enterprise Model

- An enterprise integration strategy based on CIM is a good idea, but...
 - Recognize that interoperability standards have driven the current CIM.
 - We are just beginning to consider enterprise integration within the IEC working groups.
 - Priority issues for standardization are not the same as for your enterprise CDM.
 - You will need to manage a different version.
 - Standard CIM will change and you won't always appreciate the changes.
 - If you do not periodically synchronize with the standard, you will inevitably drift away.
 - This re-sync must be planned for and budgeted!
 - Keep in mind that your vendors are also trying to maintain integrated product sets.
- Recommended practice.
 - Set up an enterprise information architecture group to maintain your model.
 - Maintain a harmonization between your model and the standard CIM.
 - Harmonization: a formal specification for transformation between two CDMs.
 - Manage transformation implementations.
 - This is where a lot of life-cycle cost is centered.



You may wind up with something like this...



- You may think that CIM is complex.
- From the standpoint of one information exchange implementation, it is.
- If you compare life cycle of 100 exchanges, each implemented in CIM, against other alternatives, CIM is much simpler.

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