Harmonization Project for 2006
SOW for Joe Hughes Funding

Development of Substation Communications Standards (IEC 61850) Harmonization with the Common Information Model (IEC 61970, 61968) Standards

The International Electrotechnical Commission (IEC) Technical Committee 57 has been developing standards for integrating substation "real-time" communications (IEC 61850) and for Control Center Communications (IEC 61970) and Distribution Operations (IEC 61968). These standards are developing for different distributed computing environments. Significant work has been contributed and adopted in each of these standards communities however, a portion of this work was performed independent of the other communities. As a result different data/information models and semantics have been created where 1) separate data models may not be necessary or 2) separate data models are necessary and they now require a way to distinguish the differences.

A number of applications are now emerging that cut across technical and security domains and could make use of these standards to integrate data and applications across these environments. These include applications that provide a more comprehensive vision of system operations. Both standards development efforts offer useful data and information for the other. This project is driven by the need to understand how use these standards for applications that require systems to integrate across these traditional environments. The term "transparency" is sometimes used to describe applications that can be constructed independent of where services are located.

This proposal request seeks to assist the appropriate integration of key standards that are developing under the IEC committees. These efforts are necessary to assist in the integration systems and applications that would rely on these standards for integration between equipment operating in real-time operations and applications running across information technology environments.

Task 1: Identify and prioritize key applications and issues that drive the need for harmonizing Substation communications standards

This task will identify key applications that drive the need for integrating data and control communications between real time environments and enterprise integration environments. Key candidate applications that drive the need for harmonization shall include managing data and information for substation and control center operations, and related applications such as system commissioning and configuration, network and systems management, planning, workforce management, management of field equipment and other functions that cut across the enterprise. These key cross cutting or location transparent applications are intended to place a context around harmonization efforts.

Relevant standards documents will be reviewed to identify potential areas of harmonization as well as gaps that may exist between the standards.

This task will prioritize the candidate applications along two dimensions: 1) key operational needs for integrated communications and 2) filling in gaps not adequately covered by work underway in work item proposals or user group activities. The project work will appropriately complement work underway to the greatest extent possible.

The highest priority will be supporting applications necessary to both manage and execute substation to substation and substation to control center communication operations. Priority will also be given to the management of the equipment and systems including configuration, and system wide security.

The result of task 1 will be a prioritized list of key applications. These applications will be described with Use Cases. The focus, when describing the applications, will be put on the data flow in particular between systems from the different standard domains.

Task 2: Develop Strategies and Methods for Harmonizing the standards for key Substation Operations and Enterprise Integration Applications

This task involves evaluation of the candidate integration applications and developing strategies and rationale for integrating and harmonizing the standards. Where IEC 61970 uses data models, the more complex IEC 61850 Standard uses the substation configuration language (SCL) and the logical node for details. The focus of this task is to analyze the key cross cutting applications and understand where semantic differences may be resolved and agreed upon by the respective communities. This analysis may result in either modifying existing or proposing new data/information models and definitions that are intended to resolve ambiguities across the standards. The intent will be to harmonize on only those elements that are key to executing the applications. In some cases a given data model from one domain may be an extension or specialization of a more generic form in the other domain. This task will involve gaining an understanding of the underlying semantics involved in key logical nodes or data models intended for the cross cutting applications. The project will endeavor to understand the driving domain knowledge for a given application and propose solutions based on new, modified or extended semantics. Where IEC 61850 standard Logical Node has well defined details for key operating parameters these will be considered the source of raw field measurement data for populating IEC 61970 data models.

The project will focus on high priority harmonization efforts and a case will be made for the types of applications and priorities proposed.

This project will make use of the Unified Modeling Language (UML) as a tool for analysis as well as documenting results.

Results of task 2 will be a number of recommendations how to achieve the required harmonization. The recommendations may include developing mappings between CIM and 61850 environments, proposed data models, and logical nodes with documentation on the semantic details. The results will be developed into direct contributions based on the evaluated applications. Strategies will also include appropriate use of IEC 61850 Part 6 Substation Configuration Language (SCL) to assist harmonization. Results will also include developing guidelines to assist the understanding of subtleties of integration including type-levels, potential loss of data on conversions, relationship-levels and attribute-levels. The work will include identifying other key standards that should be considered for harmonizing in addition to those identified within the IEC technical committees. This task will also identify any gaps in the existing standards and/or work that should be done to address the appropriate integration of these environments.

Task 3: Develop deliverables to assist the harmonization of standards

This task will implement the recommendation and strategies from task 2 and develop the deliverables that will be published by EPRI and contributed as appropriate to industry working groups and/or standards communities to assist the process of integrating and harmonizing standards. It is the intent of this project work to submit contributions during the course of this work to the appropriate standards activities.

Results of task 3 may – as an example - be concrete mappings between 61850 logical nodes and the respective CIM data model. This may include extensions to the CIM data model to incorporate information existing in a logical node as well as detailed specification of the data conversion.

Task 4: Recommendations for follow-on work.

This task will develop recommendations for further work including both harmonizing as well as developing new data models or logical nodes/SCL for applications and domains such as PMU measurements that don't make use of standardized data models.

The scope of the follow-on work will be described as well as suggestions, how to realize the follow-on work and if applicable an estimation of the work amount. Follow-on work can e.g. include recommendations for additional investigations / reports that shall be developed or a recommendation for a pilot project, but it can as well be a recommendation to issue a new work item proposal for a standardization project in TC57.