Interoperability Beyond Good Standards

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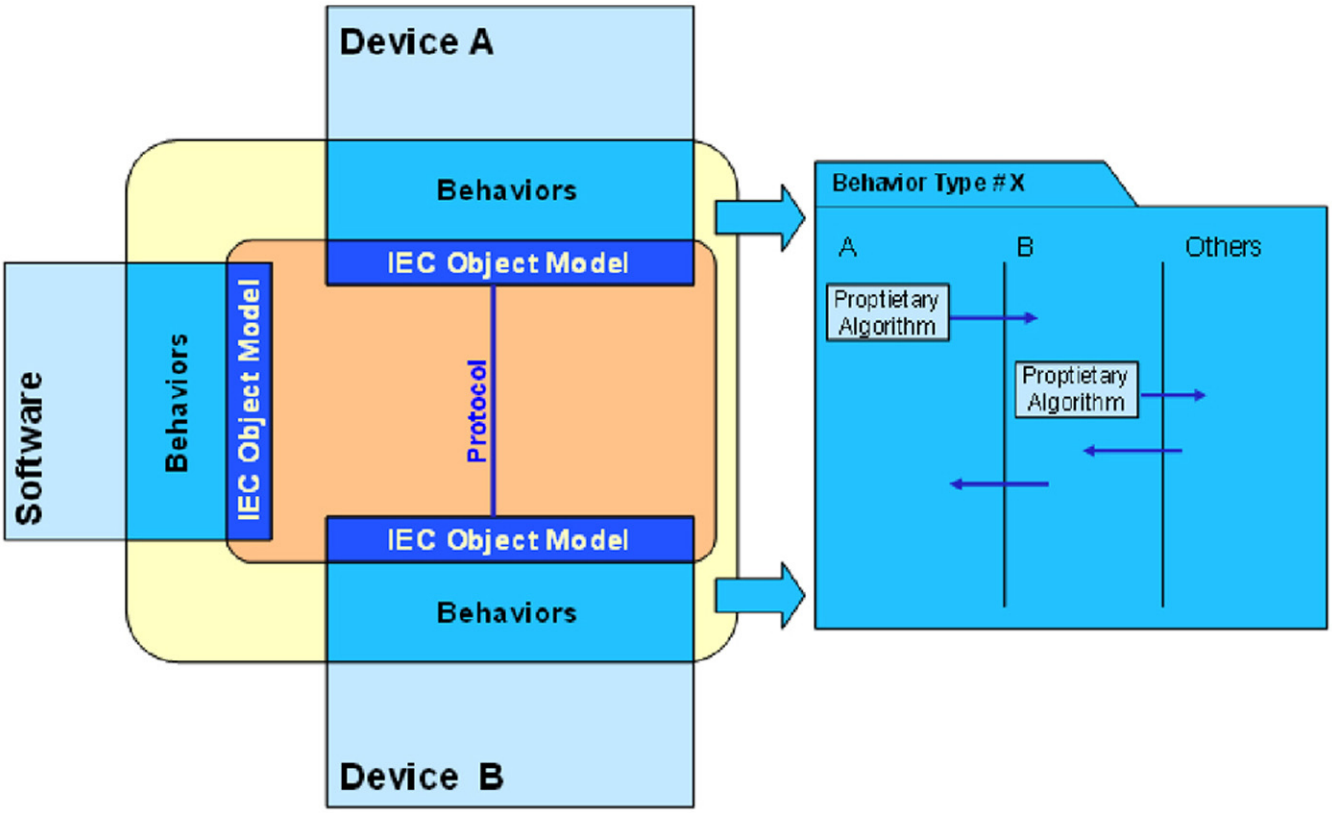
Many manufacturers, research organizations and standard bodies announce new advances towards interoperability. But in reality, in the field of distribution automation where the first major efforts where made more than five years ago with UCA, the implementation of a new standard protocol such as IEC 61850 shows that interfaces still need to be adapted for each new automation project.

But many IEC 61850 compliant devices are available on the market So why is there still a need to adapt the interfaces between equipment from different vendors? One of the reasons lays on the fact that IEC 61850 provides a vocabulary to exchange data but does not guide on how these information should be exchanged.

The Technical Committee 57 of IEC has laid out last year a Reference Architecture. It describes four building blocks to achieve an efficient exchange of information between Power Systems devices: Architecture, Vocabulary, Data modeling, and Communication codes. A missing part is the 'Process modeling' block that describes the behavior of the equipment i.e. how the data can be exchanged between equipment or software applications.



EDF has more than 5 years of experience in information architecture of digital control devices for substations. Based on EDF specifications, five manufacturers (SCLE, Areva, Schlumberger, Schneider Electric, ICE) have developed digital automation equipment for EDF distribution substation that are now operating efficiently and are being deployed among the 2200 substations on the French territory of EDF.

One of the enabling technologies that EDF has identified in this automation project is the use of UML. UML provides formalized tools to describe both information and processes (or use cases). Computer tools called 'case tools' handle the description of UML models and opens up to new horizons with capabilities such as generation of the exchanged messages between devices, code generation of the automation scheme, tests description needed to verify the completion of implementation to the specifications.

The first issue EDF has addressed is the modeling of the existing IEC 61850 standard using UML. A first version has been developed and made publicly available (www.cimuser.org). Gaps and ambiguities embedded in the plain text version of IEC 61850 were discovered during this study. Appropriate technical fixes have been proposed to the IEC TC57. The model will now be maintained with continuous improvements and when mature, will be submitted to become as international public standard.

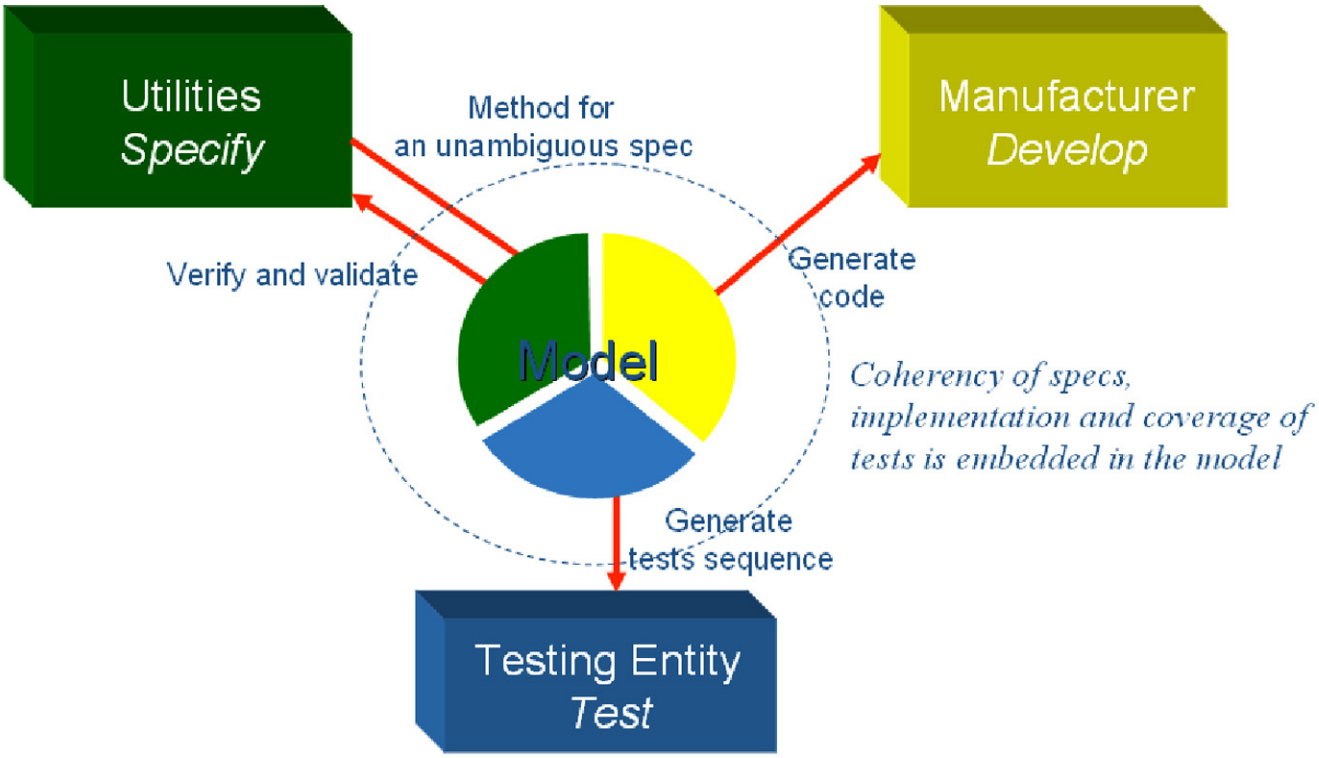
The second issue described here is adding to the UML modelling of the existing 61850 a common representation of substation automation behaviors and to share it with the industry. Here is a description of the tasks of this project:

- Select the most common processes to exchange data in substation automation
- Develop use cases and sequence diagram for these processes in UML to ensure better compliance and convergence
- Validate them within the industry (public posting through UCA)
- Test them regarding interoperability
- Inject collected feed-back to improve their definition
- Standardize these processes in the relevant standard body
- Harmonize these processes with relevant standard associations.

The objective for 2007 is to be able to generate quickly mock-up of automation schemes based on the models developed (the static IEC 61850 UML models and dynamic UML processes or use cases). Automatic code generation has been tested successful with one of the case tools that provide this functionality (Tau from Telelogic). Contacts with manufacturers are made to verify the feasibility to implement these models into devices. Further work in 2007 will verify the independence of the results from the case tool itself.

In Summary

a. Models of automation will reconcile the 3 standpoints needed for the successful implementation of any new schemes between utilities, vendors and independent verification.



b. With both static models (data models) and dynamic processes models, Utilities will tackle 3 issues with one stone: develop more quickly their requirements with a rigorous non ambiguous method, decrease the costs of reception and compliance tests, and add flexibility in their migration strategies.

Vendors will be able to decrease their development costs and shorten the time-to-market by having standard interfaces and automatic code generation. The outcome will bring new volumes of intelligent devices, higher margins thus enable new products to be develop to modernize the power systems.