IEC 61850 and UCA™ 2.0

A Discussion of the History of Origins by Karlheinz Schwarz, SCC

People ask ever more frequently, what the difference is between IEC 61850 and UCA2.0. This paper is intended to give an answer to these questions.

UCA™ (Utility Communications Architecture[1]) has multiple meanings today. Firstly, it is a generic name used to identify the new approach of communication and information technologies for utilities. The new approach comprises mainly standard network technology and in-formation modeling. Secondly, it was a title of an EPRI project (1987-1999). Finally, it is used in the title of the IEEE Technical Report 1550 – commonly called UCA2.0.

UCA – in its broadest sense – has given direction to the standardization within the IEC TC 57 (Power System Control and associated communications). The standard series TASE.2 (ICCP, IEC 60870-6) and IEC 61850 have been build on the results of the UCA projects and the IEC 60870-5 standard series.

Most notably UCA2.0 (IEEE TR 1550:1999) and the experience with the new approach has been used as input for the specification of IEC 61850 (Communication networks and systems in substations) within IEC TC 57 WG 10, 11 and 12. Several products according to UCA2.0 have been developed to demonstrate the feasibility of the new approach. In the mid 1990's the international standardization of the standard series IEC 61850 began. The technical content of IEEE TR 1550 was accepted as an important input to IEC 61850. IEEE TR 1550 focused on the needs of the U.S. market – while IEC 61850 had a more global scope.

In 1998, the IEC TC 57 and IEEE SCC 36, agreed to come up with a single international standard. The IEEE TR 1550 was published to freeze the technical content and report it to the utility community. Additionally an agreement was reached to use the standard series IEC 61850 as THE International Standard. It was also agreed not to publish the TR 1550 as an IEEE standard.

The international standard series IEC 61850 is an available and accepted International Standard. Since 2001 many interoperability tests have been run to proof the concepts and details.

The crucial differences are as follows:

IEC 61850	IEEE TR 1550 (UCA2.0)
international standard (IEC)	technical report (IEEE; GOMSFE version 0.82)
comprehensive, modular information models – open for easy extensions applying a name space concept	information models (provide for extensions, however name space concept is not included); GOMSFE Bricks are compatible in concept with Logical Nodes in IEC 61850-7-4
configuration language (XML based) for a simplified substation configuration	no configuration language provided
using **prioritized** Ethernet (Ethertype/VLAN) providing high-speed and preferred transmission of GOOSE messages	no priorities supported with UCA2.0-GOOSE
flexible IEC-GOOSE to exchange any information from any data object (digital, analogue, ...)	UCA2.0-GOOSE to exchange fixed number of digital information
sampled value transmission for CTs/VTs	no sampled value transmission supported
Information models and communication services are **independent** from protocols; multiple mappings, e.g., MMS (ISO version 2003) and web services allow for future proven technologies	mapping to MMS (ISO/IEC version 1991); development was refocused on IEC 61850 as a single international standard
control model with **enhanced security**	restricted control model

The IEEE TR 1550 (UCA2.0) is a “historical landmark” in the development of the new approach – it was not standardized as a specification for substation automation devices.

Today, the abbreviation UCA™ is a brand name of the new approach. The recently founded “UCA International Users Group” reflects this interpretation; it comprises the series IEC 61850 and TASE.2.

The specifications used for substation automation and other devices and systems are the standard series IEC 61850.

Other IEC 61850 based standards which extend the information models for applications inside and outside the substation are under development, e.g.:

- IEC 61850 extensions for power quality monitoring (PQM)
- IEC 61850 extensions for monitoring (statistical and historical-statistical information)
- IEC 61400-25 (communications for monitoring and control of wind power plants)
- IEC 62344 (hydroelectric power plants – communication for monitoring and control)
- IEC 62350 (communications systems for distributed energy resources (DER)

The relation between the UCA™ International Users Group, IEC 60870-6 TASE.2 (ICCP), IEC 61850, and IEC 61850 based standards is depicted in **Figure 1**.

Summary

The standard series IEC 61850 and various other standards under way (which are based on IEC 61850) provide a comprehensive and consistent set of specifications. Today these specifications are implemented (or planned to be implemented) in a variety of systems and devices of all major vendors.

These standards provide a solid base for tenders of today’s and future utility automation systems.

The standards are also future proven and tested – new application requirements will extend the specifications.

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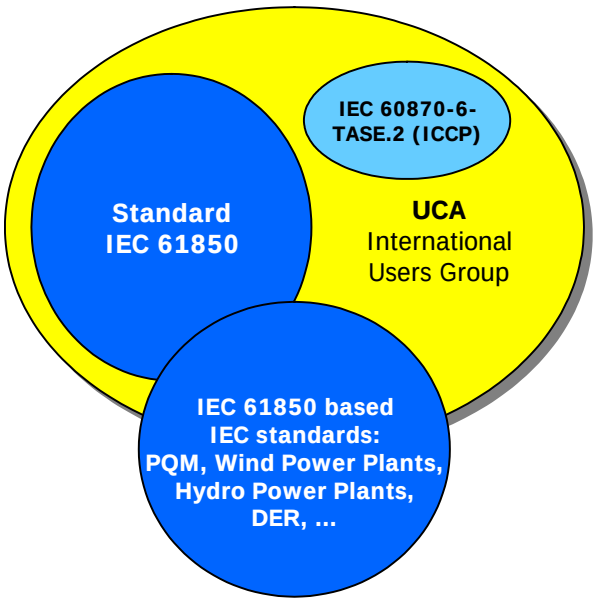

Figure 1 – Relation between standards and the UCA International Users Group

[1] UCA is a trademark of EPRI (Palo Alto (CA), USA)