IEC 61850:
First Neutral Hands-on Training
with Multivendor IEDs:
25-28 November 2008 in Sweden

IEC 61850
Comprehensive & Independent Hands-on Training

The future of power systems requires comprehensive know-how

IEC 61850 is the global standard for Substation Automation. It allows for and open and "future proof" design, different architectures and possibilities to combine products from multiple vendors. This new standard has many new possibilities but also challenges. By using the inherent advantages of IEC 61850 it is possible to optimize more reliable and cost effective solutions.

The big vendors are speeding up quite fast. In order for users and system integrators to utilize the benefits of IEC 61850 it is necessary for the generation, transmission and distribution companies to start now with the awareness and education program for their most crucial asset – people, and start the migration to IEC 61850.

Objective and structure of the training

This training has the objective to provide both theory and practice on the application of IEC 61850 in a substation by following the planning, design and engineering process for real applications all the way to configuration and testing based on a real multivendor test installation. The 4 day course consists of:

- **Module 1** gives a level 1 introduction to the IEC 61850 standard together with a summary with real applications and the demonstration of STRI facilities for multivendor interoperability testing.
- **Module 2** gives an independent and more detailed update on the IEC 61850 standard for substation and device modeling as well as communication principles with real examples.
- **Module 3** will present possible functional allocation and architecture of a typical substation with state of the art IEDs from different manufacturers (ABB, Areva, Siemens) as well as available test sets (Omicron, Doble, Programma) with group sessions on how to optimize the solution**.**
- **Module 4** is divided in two parallel courses. Option 1 – IEC 61850 hands-on workshop demonstrating interoperability of protection and control devices from ABB, Areva and Siemens. Option 2 – Substation Configuration Language (SCL) hands-on workshop. Learn what you need to know for specification, evaluation, verification, and maintenance of IEC 61850 substations and IEDs.

Your IEC 61850 hands on training competence resources

This training is a joint initiative by NettedAutomation GmbH (Germany) and STRI (Sweden).
NettedAutomation's lecturer Karlheinz Schwarz has a unique and recognized know-how of IEC 61850 and has immense experience in the migration from proprietary or other solutions to standard compliant solutions. He is involved in standardization activities within ICE, CENELEC, IEEE and DIN. In 2007 he received the IEC 1906 Award *"for his strong involvement in the edition of the IEC 61850 series, its promotion inside and outside IEC, and specifically its adaptation for wind turbine plant control".*

STRI is an accredited high voltage laboratory and independent technical consulting company with its competence extended with multivendor interoperability testing facilities for IEC 61850 and consulting services for IEC 61850. The lab comprises IEDs and tools from ABB, Areva and Siemens together with test sets from Omicron and Doble. Lecturers Gunnar Stranne and Carl Ohlen have more than 30 years experience within the field of protection, control and substation automation both in Europe and the Americas. Nicholas Etherden has several years experience in the development and configuration of IEC 61850 IEDs and Anders Fahlström has several years experience of IT & Ethernet communication.

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Training Program

Location: STRI, Ludvika, Sweden

Day 1 – Thuesday 25th of November 2008

10^{00}-10^{10}	Welcome and course introduction	Carl Öhlen, STRI
10^{10}-16^{00}	IEC 61850 Level 1	Karlheinz Schwarz, SCC
16^{00}-17^{00}	Application and IEC 61850 demonstration	Carl Öhlen, Nicholas Etherden, STRI*
19^{00}	Welcome drink for all participants	Selmas Pub*

* The demonstration and welcome event is open for participant arriving for day 2.

Day 2 – Wednesday 26th of November 2008

09^{00}-09^{10}	Welcome and course introduction	Carl Öhlen, STRI
09^{10}-17^{00}	IEC 61850 Level 2	Karlheinz Schwarz, SCC
18^{00}	Course dinner	

Day 3 – Thursday 27th of November 2008

08^{00}-15^{00}	Application of IEC 61850 in protection and control (Theory and group sessions)	Gunnar Stranne, Carl Öhlen, STRI *
15^{00}-16^{00}	Questions, answers and discussions	All

* Karlheinz Schwarz, SCC and engineers from STRI IEC 61850 Independent Interoperability Laboratory, will be available during day 3 for answering questions and providing more details on the standard series and the use in IEDs, tools and substations.

Hands-on Sessions

Day 3 – Thursday 27th of November 2008

16^{00}-17^{30}	Introduction for participants of workshop	Nicholas Etherden/Karlheinz Schwarz

Day 4 – Friday 28th of November 2008

8^{00}-15^{00}	IEC 61850 interoperability workshop	Nicholas Etherden, Anders Fahlström, Andrea Bonetti, Programma
8^{00}-15^{00}	Substation Configuration Language workshop	Karlheinz Schwarz
15^{00}-16^{00}	Comparison of results from workshops and Q&A	All

Training Content

Module 1 / Day 1

Introduction to IEC 61850, the basics of the standard series, updates and other extensions. Presentation of the STRI multivendor application with ABB, Areva and Siemens IEDs for a typical substation. Demonstration of compliant IEC 61850 software, devices and test procedures in STRI's Independent IEC 61850 laboratory.

People arriving for day 2 are welcome to take part in demonstrations and evening activities.

Module 2 / Day 2

IEC 61850 substation and device modeling and communication principles (GOOSE, Sample Values, Client/Server applications). What you need to know for specification, evaluation, verification and maintenance of IEC 61850 systems (whole substations and IEDs).

Module 3 / Day 3

Review of available functions and possible architectures for substation automation. Optimized application of IEC 61850 in power utilities with examples based on the STRI multivendor application with ABB, Areva and Siemens IEDs for a typical substation. Morning session with theory and afternoon with group workshop to design and specify typical substation functions.

Module 4 / Day 3 evening + Day 4

Module 4A: IED interoperability workshop (limited to 12 people)

The intention is to create a small system demonstrating interoperability of protection and control devices from ABB, Areva and Siemens. The participants will be divided in three subgroups with the task of browsing the IED model of each device (using self-description, validation of model and SCL file) and creating outgoing GOOSE messages from their relay. After lunch the network traffic is jointly analyzed and the reception of GOOSE messages will be configured in smaller groups. Finally the system is tested through e.g. simple multi-protection tripping schemes and the use of IEC 61850 compatible test devices.

Participant gets hands-on experience of at least two vendors IEC 61850 implementation in IEDs and tools. Experience in system debugging and network traffic analysis using third party and open source tools is gained.

Module 4B: Substation Configuration Language (SCL) workshop (limited to 12 people)

The workshop focuses on the design of typical substation functions and the engineering of the substation and IEDs according to the engineering process described in edition 2 of IEC 61850-6 (SCL). The participants will use third-party functional specification, design and engineering tools to design ICD files, substation sections, communication sections, IED sections and DataTypeTemplates. The participants will create a SCD file that is used to generate a fully functional IED (IEC 61850) server simulator. The SCD file is also used as import file for an IED configuration tool to configure a real IED (data model, server and GOOSE message). During the last hour of the workshop the two groups join for the IED configuration by use of the SCD file created by the SCL group.

This workshop 4B requires participants to bring their own notebooks (at least one for two attendees). The demo tools (from third parties) required will be provided by NettedAutomation prior to the beginning of day 4.

Registration Options and Prices

Module 1 is intended for engineers and decision makers working with substation automation, IT strategies and/or asset management within power utilities for generation, transmission and distribution to get an introduction to and update of the present status on IEC 61850 and its applications.

Module 2 and 3 is intended for engineers working with the planning, specification, design, operation and maintenance of substation automation to get a deeper understanding for migration to and application of IEC 61850. Module 4 is intended for engineers specializing in the application, engineering, configuration and testing of IEDs for protection and control in an IEC 61850 based system.

Module 1	IEC 61850 Level 1 (when booked alone)	600 EUR
Module 1	IEC 61850 Level 1 (when booked with other modules)	400 EUR
Modules 2-3	IEC 61850 Level 2 and applications	1.100 EUR
Modules 2-4	IEC 61850 Level 2, applications + interop. workshop (max 12)	1.950 EUR
Modules 2-4	IEC 61850 Level 2, applications + SCL workshop (max 12)	1.750 EUR

Please read more on www.stri.se/iec61850 and www.nettedautomation.com/seminars. Since the number of participants is limited please email a non-binding "Interest to participate" with an indication for which module you want to participate in to stri@stri.se before September 30, 2008. You will then receive a formal registration form. Formal registration depending on availability is required latest November 1st. We reserve the right to cancel the training course if the number of registered participants is less than 15 at that date. For additional dates and in-house hands-on training courses please contact Mr. Carl Öhlén or Mr. Karlheinz Schwarz (contact see below).

Curriculum vitae of Lecturers

Karlheinz Schwarz received his diploma (masters degree) in Information Technology at the University of Segen (Germany) 1982. He has held a management position within Siemens and has an immense experience in the migration from proprietary or other solutions to standard compliant solutions. He is involved in many standardization activities within IEC, CENELEC, IEEE and DIN since 1985. He received in 2007 the IEC 1906 Award *"for his strong involvement in the edition of the IEC 61850 series, its promotion inside and outside IEC, and specifically its adaptation for wind turbine plant control".* He has since many years as an independent consultant provided training courses and consulting services for IEC 61850 all over the world (http://nettedautomation.com/download/SCC-Profile-en_2008-01-16.pdf).

Carl Ohlen from STRI has a MSc in Electrical Engineering at The Royal Institute of Technology in Stockholm, 1973. He has more than 30 years of experience in protection, control and substation automation working for Vattenfall, Programma and ABB in Sweden, Switzerland, Brazil and USA. He is author of several CIGRE & IEEE papers as well as books within this field and has held a management position within ABB during the introduction of IEC 61850 IED product family.

Gunnar Stranne has more than 40 years experience in application of protection, control and substation automation working for ABB and GEC-Alstom (Now Areva) with base in Sweden (20 years) and USA (20 years). He has been lecturer in many seminars and is author of IEEE papers including training of IEC 61850 IED products and tools.

Anders Fahlström from STRI has a Bachelor of Science with a major in Electrical Engineering. Main area of expertise is beside Internet/Intranet and Ethernet applications also: Electronic design, embedded systems, compilers and electronic production and EMC considerations. Software development in C, C++, Visual Basic, Delphi, Matlab and web development in html, java, java script, flash, PHP including database programming like My SQL, Access.

Nicholas Etherden for STRI has a Master of Science in Engineering Physics from Uppsala University, 2001. He has several years experience from the development of a new IED family for IEC 61850 as application engineer, project manager and product marketing manager at ABB. This includes tools, application development and application support.

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