

## DAYS IEC 61850 COURSE

WITH PRACTICAL DEMONSTRATIONS AND HANDS ON  
MR. KARLHEINZ SCHWARZ (NETTEDAUTOMATION), MR. ANDREA BONETTI (FMTP)

With focus on protection and control in HV/MV substations  
using GOOSE, SV, SCADA and SCL Language

**All the presentations are supported by practical examples or demonstrations.**

### Detailed Program:

#### DAY 1 – Morning

09:30 – 10:00	<b>Registration</b> Welcome and introduction to the seminar. Presentation of the teachers and organizations.
10:00 – 12:30  (Karlheinz Schwarz)	<b>Smart Grid and IEC 61850</b> Status of Smart Grid Role of the Communication Structure in Smart Grid systems Role of IEC 61850 in Smart Grid systems

#### DAY 1 – Lunch

12:30-13:30

#### DAY 1 – Afternoon


13:30 – 18:00  (Karlheinz Schwarz)	<b>Introduction to the IEC 61850 standard</b> Introduction of basic concepts (information modeling, information models, information exchange, system configuration) History of the Standard: from the 90's to 2016 Structure of the IEC 61850 standard documentation, Edition 1, Edition 2, Edition 2.1, Edition 3... Lessons learned and what to expect in the near future  <b>Basics of IEC 61850 mapping and modelling, SCL language</b> Modelling concept in IEC 61850, Logical Nodes, Logical Devices, SCL language, types of SCL files, type of IEC 61850 documents (PICS, PIXIT...)  <b>Communication services</b> GOOSE, SV, File Exchange: Protocol understanding and encoding
--	--

**All the presentations are supported by practical examples or demonstrations.**

Lima, NM Lima Hotel, Av. Pardo y Aliaga N° 330,  
San Isidro 15073  
Del 13 al 17 de Noviembre del 2017.  
Horario: De 09:00 a 17:00 horas.


Informes e inscripciones:  
**NAKAMA SOLUCIONES S.A.C.**  
+51-1-3460426 / 997266827  
capacitaciones@nakama.com.pe  
**Vacantes limitadas**

**DAY 2 – Morning**

<p><b>09:00– 12:30</b>  (Karlheinz Schwarz)</p>	<p><b>IEC 61850 Vertical Communication, Client/Server</b> Communication services MMS, COMMANDS, REPORTS: Protocol understanding and encoding. Network analysis and Testing Client/Server Publisher/Subscriber. Vertical communication, "engineering of SCADA System". Importance of event driven reporting. Signal list to the SCADA System. Report Control blocks. Communication between substations and remote control center (IEC 60870-5-104, DNP3) How to build and configure Gateways from IEC 61850 to IEC 60870-5-104</p>	
---	---	---



**DAY 2 – Lunch**  
**12:30-13:30**

**DAY 2 – Afternoon**

<p><b>13:30- 15:30</b> (Karlheinz Schwarz)</p>	<p><b>Group Practical Exercise.</b> Participants will have a chance to run practical exercises of IEC 61850 modelling, reporting, logging, retrieving self-description etc. An evaluation package will be provided to every participant in advance to the training course. This training requires a Windows PC with .net framework and the possibility to install and run communication software. We will help to install and run the package onsite (e.g., immediately after closing the first course day).</p>	
<p><b>15:30 – 18:00</b> (Karlheinz Schwarz)</p>	<p><b>SCL Language in details.</b> Fundamentals of the SCL Language. Use cases for SCL language Different types of SCL files</p>	

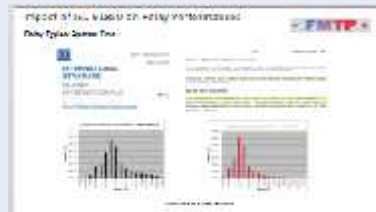
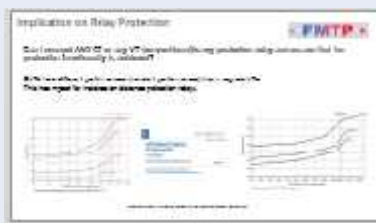
**All the presentations are supported by practical examples or demonstrations.**

**DAY 3 – Morning**

<p><b>09:00 – 12:30</b>  (Andrea Bonetti)</p>	<p><b>Impact of IEC 61850 Standard on Substation Automation Protection and Control.</b> Substation automation protection and control philosophy, vertical (MMS) and horizontal communication (GOOSE, SV), protection schemes, interlocking. IEC 61850 engineering process.</p>	
<p>(Andrea Bonetti)</p>	<p><b>Real time performances for protection schemes, horizontal communication.</b> Different types of GOOSE messages for different types of "substation signals". Protection security and dependability with IEC 61850 GOOSE and conventional technologies. What is important to remember to specify.</p>	

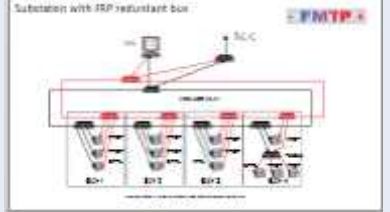
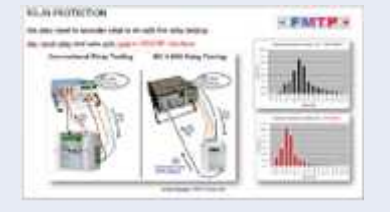
**DAY 3 – Lunch**  
**12:30-13:30**

**DAY 3 – Afternoon**

<p><b>13:30 – 15:30</b> (Andrea Bonetti)</p>	<p><b>Real time performances for protection schemes, horizontal communication (CONT)</b> Protection security and dependability with IEC 61850 GOOSE and conventional technologies. What is important to remember to specify.</p>	
<p><b>15:30 – 18:00</b> (Andrea Bonetti)  (Andrea Bonetti)</p>	<p><b>Process Bus and implications for the protection community</b> Process Bus (sampled values) today and expectations for the future. Interoperability, responsibility and testability. The role of different IEC committees: IEC TC 57 (Power systems management and associated information exchange), TC 95 (Measuring relays and protection equipment) and TC 38 (Instrument transformers).  <b>Groups Practical Exercise.</b> Investigate on process bus SV Streams. Understand time synchronization of the Merging Units</p>	



All the presentations are supported by practical examples or demonstrations.

**DAY 4 – Morning**



<p><b>09:00 – 10:30</b> (Andrea Bonetti)</p>	<p><b>IEC 61850 Network topologies and redundancy</b> Redundancy YES or NO? When? RSTP, PRP, HSR Examples from today's substations</p> <p><b>IEC 61850 Network topologies Communication Study</b> Communication study to assist the design and validate the Quality of Service of the network topology. Network Study for Communication in the substation and between substations Example of studies in Scandinavia</p>	
<p><b>10:30 – 12:30</b> (Andrea Bonetti)</p>	<p><b>IEC 61850 Testing for commissioning and maintenance activities.</b> Which kind of test equipment are available, test tools, how to use them. PROs and CONS, Feedback from IEC 61850 FAT tests in substations.</p> <p><b>Group Practical Exercise.</b> Measure the response time of protection schemes with GOOSE messages.</p>	

**DAY 4 – Lunch**  
**12:30-13:30**


**DAY 4 – Afternoon**

<p><b>13:30 – 15:30</b> (Andrea Bonetti)</p>	<p><b>IEC 61850 Testing for commissioning and maintenance activities (CONT)</b></p> <p><b>Interoperability problems and solutions.</b> Feedback from commissioning activities in the substations: which types of problems have been met, how they have been discovered and which solutions have been found.</p> <p><b>Group Practical Exercise.</b> Investigate (and solve) an interoperability problem in GOOSE communication scheme</p> <p><b>Disturbance Recorder Logical Node.</b> Maintenance substation tests based on post-fault analysis</p>	
<p><b>15:30 – 18:00</b> (Andrea Bonetti)</p>	<p><b>Engineering process with third party IEC 61850 Engineering Tools Helinks STS</b> Specification process Top Down Engineering Bottom Up Engineering</p> <p><b>Group Practical Exercise. Specification/Engineering</b> Specification and engineering of a small multivendor substation with horizontal and vertical communication. Use of third party IEC 61850 System Configuration Tool (SCT).</p>	

**DAY 5 – Morning**

<b>09:00 – 12:30</b>  <b>(Andrea Bonetti)</b>	<b>Group Practical Exercise. Specification/Engineering</b> Specification and engineering of a small multivendor substation with horizontal and vertical communication. Use of third party IEC 61850 System Configuration Tool (SCT). Example with <b>SCADA system from COPA DATA - Zenon</b>  <b>Group Practical Exercise. Engineering/Configuration/Testing</b> Download of the engineered SCD file into protection relays with use of IED Configuration vendor specific Tools (ICT).  Final testing of the communication scheme.	  
---	--	--

**DAY 5 – Lunch**  
**12:30-13:30****DAY 5 – Afternoon**

<b>13:30 – 14:30</b> <b>(Andrea Bonetti)</b>	<b>Group Practical Exercise. Engineering/Configuration/Testing (cont.)</b>	
<b>15:00 - 16:00</b> <b>(Andrea Bonetti)</b>	<b>Real time testing of power systems in IEC 61850 environment</b> Introduction about <b>OPAL-RT systems</b> Real-time application and IED closed-loop testing	
<b>16:00 – 16:30</b> <b>(Andrea Bonetti)</b>	<b>Question &amp; Answer time</b> <b>Discussion Forum</b>  <b>End of the Seminar</b>	

**All the presentations are supported by practical examples or demonstrations.**

*Please note: This is a proposed scheduling of the content, the training blocks can be slightly re-dispatched at different time during the week.*

Lima, NM Lima Hotel, Av. Pardo y Aliaga N° 330,  
 San Isidro 15073  
 Del 13 al 17 de Noviembre del 2017.  
 Horario: De 09:00 a 17:00 horas.

**Informes e inscripciones:**  
**NAKAMA SOLUCIONES S.A.C.**  
 +51-1-3460426 / 997266827  
 capacitaciones@nakama.com.pe  
**Vacantes limitadas**