Training modules for public and in-house courses

IEC 61850, IEC 61400-25, IEC 60870-5/-6, IEC 61970 CIM, DNP3, ...

General	
• Welcome and opening	Welcome, opening, roll call, and IEC 61850 in brief
• Summary	Summary and next steps
Management and automation of the power system (basics)	
• Power system automation basics	Basics of power system information integration and automation covering control centers, substations, power generation, ...
• Standardization	IEC activities related to power system standardization, IEC TC 57 and TC 88 activities, IEEE
• System design and specification	Introduction to specification, availability considerations
• System migration aspects and role of system integrator	Stepwise migration from existing systems to solutions compliant to standards, project and migration planning, ...; roles of users, vendors and system integratos
• Security	Secure communication (data on travel and data stored) (IEC 62351)
• System management	Revision control, asset management
• Testing devices and systems	Test coverage and steps towards system testing and simulation (from devices to systems)
IEC 61850 (and IEC 61400-25) basics	
• IEC 61850 series – overview	Communication networks and systems in substations: general introduction on whole series
• IEC 61850 Application modeling principles	Modeling protection, substation automation, other applications (Logical nodes, data and data attributes, function modeling, extension of the models, monitoring)
• IEC 61850-6 engineering process	Engineering process using the configuration language
• Communication	Information exchange, ACSI, mappings
• Implementation of IEC 61850 conformant devices and tools	Device models, design of advanced IEDs, software and hardware architectures, OEM software
• Device conformance testing	Conformance testing of devices according to IEC 61850-10
• Extension rules IEC 61850	The extension rules for Logical Nodes, Data, and Common Data Classes
• Substation configuration language (SCL)	System configuration language: basics and details; Engineering process and SCL, SCL object model, SCL syntax (IEC 61850-6 (SCL))
Substation automation and protection	
• IEC 61850 modeling details	Modeling of protection, switchgear, metering and power quality equipment and other substation automation applications
• Applying IEC 61850 for substation automation – use cases	Use cases from substation automation like measuring of current and voltage, protection, operating a switch, creation of a sequence of events
• Product specifications for substation equipment	Implementation guideline IEC 61850-9-2 “LE”, Product standard for switchgear with integrated IEC 61850 interface (IEC 62271-003)
• Substation automation system architecture	Communication architecture and topology, device architecture, impact of new technologies
• Substation to substation comm. for protection and control	Interlocking between substations, listance protection, line differential protection, etc.
Power generation	
• Wind power plants	Communications for monitoring and control of wind power plants – IEC 61400-25
• Hydro power plants	Communications for monitoring and control of hydro power plants – IEC 61850-7-410
• Distributed Energy Resources	Communications for monitoring and control of Distributed Energy Resources (DER) – IEC 61850-7-420
• Application modeling for hydro power plants	IEC 61850-7-410 modeling details New common data classes for hydro power plants
Communication between field devices and system level and at system level	
• Telecontrol protocols I	Fundamentals of Telecontrol equipment and systems – Part IEC 60870-5-101 and Part IEC 60870-5-104: Transmission protocols – Network access for IEC 60870-5-101 using standard profiles
• Telecontrol protocols II	Fundamentals of DNP3

• Substation to control center communication with IEC 61850	New work item of IEC TC 57 WG 19. Presentation of status and plan.
• Inter control center communication (ICCP)	Fundamentals of the use of IEC 60870-6-TASE.2 (ICCP)
• Webservices	Fundamentals of the definition of Webservices specified in IEC 61400-25-4
• Comparison of protocols	Detailed comparison of the protocol suites listed under S-50 to S-54
System level applications	
• IEC 61970 / 61968 series	Energy management system application program interface (EMS-API) / System interfaces for distribution management – introduction
• IEC 61970-301 CIM	Energy management system application program interface (EMS-API); focus on Part 301: Common Information Model (CIM) and harmonization with IEC 61850
• Dynamic and static use of the CIM Model	Component Interfaces for information exchange, use cases for the CIM: GID, EAI, Network models
• Tooling for the Common Information Model CIM	Available tools, platforms, experiences with power delivery systems Overview of existing OS tools: CIMTool, Xpetal, CIMVT, CIMValidate, CIMSpy; Available commercial tools; Flaws and future tools
Communication and SCADA aspects and protocol implementations	
• Extracting data from field devices	General SCADA services – configuration of logs, reports, ... (IEC 61850-7-2)
• Alarm handling	Fundamentals of special SCADA services (IEC 61850-7-2)
• Communication technologies	Fundamentals of Industrial Ethernet used for substations and beyond
• Information presentation and encoding	Fundamentals of UML, XML, ASN.1, ...
• Protocol details	Fundamentals of ISO 9506 (MMS), Webservices, IEC 60870-5, DNP3, ICCP
• Protocol implementations and Mappings for IEC 61850-7-2	Details on how to implement protocols and information models? MMS, ASN.1 BER, Webservices, ..., simple MMS clients; IEC 60870-5, ICCP, DNP3
• Demonstration of compliant software	Demonstration of IEC 61850 compliant client and server software
• MMS client and server implementation - the basis for IEC 61850	Comprehensive training on the implementation of MMS clients and servers for all basic servcies required by IEC 61850-7-2 and TASE.2: Association, NamedVariable, NamedVariableList, Read, Write, Information Report, ... 1 to 3 day course
• ICCP (IEC 60870-6 TASE.2 Protocol)	Use of MMS for realizing the TASE.2 services
Products and projects	
• Practical experience	IEC 61850 devices, tools, and projects in reality; penetration of IEC 61850 (61400-25) in the market
• Tool support	Tools for IEC 61850, SCL, IEC 61400-25, Ethernet, TCP/IP, MMS, ASN.1
• User support	UCA international users group, quality measures and TISSUE process
• Current and future standardization	Introduction of current and future application domains using and extending IEC 61850; Update on ongoing and planned standardization activities
• SCL demo with compliant software	Use of SCL files for building data model in an IED, extension of model (new data); including live demonstration
• Products offered by major vendors	Market situation, what is the situatrion on the market?
• Multivendor projects and turn key projects of single vendor	Experiences after two years substation automation and protection with IEC 61850; turn key projects, ... User's view and requirements for the future. Are the users' expectations met?
Additional modules for hands-on training for in-house courses	
• Extended modeling of non-standardized information	Build your own extended model. The use of the extension rules of IEC 61850 to model application information outside standards
• Design and engineering of a substation	Engineering of substations, IEDs and other systems using SCL tools
• Real models	Analysis of existing real models; design of the model for your application
• Device communication	Analyzing the communication according to IEC 61850: client-server, GOOSE, SV; communication testing
• IED communication	Training of the use of communication services (ACSI) using a common IED Browser in practice

Date and locations for public events: http://www.nettedautomation.com/seminars/uca/sem.html#standardpublic
In-house courses: http://www.nettedautomation.com/seminars/uca/sem.html#inhouse
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