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Training Systems Australia
First in Vocational Training Equipment
A Division of Pullman Learning Group

300 Centre Road, Bentleigh, Victoria, 3204
p: +613 9557 7993 e: info@trainingsystemsaustralia.com.au

LN
LUCAS-NÜLLE

SCADA FOR POWER ENGINEERING

The Educationally Designed SCADA Solution
for Technical Training



Cyber Security



SCADA FOR POWER LAB IN SMART GRID



By Supervisory Control and Data Acquisition (SCADA) we mean the real-time monitoring, control and data acquisition of technical processes. In electrical power engineering, SCADA is used to cover everything from power generation and transmission up to and including security and power usage.

SCADA permits the visualisation and modification of process data. Measurement values are displayed on the screen in real-time. Control signals can be adjusted during the process. The SCADA system can also perform process control automatically. Thanks to the fact that many measurement values are recorded, future planning and economic optimization are possible.

The system can also be remotely controlled via the Internet or also using local area networks (LAN).

SCADA for Power Engineering is a software designed to control and monitor power engineering systems. In the software, the system's measurement values and operating data can be displayed on existing measuring instruments in real-time. Important parameters and signals can also be controlled via the software.

The measurement values and operating states of the equipment can be selected, recorded and displayed over time. Evaluation and export are also possible.



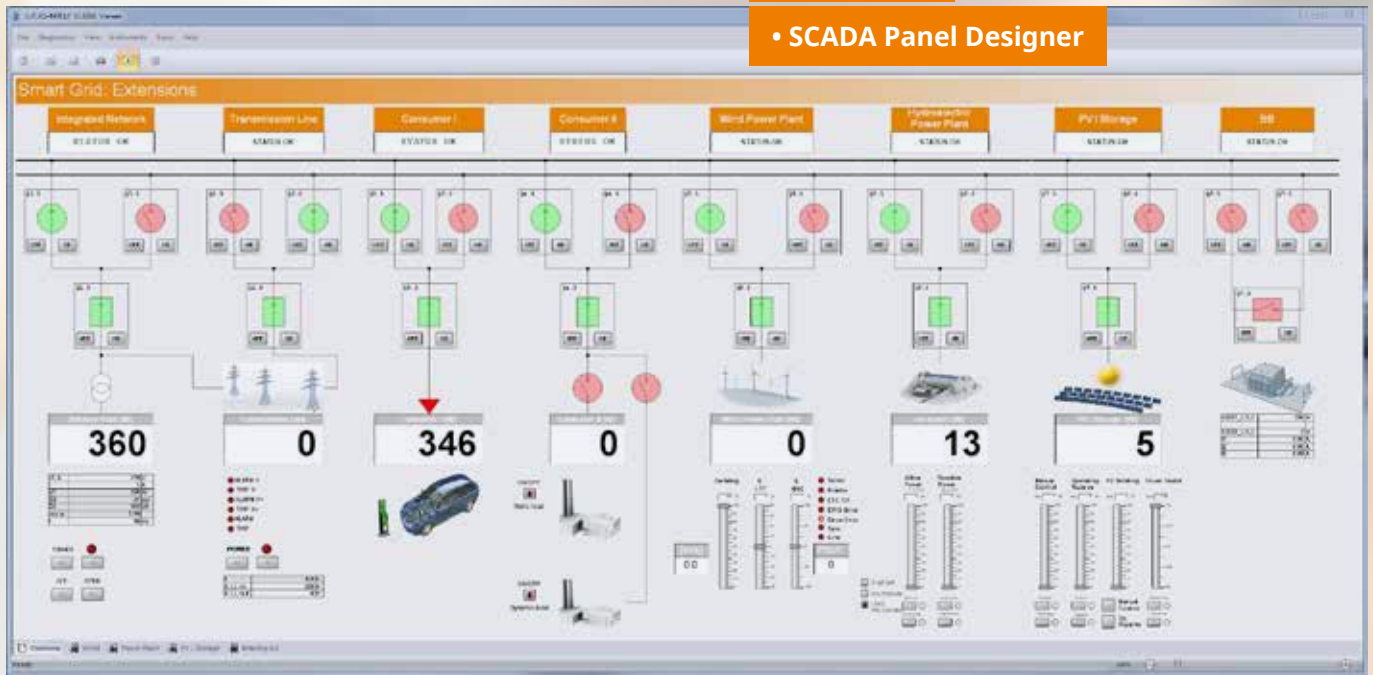
• SCADA NET

• SCADA Remote

• SCADA Logger

• SCADA PLC

• SCADA Panel Designer



The SCADA Designer is used to create user interfaces.

The Viewer is the SCADA system used for system control operation and monitoring.

Software functions

• SCADA Designer

- Freely configurable user interfaces
- Icon configuration for all Lucas-Nülle equipment used in power engineering
- Standardised electronic switching symbols for the visualisation of circuits
- Individually configurable lists of measurement values for any number of measurements
- Display of measurement values and operating states in real time
- Implementation and analysis of the Smart Grid
- Design of several worksheets per system

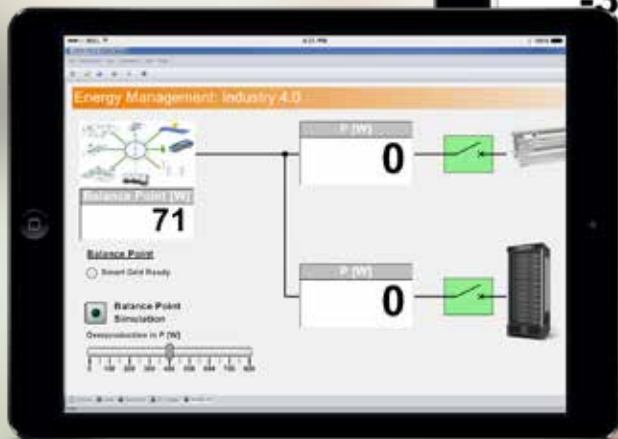
• SCADA Viewer

- Permits full system control
- Analysis of smart grid
- Display of measurement values and operating states in real time
- Configure files created with SCADA Designer
- Sample file templates for all experiments
- Multiuser-capable

SCADA REMOTE CONTROL



- Tablet Mode
- Worksheets (Tabs)
- Multiuser



Easy-to-use monitoring and control of the SMART GRID using a host of different end devices

- Tablet mode
- Clear and straightforward servicing thanks to matching worksheets:
 - Survey the entire system
 - Control operation of the individual system
- Connection via WiFi
- Connection via Internet
- Simultaneous access from all computers



• Encryption

• Firewall

• Security Router



SO2805-4B: "Cyber Security in Automation Technology and Power Engineering"

In modern power supply grids, the subject of cyber security is indispensable. All of the standard safety measures used against cyber attacks on power engineering systems are covered with a multitude of exercises.

Training content

- Code of conduct for using such systems
- Physical measures
- Configuring a high-security LAN router
- DHCP server
- Firewall
- Open VPN
- Analyzing network protocols
- Secure Shell (SSH)
- HTTP(S)
- Remote maintenance with Sinema
- Access control / access restriction
- Authentication / granting access
- Encoding / Encryption
- Certificates

SCADA NET

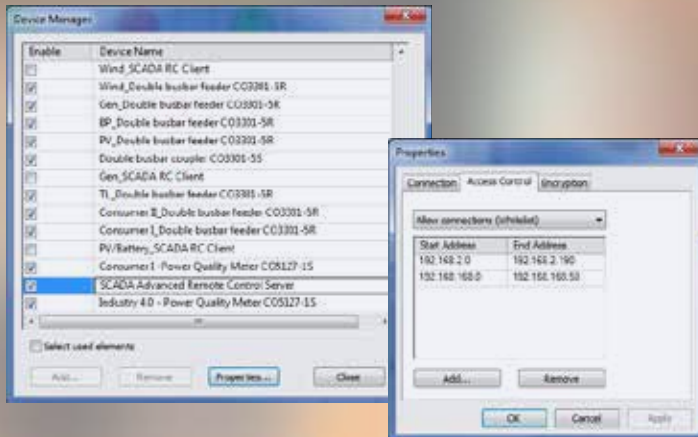


• SCADA Client Server

• SCADA OPC

• Cyber Security

• SCADA IEC 61850



OPC Client

Server: LN OPC Server for SCADA

Group	Name	Type	Value	Quality	Timestamp	Access	ID
Group 1	[00] Apparent current in phase L1	REAL	0	Good	01.12.2017 15:32:25	R	[07] Time Over Current Relay C03301-40; [00] Apparent current in phase L1
Group 1	[01] Apparent current in phase L2	REAL	0	Good	01.12.2017 15:32:25	R	[07] Time Over Current Relay C03301-40; [01] Apparent current in phase L2
Group 1	[02] Apparent current in phase L3	REAL	0	Good	01.12.2017 15:32:25	R	[07] Time Over Current Relay C03301-40; [02] Apparent current in phase L3
Group 1	[03] Voltage VL1-N	REAL	231.9857	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [00] Voltage VL1-N
Group 1	[04] Voltage VL2-N	REAL	231.2036	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [01] Voltage VL2-N
Group 1	[05] Voltage VL3-N	REAL	226.6036	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [02] Voltage VL3-N
Group 1	[06] Voltage VL1-L2	REAL	402.8106	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [03] Voltage VL1-L2
Group 1	[07] Voltage VL2-L3	REAL	398.5306	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [04] Voltage VL2-L3
Group 1	[08] Voltage VL3-L1	REAL	398.5317	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [05] Voltage VL3-L1
Group 1	[09] Current L1	REAL	0.172950	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [06] Current L1
Group 1	[10] Current L2	REAL	0.146506	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [07] Current L2
Group 1	[11] Current L3	REAL	0.134736	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [08] Current L3
Group 1	[12] Neutral Current	REAL	0.120544	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [09] Neutral Current
Group 1	[13] Apparent power L1	REAL	40.46981	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [10] Apparent power L1
Group 1	[14] Apparent power L2	REAL	34.03426	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [11] Apparent power L2
Group 1	[15] Apparent power L3	REAL	30.51601	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [12] Apparent power L3
Group 1	[16] Active power L1	REAL	22.60091	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [13] Active power L1
Group 1	[17] Active power L2	REAL	-8.66128	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [14] Active power L2
Group 1	[18] Active power L3	REAL	-8.27730	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [15] Active power L3
Group 1	[19] Reactive power L1	REAL	-8.54271	Good	01.12.2017 15:33:24	R	[08] BP-Power Quality Meter C05127-15; [16] Reactive power L1



• SCADA Remote Client / Server

- Permits monitoring and operating of all systems from every PC in the laboratory
- The power engineering lab in the Cloud

• SCADA OPC Client

- Connection of external devices, e.g. PLC

• SCADA OPC NET Server

- Real-time connection to e.g. MATLAB®/Simulink® and LabVIEW via the OPC server

• Cyber Security

- Limiting connections
- Access control (black / white list)
- Encryption

• Further supported protocols

- SCADA IEC 61850 client (connection of external devices, e.g. PMU)
- TCP/IP client/ server
- MODBUS
- SML (Smart Message Language)
- HTTP

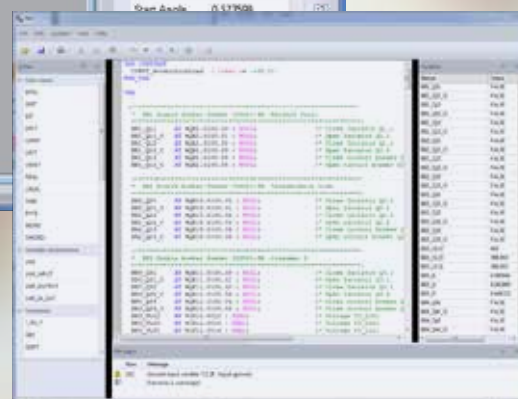
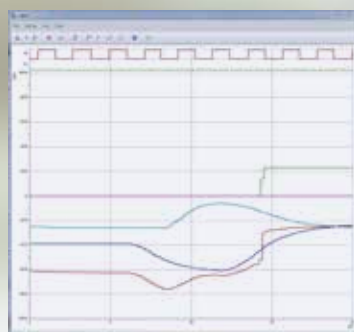
SCADA TOOLS



• SCADA Logger

• SCADA Panel Designer

• SCADA PLC



• SCADA Logger

- Plots graphs of measurement values and signals over time
- Permits graphs to be processed, analyzed and exported
- Value scaling

• SCADA Panel Designer

- Permits design and configuration of own user interfaces

• SCADA PLC

- Integrated soft PLC (in accordance with IEC61131)
- Permits access to all values and signals in the Smart Grid
- Automatic generation of variable list permits variable monitoring

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a 300 Centre Road, Bentleigh, VIC, 3204