



IEC 61850 Server Toolkit

Xelas Energy Management (XEM) is a suite of smart, essential grid management software components. These components:

- Easily add IEC61850 communication protocols/applications using XEM 61850 Client development toolkit and XEM 61850 Server development toolkit.
- Simplify testing with XEM 61850 Client Simulator and XEM 61850 Server Simulator.
- Facilitate the integration of existing devices or applications using the XEM connectivity toolkit.
- With XEM, application developers and integrators gradually implement seamless and flexible grid management, based on an advanced mix of OT (Operations technology) and ICT (information communication technology).

The XEM **61850 Server Toolkit** was developed with the latest technology, based upon more than 25 years of expertise in delivering reliable and scalable communication and management solutions

This datasheet will describe the features of the 61850 Server Toolkit.

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1. IEC 61850 Server development Solutions

The XEM IEC 61850 Server development toolkit provides the functions to easily implement management functionality within processor driven network equipment or switch gear.

The management software is ready to be used for all aspects of 61850 energy network management: control, protection, monitoring, fault restoration, configuration, performance, accounting (metering, usage data) and security management.

The XEM server development toolkit is provided as a binary code on various platforms including i686 servers running Linux and various RTOS including vxWorks and embedded Linux. Xelas provides porting services to any requested i686 server or RTOS. The development license of the toolkit can also be delivered as a source code package for customers who want to do the porting to their specific RTOS in house.

XEM development toolkit includes communication features for all IEC 61850 protocols ready to adapt into your IED: MMS, (Manufacturing Message Specification), GOOSE and Sampled Values.

The software is developed, focused on the usage within Intelligent Electronic Devices (IEDs) such as RTUs, meters, turbines, switches, PLCs, and other “CPU constrained” embedded applications.

Having spent 25 years supporting leading network equipment vendors, Xelas Energy Software has developed the processes for regular updates to support rapidly evolving standards and industry requirements. Our company works closely with standardization organizations, timely updates to our products are made as new functionality is introduced.

IEC 61850 Server

Platform: RealTime OS

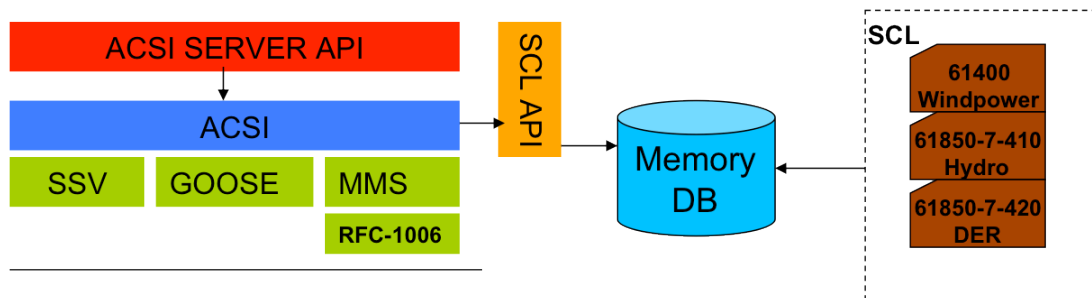


Figure 1 – IEC 61850 Server Toolkit Architecture

Our carrier grade software is tested and built for millions of operations without failures. The development of reliable energy network applications demands this extremely high quality level from its software components.

Product Highlights

The following are highlights of the XEM 61850 server toolkit:

- Optimized Architecture for embedded RTOS
- Includes embedded transport stack (ETS), a Xelas owned product for transport of OSI protocols such as MMS, widely used and recognized as the best embedded OSI stack on the market
- Fully automated interoperability with XEM 61850 client or client simulators, highly supported bonding with third party clients or simulators
- Dynamic loading of SCL files with various information model such as 61850-7-420 (DER,) 61850-7-410 (Hydro,) 61850-7-x (substations,) 61400 (Wind power)
- Full protocol support for IEC 61850-6, 61850-7-2, 61850-7-3, 61850-7-4, 61850-8-1 (MMS, GOOSE), 61850-9-2 (Sampled Values)
- Extendable Common Information Model (CIM) based on IEC 61870-7-x
- Value adding Fault, Configuration, Auditing, Performance and Security (FCAPS) test and inventory discovery service features
- Optional XEM 61850 client simulator with automated conformance test suite support
- Customer system integration using manufacturers API (POSIX compliant C-API) with example code and API documentation.

Development Architecture and Features

Smart grid operators have to build on remote network management. Because of the inherit intelligence of these grids, remote management and control is not only necessary when there is a problem with a specific device or substation, also when there are issues elsewhere in the network, switches may have be operated immediately to restore network functions.

The data gathered from all the device management servers and the information built from this data is extremely valuable at various layers within an organization, not only at the network control center, but also for asset managers and for correct billing.

XEM 61850 servers are designed to meet the highest reliability and scalability requirements by using:

- i. Multi-threaded solutions for single stack high performance
- ii. High performance embedded RFC1006/OSI protocol stacks

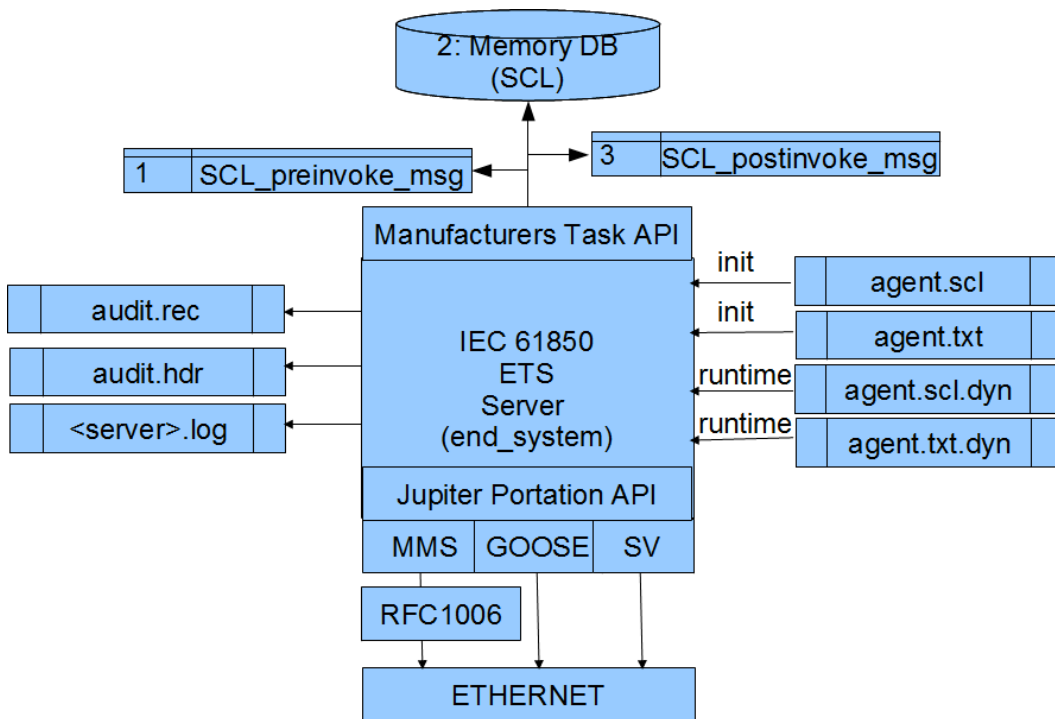
Data within an IEC 61850 server is structured using the extendable Common Information Model (CIM) based on IEC 61870-7-x.

A professional process management function enables overall control.

Integration with the network device can be achieved in following different ways.

- i. Use the existing manufacturers API which runs as a separate task and receives and sends ACSI compliant messages.
- ii. Add additional customer task which can handle ACSI compliant messages to the server adapter. XEM provides sample C-sources for the final server adapter (ANSI-C compliant, development edition)
- iii. Configuration in the SCL XML file which is loaded on startup can be imported into the database and copied into memory
- iv. The default implementation can detect changes in a text file and act upon this, this allows for a sample file-based interaction.

Figure 2 – IEC 61850 Server Simulator Detailed Architecture



For a full overview of supported functions, the following documents are available:

- PICS (protocol implementation conformance statement)
- MICS (model implementation conformance statement)

Component	Explanation
SCL_preinvoke_msg	Callback when a IEC 61850 operation is about to be processed. Part of documented manufacturers C-API.
SCL_postinvoke_msg	Callback when a IEC 61850 operation has been processed. Part of documented manufacturers C-API.
Memory DB (SCL)	Memory based database containing loaded SCL and updated values from API.
end_system	Server binary, which handles the IEC61850 operations from clients, as well as sends reports, goose message or SV messages in accordance with IEC61850. It contains layers: MMS, GOOSE and SV for external communication.
Jupiter portation API	This is a library which provides OS independence for other components, and has all functions for file, OS, system specific access.
MMS	Manufacturing Message Specification, used with mappings as specified in IEC 61850-8-1 standard.
RFC1006	This supplies OSI on top of TCP/IP on top of Ethernet.
GOOSE	Generic Object Oriented Substation Events, allows for transmission of sets of data with high performance on top of Ethernet.
SV	Sampled Values (Unicast and Multicast), with mappings as specified in IEC 61850-9-2.
Files: agent.scl, agent.txt	Loaded during initialization time (see next paragraph for details) and also used to write data to (during updates)
File: agent.scl.dyn, agent.txt.dyn	Files loaded at runtime (see next paragraph for details) as part of example code in manufacturers API
Files: audit.rec, audit.hdr	Audit files, recording IEC61850 operations from clients with date and result. This is verified by testsuite scripts.
File: <server>.log	Traces from the end system can be redirected to a file

Figure 3 – server components table

Summary

The XEM 61850 server development toolkit enables easy addition of IEC 61850 operations into your device/equipment/gear. It can be implemented in days and is built to provide highly reliable, professional and flexible management. XEM server development supports ALL of the IEC61850 defined operations. This ensures easy and powerful conformance testing. Adaptations can be automatically loaded as SCL compliant files for different information models (substation automation, wind, hydro and DER).

Business cases with clients have shown that the XEM server development tool kit enables equipment vendors and integrators considerable cost savings on the development of IEC 61850 devices. While development cost reductions are comparable with competitive products, the cost reductions during testing, validating and ensuring interoperability using the XEM server development environment are up to 70 % higher than with any other product on the market.

Product Details

Platforms

UNIX or Linux server – Redhat Linux and Suse Linux
Embedded RTOS - VxWorks and embedded Linux

The Xelas packages for Linux are delivered in RPM format as commonly used by the Linux package manager tools. The packages can have an extension for 32-bit or 64-bit. The packages may have an extension for runtime or development usage.

Differences between runtime and development edition:

- The Runtime edition allows development and startup of the IEC 61850 server edition on the platform for which it was delivered, and allows modification example code based on manufacturers API. Some example sources are provided along with an API description.
- The Development edition can be used for cross-compilations and portations to another (embedded) platform.

Memory Requirements

Minimum memory requirements depend on specific OS port and on loaded SCL memory information model.

On linux: 5 MB RAM

Standards Supported

- Full protocol support for IEC 61850-6, 61850-7-2, 61850-7-3, 61850-7-4, 61850-8-1 (MMS), 61850-9-2 (Sampled Values)
- Multiple information models supported such as 61850-7-420 (DER,) 61850-7-410 (Hydro,) 61850-7-x (substations,) 61400 (Wind power)
- Extendable Common Information Model (CIM) based on IEC 61870-7-x
- OSI: Presentation, Session, Transport, ACSE, ROSE, embedded RFC1006 –OSI on top of TCP/IP)

2. Xelas Energy Management (XEM) Product Portfolio

The Xelas Energy Management (XEM) product portfolio offers all the necessary building blocks to implement an IEC 61805 standard based communication network.

Protocols for all Essential Layers of the IEC 61850 Standard

- Protocols are delivered with toolkits to implement customer solutions.
- Manufacturing Message Specification (MMS) Protocol Stack including OSI Protocols
- RFC-1006 OSI Protocol stack
- GOOSE and Sample Values

IEC 61850 Client Toolkit

- 61850 Edition 1 and 2 fully supported
- Native MMS, GOOSE/SV Support
- Built on top of Java J2EE Framework. C and C++ APIs also available
- Persistent storage of all data, multiple database support, though ODBC/JDBC
- Multiple Information modules supported such as 61850-7-420 and 61400
- Multi-threaded scalable architecture
- Ported on various platforms: Linux, Windows, UNIX

IEC 61850 Server Toolkit

- 61850 Edition 1 and 2 fully supported
- Native MMS, GOOSE and SV support
- C Development environment for greater portability and performance
- Architecture optimized for embedded RTOS
- Ported to VxWorks, pSOS, Embedded Linux
- Both binary as well as source code available

IEC 61850 Dynamic Integration Platform

- Integrate various Protocols and Information Models
- Dynamic reconfigurable with Java script Off the shelf adaptors: IEC 61850, SCADA 5-104, OPC, XML, SNMP, ASCII
- Platforms: Linux, Solaris, HPUX, Windows
- Off the shelf Adaptations for various Information Models:
 - IEC 61850-7-2/3/4 – Substation Automation
 - IEC 61400 – Windpower
 - IEC61850-Part 7-410 – Hydro-electric Power Plants (HYDRO)
 - IEC61850-Part 7-420 – Distributed Energy Resource (DER)

Check www.xelasenergy.com for more product Information.

3. About Xelas Energy Software

Xelas Energy Software is a dedicated division of Xelas Software. The Xelas Energy Software products and solutions are based on twenty five years of experience of implementing complex network management solutions.

Xelas Software established its market role through intense participation in industry collaboration, and developed standard software components now widely used by market leaders such as Alcatel-Lucent, Nokia Solutions Networks (NSN), Motorola, Ericsson, IBM, NTT, NEC, Samsung, Huawei and Telefonica. Xelas Software products are made to fit energy, telecom, messaging and aviation network management markets.

Xelas Software is a privately owned company, which acquired the software licenses and intellectual property of Vertel Corporation and Retix. Xelas Energy Software, a division of Xelas Software, with development offices in the U.S. and Europe, is one of the few software vendors worldwide to have implemented in-house the IEC 61850 standards, including MMS protocol, GOOSE, SV and OSI Protocols (RFC1006.)

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