IEC 61850 Client Toolkit

The **61850 Client Toolkit** was developed with the latest technology, based upon more than 25 years of expertise in delivering reliable and scalable communication and management solutions. The **61850 Client Toolkit** is one of the products of the Xelas Energy Management (XEM) Product line.

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

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1. IEC 61850 Client Solutions

The Xelas Software **Xelas Energy Management (XEM) IEC 61850 Client Toolkit** provides the functions for all aspects of energy network management: control, protection, monitoring, fault restoration, configuration, performance, accounting (metering, usage data) and security management.

Xelas Energy Software is one of the few vendors to support all operations defined in the IEC 61850 standard. 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 operations are introduced.

The functions offered by XEM 61850 Client applications focus on full management of any type of 61850 servers.

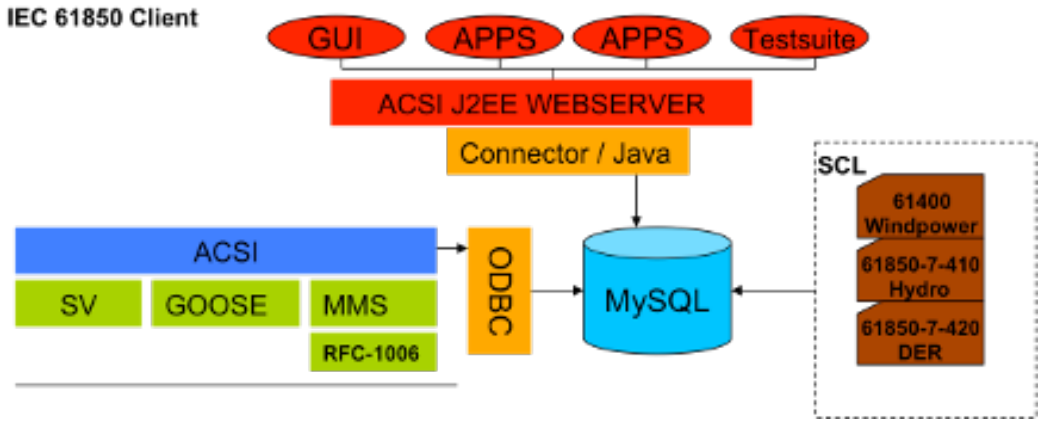


Figure 1 – IEC 61850 Client Toolkit Architecture

Xelas Software carrier grade software is tested and built to manage tens of thousands of servers without failures. The development of reliable energy network applications demands this extremely high quality level from software components. More in depth information about how the XEM 61850 Client ensures scalability is provided later in this document.

The XEM 61850 Client implementation provides all **central** client components needed to build energy network management functions. The software is designed to run on Linux/UNIX platforms and ported 'out of the box' to Redhat, Windows and SUSE Linux.

Product Highlights

The following are highlights of the XEM 61850 Client Toolkit:

- Web GUI enabled
- Web server based access for thin clients (J2EE based with JDBC connector/J)

- Persistent storage of all data, multiple databases supported through ODBC and JDBC adaptor (for example: MySQL, Oracle, Progress)
- Full process management control
- 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 (Windpower)
- Multiple northbound interfaces (IEC 61870-5-104, Web services, OPC-DA XML)
- Possibility to integrate southbound interfaces such as IEC 61870-5-104
- 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
- Fully scripted client environment.
- Fully automated testsuite for conformance and regression testing
- Scalable and capable of supporting a large number of Intelligent Electronic Devices (IED) conform to the IEC 61850 standard
- Integrated 61850 compliant server simulator
- Customer system integration can be done on various levels
- Northbound or southbound interfaces
    - IEC 60870-5-104
    - Web services
    - New interface types can be added

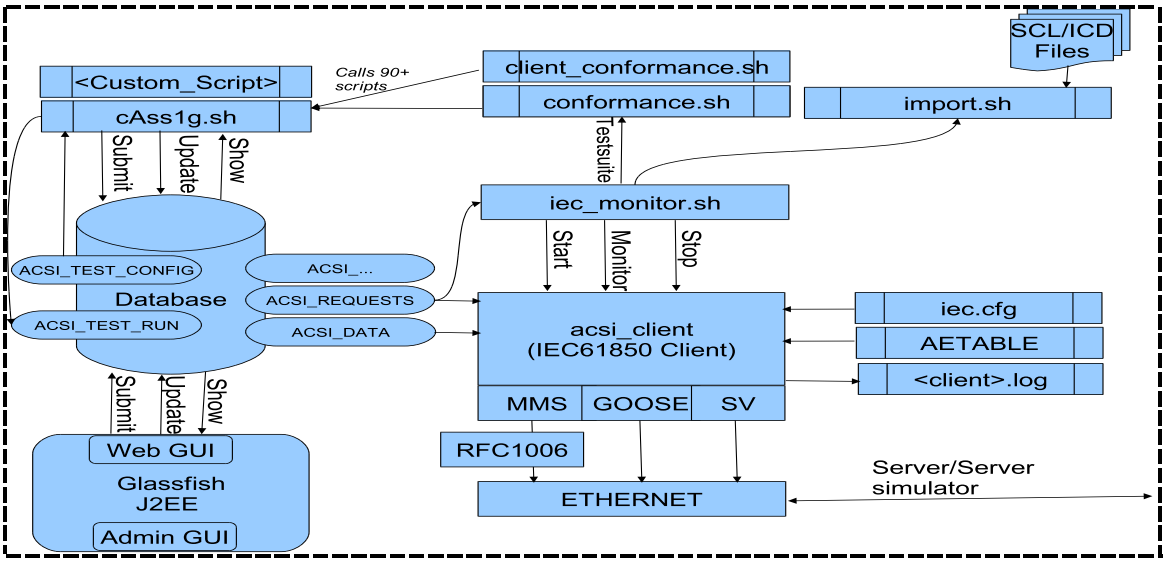
Development Architecture and Features

The XEM 61850 Client Toolkit provides an array of network management functions that are valuable not only for IEC61850 servers but also for other devices i.e. devices not using IEC 61850 protocols. Customers have stressed the importance of easy integration with other devices/protocols and the requirement of making the IEC 61850 client solution value available across the wider network.

The XEM product line overall architecture is developed to provide easy individual steps to build IEC 61850 conformity, but at the same time provide a basis for seamless grid management. The XEM client can easily integrate, so it can be added or be used to replace existing legacy applications. Together with offering multiple northbound and south bound interfaces, integration can be achieved in the following different ways.

- Database schema
- Adding customer tasks which can send ACSI compliant messages to client adaptor. XEM provides sample C-sources for client adaptor (ANSI-C compliant, development edition)
- Configuration in the SCL XML file which is loaded on startup can be imported into the database.
- Adding services implemented in JAVA. XEM provides sample JAVA sources for J2EE based Web GUI (development edition)

Figure 2 – IEC 61850 Client Toolkit Detailed Architecture



Component	Explanation
iec_monitor.sh	Runs on every platform and performs services: - Start/stop server simulator (triggered by request in database) Script: start_server.sh, stop_server.sh - Set service mode (accept/reject service, specific error code) (triggered by request in database) Script: set_service.sh - Monitor client adaptor - Calls other scripts and services such as testsuite, import, etc.
acsi_client	Client adaptor binary, which handles the IEC61850 operations from the database, as well as receives reports, goose message or SV messages from IEC61850 servers. It contains layers: MMS, GOOSE and SV for external communication
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. This runs as a separate user process.
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.
Glassfish/J2EE/ Web GUI	The Web GUI written in JAVA, is monitored by Glassfish J2EE application server, and interacts with the database
File: AETABLE	Contains OSI selector information. This is a cached contents of the database tables
File: iec.cfg	Contains simulator additional information such as SCL File, alias to use.
File: acsi_client_<alias>.log	Traces are stored by default in <LOGDIR>/monitor, for example /tmp/iec/acsi_client_<alias>.log. Trace level can be specified in ACSI_CONFIG (configuration), and are taken into account at startup.

On top of all these client integration features, XEM offers dedicated additional software components for connectivity (XEM Dynamic Integration Platform), which is explained in a separate product sheet.

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

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

Integrated Web GUI

The powerful XEM 61850 Client Web GUI provides additional value for the programmer and user. The GUI is developed above the client's command driven API. Complex data structures and large quantities of data can be understood, overseen and managed more easily via this graphical interface. The XEM 61850 Client GUI integrates seamlessly with the XEM 61850 Client Simulator for compliance testing, allowing results to be displayed in a user-friendly manner.

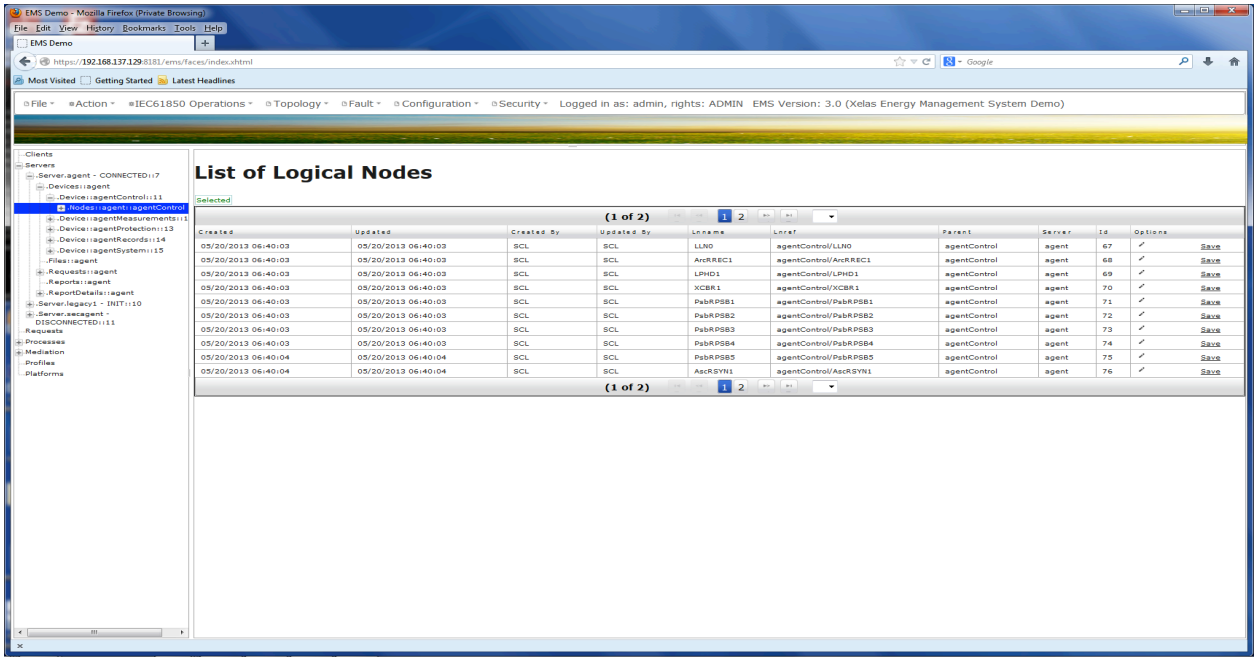


Figure 2 – Integrated Web GUI

Client management functions are needed in Element Management Systems (used for the full management of a single type of device), Network Management Systems (for the overall management of networked devices, potentially multivendor) and Service Management/Business Management applications (applications built to provide or control specific network features or services).

Native RDBM support via integrated ODBC/JDBC adaptors

The data gathered and the information built from this data is extremely valuable at various layers within an organization. All data entering an XEM 61850 client is directly stored to database and made available via ODBC and JDBC adaptors. This approach of **building the IEC 61850 clients directly on top of the RDBMs** satisfies current and potential future data requirements within the organization.

All data within an IEC 61850 Client is structured using the extendable Common Information Model (CIM) based on IEC 61870-7-x. Using professional service application technology, many different services for advanced fault management, configuration management and other management functions are added in the basic client functionality. Existing application functions can be easily coupled.

Performance and Scalability

A professional process management function enables overall control.

The XEM 61850 Client Toolkit is designed to meet the highest reliability and scalability requirements.

These are achieved by using:

- Multi-threaded solutions for single stack high performance
- Multi-process solutions for parallel handling of groups of devices
- High performance RFC1006/OSI protocol stacks

Summary

The Xelas Software XEM 61850 Client Development Toolkit enables easy addition of IEC 61850 management. It can be implemented in days and provides highly reliable, professional and flexible management. XEM Client Toolkits offer both a WEB GUI and command driven API, and support all of the IEC61850 defined operations. This ensures easy and powerful conformance testing. The XEM Client Toolkit is fully RDBM based; all data is immediately stored, structured (CIM) and persistent. The application server technology offers a growing number of “standard” services such as discovery, topology and many more. Adaptations are available for different information models (substation automation, wind, hydro and DER). As part of a distributed architecture it offers various different integration features.

Product Details

Platform

Linux Redhat, Linux Suse, Windows

Development APIs

Services development:	JAVA (JDBC) or ODBC/C and C++ API or other language with database API
Integration development:	Protocol adaptors, Javascript mediators
GUI development:	JAVA, HTML 5, Primefaces, Netbeans
Adaptor development:	POSIX C - API

Memory Requirements

RAM RESIDENT SIZE: 3 MB (per adaptor). Many adaptors can run on single platform, up to the memory available on the operating system.

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 (Windpower)
- Multiple northbound interfaces (IEC 61870-5-104, Web services, OPC-DA XML)
- Possibility to integrate southbound interfaces such as IEC 61870-5-104
- Extendable Common Information Model (CIM) based on IEC 61870-7-x
- OSI: Presentation, Session, Transport, ACSE, ROSE, 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, Huawai 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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