

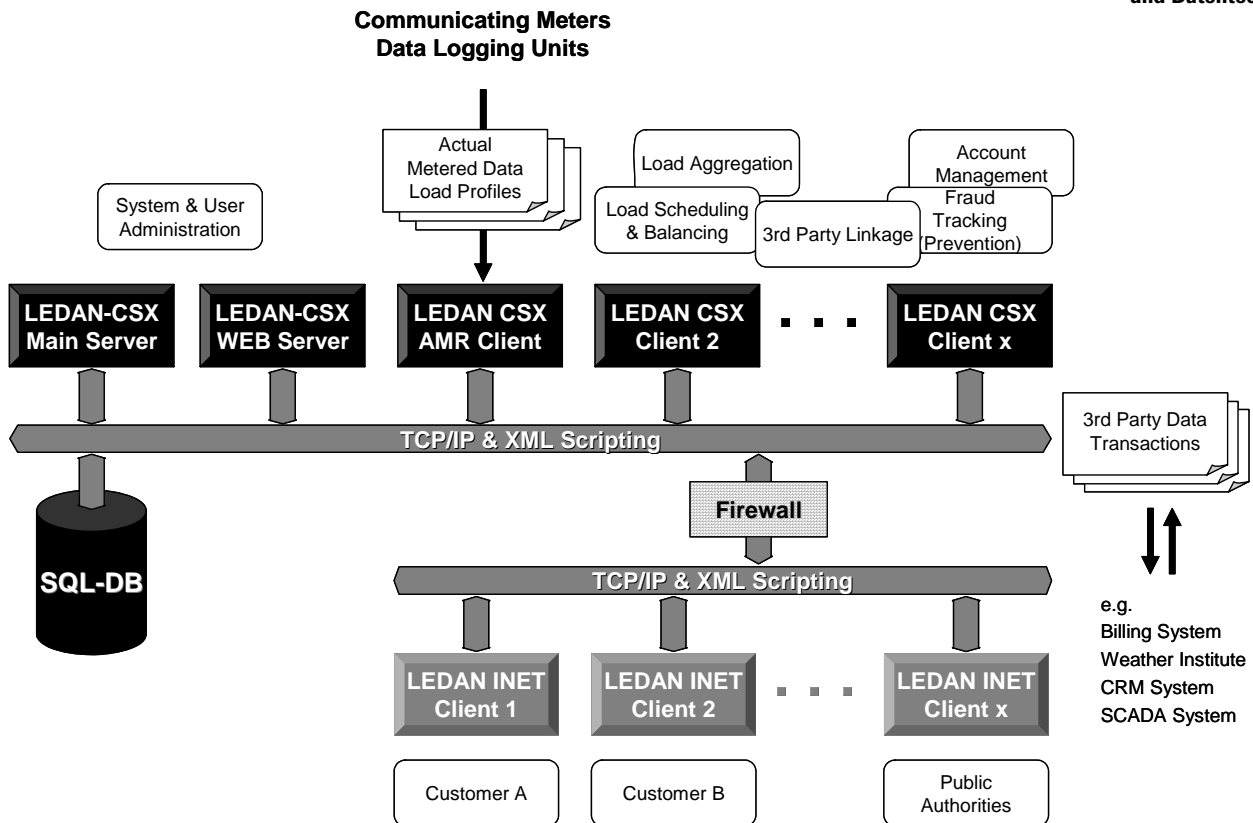
OVERVIEW

Power producing and consuming industries are continuously challenged by evolving market rules, while predictable and reliable energy is being pre-requisite to address the needs of customer's growing digital assets and myriad of sensitive loads. The knowledge of load profiles nearly in real-time, and load scheduling based on forecasts are two key elements determining both the economical and technical performance of the power supply business. Therefore, genuine load profiles reflecting the market behaviour have to be linked with services & transactions in marketing and technical terms to a comprehensive Energy Information System. LEDAN-CSX provides, as a linkage hub, the entire functionality of such a system towards all participants of the energy marketplace:

- *Large users* to understand energy consumption patterns across their enterprises, uncover efficiency opportunities and determine how to set up curtailment programmes or plan co-generation schemes, i.e. micro-grids
- *Network operators* to improve the network efficiency by better knowledge of customer's behaviour, to match network (grid) characteristics and capacity limits
- *Power producers* to address the supply/demand imbalance with balancing strategies, to fit available production capacities with load schedules
- *Cluster of customer groups* to provide aggregated loads for demand response programmes, to buy energy at best suited rates
- *Service providers* to remotely maintain and manage the data assets across multiple facilities and/or multi-site customers
- *All market actors* to reduce risks in mutual transactions by profile based forecasting and where appropriate in correlation with weather data

LEDAN-CSX consists of a distributed client/server, SQL-DB platform performing, connecting and delivering real-time energy data applications. The applications are networked through seamless, open communication architecture, based on XML-scripting and browser technology. All applications being browser capable to allow rapid parallel processing via the intranet and internet, the system can be remotely accessed anywhere and anytime by any participant. The system itself and standardised applications are highly customisable according to specific requirements in a tool-kit fashion. Over 410 customers are using in different configurations well proven LEDAN-applications, such as

- Load profile acquisition, validation & estimation
- In-depth analysis, tracking of load profiles, intelligent graphical presentation
- Tariff design, billing determinants
- Modelling of load profiles, aggregation, shaping, relocating
- Advanced mathematical processing
- Load scheduling & forecasting
- Energy balancing schemes
- Internet access & delivery
- Multiple, configurable information exchange formats & protocols for 3rd party systems (e.g. ASCII, XML, EDIFACT/MSCONS)
- Management of historic records
- Integrated AMR
- Activity-based costing & cost allocation



Sample Distributed Configuration with Internet/Intranet Access

TIME SERIES INFORMATION / LOAD PROFILES

The energy data repository, as a centralised SQL database server, manages all types of multi-utility energy and energy related information. It contains time-slice data – data that are entered at a time series of equal intervals. The LEDAN system hosts and processes this way all types of primary time series, such as energy and demand time series, actual and calculated load profiles, generated demand schedules. Additional non energy type time series, such as time dependent marketing information and / or weather data for load forecasts are also handled in similar way. The time interval base is given by actual data being acquired by the system, e.g. 5, 10, 15, 30 or 60 minutes.

Actual information is acquired either directly from automated meter reading systems or through electronic data interchange (EDI) formats which may be standardised or specific ones. EDIFACT, MSCONS are commonly used standard formats. LEDAN has adopted with this respect a straightforward strategy of promoting XML based standard formats to link utility business processes together, the objective being to achieve the high quality of standardisation level as already practically exercised in the “Supply Chain Management” (RosettaNet Consortium).

The LEDAN platform is being currently expanded to the AMR – functionality, we are introducing an XML-based communication for telemetry and metering devices as well.

INTELLIGENT GRAPHICAL AND FUNCTIONAL PROCESSING

Intelligent graphical processing of time series information in a multitude of advanced functionalities and extensive presentation forms has historically been the strength of the industry proven LEDAN analysis and evaluation means such as time based displays (scatter-xy), bar graphs, duration lines, distribution curves, averaged load profiles, envelope curves, scatter-diagrams and multiple displays.

Graphically supported mathematical functions permit not only the user-defined linkage of load profiles with one another with virtually no restrictions, but also the processing of single values, i.e.

- The linking of single values from the database with load profiles, e.g. for the multiplication of modelled load profiles with a customer's forecasted annual energy demand
- Storage of the determinants derived from load profiles (e.g. annual energy, usage period, etc.) as single values in a database table

Historical records of both parameters and measuring points, such as validity or applicability periods, are fully handled and considered in the calculations.

The graphic engine can also be provided as a server application for all clients. Introducing the most innovative XSL – FO Technology from the XML family for report publishing, user-defined printer templates will be made available as a standard functionality.

A wide range of reports, log documents and historical records are provided including logs on automated workflows, logs on data transactions, tracking of changes in measured data, database logs and debugging protocols with configurable log level for analysis purposes. These logs provide verification of which user performed which operation at what time, thereby guaranteeing a high level of transparency especially for complex operations.

TARIFF DESIGN AND LOAD PROFILE MODELLING

The tariff module is used for tariff definition, designing special tariff structures and contracts as well as for anticipated billing based on load profile data. As a planning tool it supports the price-based evaluation of time sequence data and permits tariff contracts to be defined and modified quickly and easily. Complex tariff structures for special customers can be directly compared with one another in a convenient way.

For special requirements the user is also able to create own macros. The module is best suited for the design, negotiation and auditing of new contracts. Furthermore it can be applied to direct billing in industrial enterprises. The billing data module provides data required for billing in a diversity of formats – with a prospective user-programmable feature as well – to be transferred to existing billing systems.

The tariff component for planning tasks uses EXCEL, incorporated in LEDAN, and permits:

- Entry of tariffs and special contracts
- Calculation of acquired load profiles
- Comparative calculations, "what-if" scenarios
- Manual calculations by means of the manual entry of consumption data
- Automatic calculations
- Mass (Bulk data) calculations

The contract structures are stored in the database in XML format and are therefore retrievable at any time and, if required, can also be exchanged with external systems.

Modelled load profiles are generated from standardised daily profiles, or "standard load profiles", which contain a set of daily load profiles for pre-defined weekly and annual periods. LEDAN permits such "standard load profiles" to be imported from pre-defined EXCEL templates, regardless of whether these are supplied by a library or generated using LEDAN functions. The modelled profiles, which can be used just like actual, measured load profiles, are calculated for the individual customer with reference to the stored customer group and annual energy, and take full account of public holidays.

In order to ensure that the public holidays are correctly accounted for, these are entered in *Public holiday definition*. Here, local, regional and national public holidays can all be taken into account. The holiday ruling can also be used, for example, in order to evaluate chronological sequences over corresponding switching times/tariff periods or to calculate, for example a "mean weekday" from existing data.

PROXY BASED FORECASTING

The Proxy Based Forecasting transfers existing profile data to other time periods. Missing or future (predicted) data can be substituted/generated from a pool of existing data, in accordance with precisely defined rules and taking into account public holidays and other special days, with averaging options - the substitution possibilities are virtually unlimited.

If, for example, the second Wednesday in August is missing, it can be replaced by the corresponding day in the previous year. If that day just happened to be a public holiday, however, another substitution rule can access the corresponding day in the previous week. Following this way, it is also obvious to generate an entire annual load progression from an existing data pool, taking full account of public holidays, based on:

- Estimated measuring points
- Historical data records
- Modelled load profiles

Furthermore the CSX platform incorporates advanced modules to generate a forecast of demand based on a model which is established by correlation analysis using neural networks. Model parameters are assigned as a result of minimisation of the error of forecast on historical data. Profiles facilitate the transition between data and models created for different geographic ranges and group of clients.

ACTIVITY-BASED COSTING & COST ALLOCATION

Industrial enterprises, public & private plants must gather and correlate the right information to develop successful strategies for facility expansion, power distribution, production line reconfiguration, buy-versus-build decisions, and particularly to decide on load management alternatives to be applied, e.g. load shifting, co-generation, energy storage, fuel switching. The EDM system solves all these energy issues through activity-based costing, and automatic information processing.

Activity-based costing, or cost allocation, is used to determine the expenses incurred by individual company departments and specific devices. It is also used to accurately assess the cost of every product/service by identifying all activities that lead to final output including energy expenses. The branch specific package of LEDAN automates meter reading, information delivery and data processing, so all actors involved across the company can get

historical and real-time data and event logs at their desktops. They can instantly generate customised reports, implement complex cost formulas and exchange data with ERP-systems.

INTERNET ACCESS AND PUBLISHING

As a comprehensive platform in toolbox fashion, LEDAN-CSX provides a multitude of functional applications for the complete range of energy data management, widely utilised in almost all areas of the energy business.

While the core functionality of LEDAN is commonly used by all customer groups it can additionally fulfil dedicated applications, for example in the case of providing consultancy to energy clients. Remote access in such a deployment being highly required, web based solutions represent the best option to be adopted.

LEDAN-Inet, building upon LEDAN-CSX as a standard extension module, is the server backed browser solution which allows full scheme remote access via the intranet or internet. Since all basic functions are covered LEDAN-Inet is a cost-effective functional extension of the overall EDM functionality. As a dedicated solution LEDAN-CSX is particularly targeted to customer care applications by delivering load profiles and billing data, making available a complete set of management and processing functions. The clients as users take benefit of this comprehensive functionality:

- Multifaceted visualisation
- Report generation & publishing
- Data export/delivery
- Data upload/download
- Functional processing
- Load scheduling

The system administration functionality is part of the system. It can be used by the system operator to administrate all users, system rights, to configure and distribute client applications and to handle data upload/download. LEDAN-Inet provides a complete remote control & operation of your applications.

PROSPECTIVE VIEW

Due to the rationalisation impact, today's IT organisations and engineering people are required to continuously minimise the overall administration cost of the utilised software. The individual installation of Windows-32 programmes on user computers represents a typical example with this respect. Centralised applications running on terminal servers are the result of such a development which clearly reduces the performance of the IT systems, particularly in the perception of users. Such solutions severely inhibit the parallel execution of application software via an internet connection.

MEDATEC is therefore steadily expanding the scope of the functionality which is available through the internet browser technology based on LEDAN-Inet, in order to fulfil the above requirements without making use of any terminal server software.