haulogy
The Energy IT Company

EnergyComm - Connector to the Utilities Market

White Paper

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1 haulogy

haulogy.net SA was created in April 2005 by five partners, all from SchlumbergerSema. The ambition of this experienced team, combining management and technology skills, was to build an independent Belgian IT company delivering high quality value-added services to its customers, as well as a rewarding and flexible working environment to its employees.

By end of 2018, more than 75 full time equivalents work for haulogy.

The core business of the company is the implementation of IT solutions with high added value for its customers. haulogy masters a very specific expertise in the Energy sector, which accounts for 100% of its yearly turnover. Following the liberalization of the market, haulogy's experts are mainly active in the integration of complex IT systems exchanging information between different actors (grid operators, suppliers, balance responsibles, ...)

The company is mainly active on the Belgian market but plans to expand to neighbouring markets in the coming five years.

Services & Products in the Energy Market

For more than 15 years, haulogy engineers have been active on the Belgian Energy Market where the following services and products are delivered to our customers:

- **IT Consultancy**: IT strategy, IT architecture, impact and feasibility study, coaching in implementation phase, …
- **Business Consultancy**: assistance to DGO's and suppliers to streamline their internal implementation of the energy market processes.
- **Business Integration**: implementation of IT solutions for business integration.
- **Managed Services**: hosting and operation of niche IT services (VAN interface, Web EDI, …).
- **SaaS**: our solutions for suppliers are provided in two modes: SaaS or licence.
- **Application Management**: a large range of services is provided in the scope of Application Management contracts (help desk, support, maintenance, consultancy, …).
- **Software Editor**: development of software suites for DGO's and suppliers.

Integrated Suite for Energy Distribution Grid Operators (DGO)

haulogy has developed a software suite enabling operators of gas & electricity grids to comply with market obligations. Though available as individual modules, all components are tightly integrated to provide a unique suite where all information is shared through a centralised Access Register:

- ***Clearing House***: a B2B platform to support all UMIG processes and exchanges with all market players.
- ***Settlement***: a suite of modules including Grid Fee, Allocation, and Reconciliation.
- ***Metering***: management of metering data.
- ***ERPGis***: ERP management solution of DGO's contracts, assets, planning of index readings tours, etc.

- ***GIPROM***: a workflow solution to manage, monitor and control DGO's internal business processes interacting with the Clearing House.

Integrated Suite for Energy Suppliers

haulogy has also developed a software suite for suppliers of gas & electricity:

- ***Haugazel***: a complete solution for managing the supplier's customer portfolio and invoicing
    - CRM: management of customers & their contracts.
    - Billing/Invoicing: computation & edition of customer's invoices, interfaces with external accounting application.
    - Reporting: generation of XML, CSV… reports for regulators and other B2B players.
- ***EnergyComm***: a market gateway solution to connect to the Utilities Market.

This document presents the **EnergyComm** solution of haulogy.

2 EnergyComm solution

2.1 Scope

In addition to its back-office system managing the portfolio of customers, their contracts and their invoicing, an energy supplier needs to implement a solution enabling the communication with all energy market's actors, especially the distribution grid operators (DGO). Through this communication channel, a supplier informs the market when it gains a new customer, when a customer will use a new access point (meter), when the characteristics of its customer have changed, etc. The supplier is informed by the market of the loss of a customer, when new meter readings are available, when a new meter has been installed, etc.

Compliant with the rules of the Belgian Market (VAN, EDIEL, Message Implementation Guide, Access Register, ...), the EnergyComm module of haulogy enables this two-way communication and acts as a *market gateway*.

The following features are provided:

- Communication with the market using different channels:
  - Multi market (gas, electricity)
  - Multi country ready (flat files, web services, …)
  - Multi format (EDIEL, CSV, XML, …)
- Complete UMIG support (including non EDIEL messages)
  - Structuring, metering, settlement, grid fee, …
  - Message sequencing (waiting queue)
  - Control of market time-limits
- Functional & syntactic validation of messages received from the market, including transmission of an ACK or NAK for each message
- Mirroring of the Access Register for all access points of the supplier
- Clear separation of market protocol and business layers
- Additional control of incoming market data
- Monitoring and auditing capabilities (including alerts)
- Management of errors, logs for all received & sent messages
- Possibility of automatic reaction to exceptions based on client strategy
- Control of the back-office requests (authorized processes, interaction matrix, ...)
- Notification of updates to the Access Register through Publish & Subscribe functionality
- Access through a web services catalog to the Access Register data: meter readings, meter, configuration of the access point, …

2.2 Benefits

With EnergyComm, market complexity is reduced via strong controls of incoming market data. Only business relevant information is transferred while consistency and integrity checks are performed by EnergyComm.

You also benefit from a flexible solution featuring the ability to add your own business rules or controls to the generic market rules already provided with EnergyComm. Customisation of automated actions to exceptions based on your own strategy will help you reduce manual operations.

EnergyComm is an extensible module that can be seamlessly adapted to market evolution both at the technical level (protocol, …) and at the business level (market rules, …)

EnergyComm also provides comprehensive monitoring and auditing capabilities allowing your operational team to react quickly and efficiently.

You focus more on your business, and …

- less on market communication
- less on EDIEL, CSV, XML
- less on UMIG details
- less on Access Register management
- less on UMIG evolution

You tailor the system according to your business

- Market data control rules
- Exception handling rules

You monitor market exchanges and processes through

- Proactive monitoring
- Active notification (alerts)

2.3 Architecture

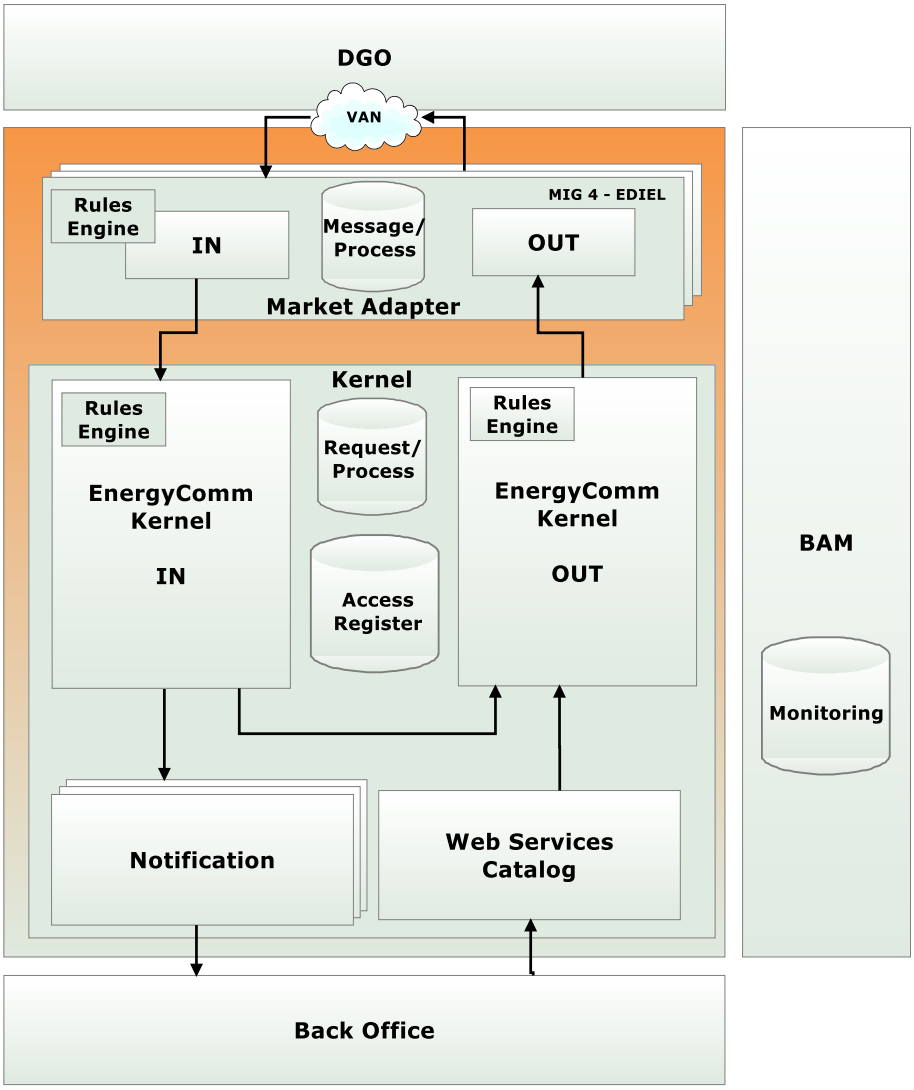

Figure 1 : Global architecture

2.3.1 EnergyComm – A Market Gateway

EnergyComm acts as a gateway between the supplier's back-office and the market.

Whenever the back-office needs to send information to the market, EnergyComm provides a set of business services to achieve this goal. These business services are made available through a published Web Service Catalog.

Each time the market has relevant information for the supplier's back-office, EnergyComm publishes a notification. Any process that has subscribed to this notification will trigger an appropriate action.

From a business point of view, EnergyComm is totally independent of the market. A clear separation is drawn between the market protocol and the business layer. The market protocol is implemented as a market adapter, while the business layer resides in EnergyComm's kernel.

Out of the box, EnergyComm comes originally with the implementation of the current Belgian UMIG 4 protocol and a rule engine. The use of a rule engine rather than a workflow engine offers far more

flexibility, providing the supplier with the ability to add to or overload the standard business rules set of UMIG with custom rules.

Thanks to its flexible architecture, EnergyComm has been adapted to be compliant with the upcoming Belgian UMIG 6 specification.

Furthermore, EnergyComm has been ported to other European energy markets. EnergyComm currently supports the Dutch market and the French market.

2.3.2 The Kernel

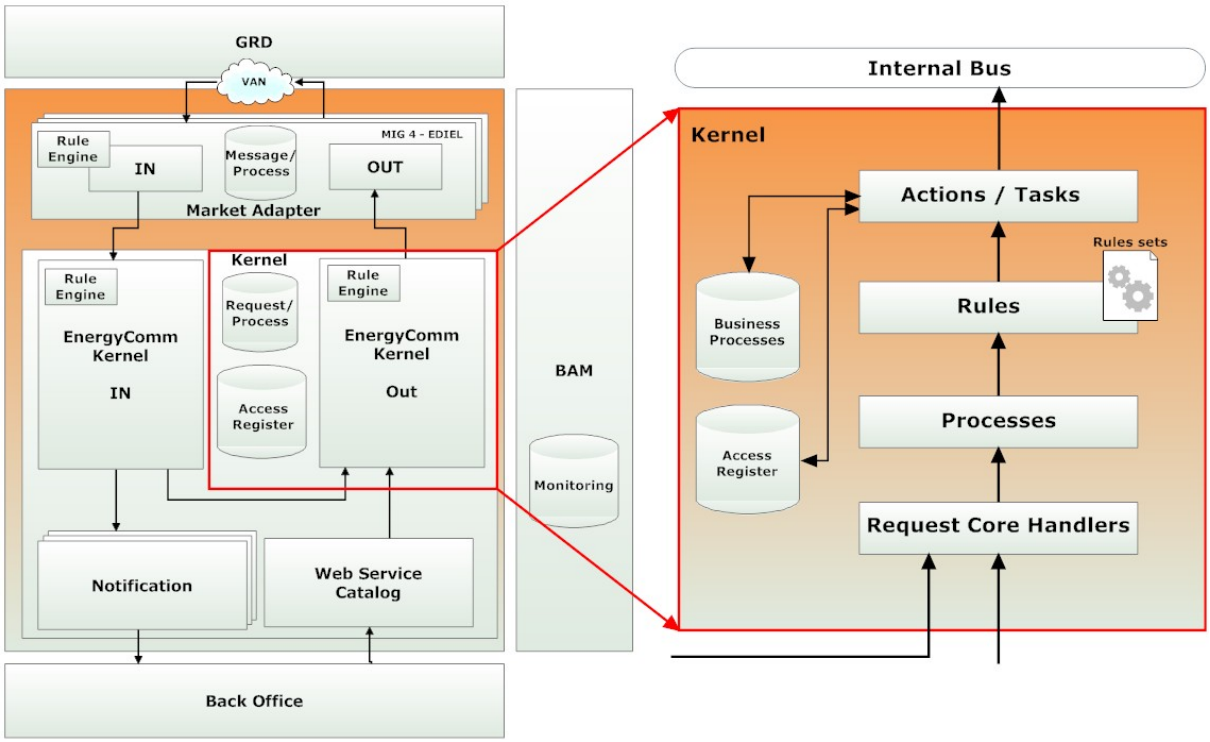

Figure 2 : The Kernel architecture

2.3.2.1 Service Layer

The service layer offers high level, business oriented, coarse-grained services. Some of these services are exposed to the outside world through web services. This typically enables back-office applications to use EnergyComm services for switching access points, consulting the access register, etc.

On the other hand, some other services may be invoked internally (usually by the Market Adapter) via the « Bus » - typically after the arrival of some data from the market.

In all cases, the request, whatever its origin, will be handled by the appropriate Request Core Handler depending on the request type.

2.3.2.2 Process Layer

The process layer is responsible for the management of business MIG scenarios. Requests received by the service layer often result in some actions (e.g. start, cancel, resume, etc.) on a new or existing process. This layer also isolates all process-specific business validation rules. Think for instance about the time-to-market constraints, or about the interaction matrix defining under which conditions a running process may be cancelled by the launch of another process of a different type.

Aside from the mere progress of the process itself, updates on the access register are also needed in order to model the business impact (e.g. gain or loss of contract, invoicing trigger, etc...) on the client portfolio of the supplier.

2.3.2.3 Rules Layer

To help the process layer in accomplishing this complex job, a rules engine was introduced.

It primarily focuses on three categories of rules:

- Data validation rules: determining what makes a request valid or not
- Data rejection rules: determining which actions should be taken when dealing with invalid data
- Data qualification rules: translating a valid request into some operational tasks (some of which might be delegated to the Market Adapter)

Using a rule engine rather than a workflow engine offers much more flexibility. One of the biggest and concrete advantages is the ability to overload or complete the standard business rule set of the MIG with additional custom rules wished by our customers.

2.3.3 Market Adapter

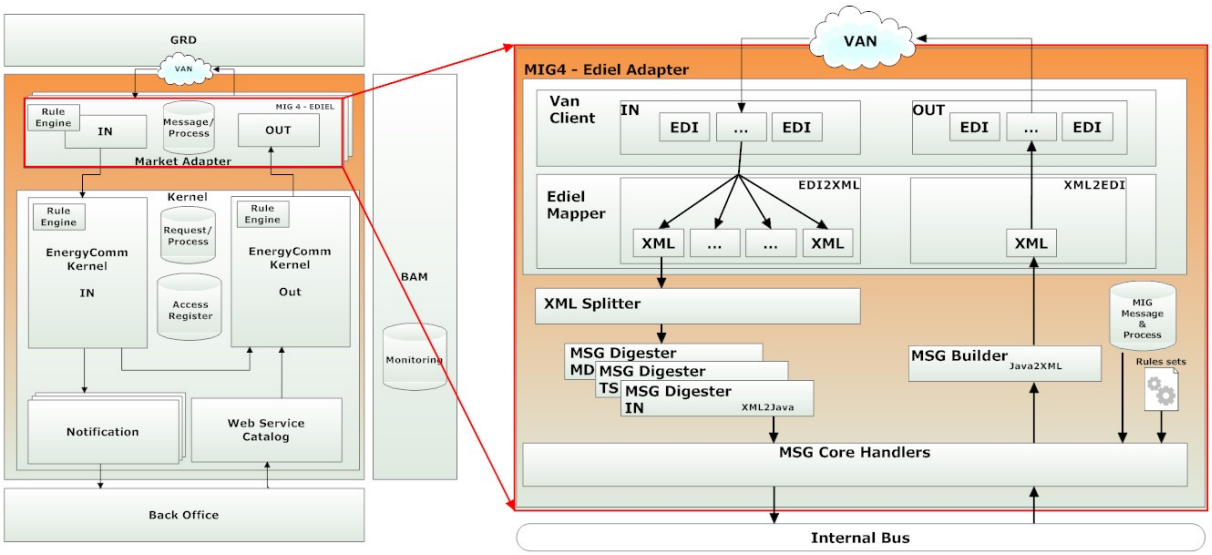

Figure 3 : The Market Adapter architecture

2.3.3.1 VAN Client

The VAN is a platform of communication that allows the standardized exchange of specific information between most actors of the Belgian Energy market. The exchanged data is related to customer switching, meter data handling, billing data delivery, master data parameters, rectification data, as well as aggregated data of allocation and reconciliation.

All players on this market must therefore implement a VAN connector in order to receive and send messages from and to the VAN. In the EnergyComm solution, this role is achieved by the "VAN Client" component.

In order to exchange EDIEL messages, the VAN Client uses an extension of the Secure Shell protocol (SSH): SFTP. This protocol assures that it runs over a secure channel, such as SSH, that the server has

already authenticated the client, and that the identity of the client user is available to the protocol. An inline data compression algorithm reduces the amount of transmitted information.

2.3.3.2 EDIEL Mapper

The EDIEL mapper reads incoming EDIEL exchanges, and builds EDIEL envelopes for outgoing exchanges. This mapper has two main purposes:

First, it hides the complexity of the underlying physical format (e.g. UN/EDIFACT) - in terms of syntax and structure - by providing a more readable, more manageable representation of the EDIEL message contents. Not surprisingly, we opted for XML, the de-facto standard for self-descriptive file formats, with strong capabilities when dealing with hierarchical data such as in EDIEL[1]. Furthermore, XML offers extensive tools and libraries to handle, i.e. read, validate, build, etc., XML format files.

Secondly, mapping a file from one structure to another enables us to work with more business-oriented contents. Consider the various code lists defined in the MIG (needless to say that <effectiveDate> is much more business-meaningful than « DTM+92 »), or how easily we can add new child elements to any existing collection, etc...

2.3.3.3 XML Splitter

This component is only used for incoming files. Taking advantage of the XML representation of any input file, we can easily slice huge data files into a set of smaller, independent, fined-grained (i.e. single-transaction) files. Not only does this open the door for parallel processing, but it also divides the work complexity by considering transactions individually, thereby reducing the risk of stalling a whole file because of a problem in a single transaction.

2.3.3.4 Message Digesters & Builders

As their name suggests, digesters are used to read and parse incoming XML data, while builders offers services to construct new outgoing XML messages intended for the market.

In both components, a marshalling[2] technique is used in order to implement Java -> XML (builder) and XML -> Java (digester) conversions.

Concretely, all this results, for client applications or components, in a 100% pure Java programming model leveraging the processing of EDIEL messages.

2.3.3.5 Message Core Handlers

Message handlers are important pieces of the puzzle, the real “brain” of the Market Adapter.

Whereas message builders and digesters typically know HOW and WHERE data are found, they still need to know WHAT kind of business data should be read from or written into which type of message, under which circumstances (WHEN), and with what consequences in terms of UMIG processes. To accomplish this task, they intensively collaborate with a rules engine.

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[1] envelope > messages > transactions > ...

[2] marshalling (similar to serialization) is the process of transforming the memory representation of an object to a data format suitable for storage or transmission. The reverse of marshalling is called unmarshalling (similar to deserialization)

3 Conclusion

EnergyComm provides energy suppliers with a powerful solution for communicating efficiently with all market players, especially with DGO's. EnergyComm is compliant with the rules of both current and upcoming Belgian Energy market (UMGIG 4 and UMIG 6), as well as with rules of both Dutch and French markets, and its flexible architecture enables the customisation of these standard business rules according to customers' needs.

EnergyComm will help you focus more on your business and less on market communication exchanges and their future evolution. Finally, EnergyComm gives you easier monitoring of market exchanges and processes by means of proactive monitoring and active notification through alerts.